To the Editor, *The Mathematical Gazette*

SIR,

Definition: A *solution* of a polynomial equation $p(x) = 0$ is a (real) number a such that $p(a) = 0$. The *multiplicity* of a solution a is the largest integer n such that $(x - a)^n$ divides $p(x)$.

In his response to "Find the solution set of ..." Mr Pargeter (October *Gazette* p. 303) uses the word "solution" in the above precise sense, in which sense the solution (set)s of the equations are the same. In the next sentence he implies that he also uses the word to mean "number-plus-multiplicity" in which sense the solution sets are different.

Yours sincerely,

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To the Editor, *The Mathematical Gazette*

SIR,

In the May and October, 1970, issues of the *Gazette* you have published three letters from Mr. A. R. Pargeter in which he criticizes aspects of "modern" mathematical syllabuses, "new approaches," and "blind adherence to the use of 'set language' ".

In the Exeter branch of the Association we have become accustomed to hearing Mr. Pargeter inveighing against what he thinks many of the rest of us are doing, as distinct from what we are actually doing. There are, however, two major difficulties involved in countering the general effects of Mr. Pargeter's attacks, which are to discourage teachers from examining sympathetically proposals for change, and to fortify and support those who for the wrong reasons do not wish to make any changes. The first of these difficulties is that Mr. Pargeter is a senior member of our profession, widely acknowledged as a most able mathematician and teacher whose views deserve respect. The second is that in the first flush of reform ten years or so ago much was done, and persists in text books and examination papers, which to say the least of it was hasty and ill advised, and is open to justifiable criticism; that criticism, incidentally, has not been lacking from the authors of change themselves.

If we regard teachers of mathematics as being divided into two camps—those generally satisfied, after very careful thought, with traditional syllabuses, and those who genuinely feel that substantial changes are necessary—then we might think of both camps as being embarrassed by adherents of the wrong kind: those too idle to change tacking on to the first and the whizz kids waving banners round the second. In this situation individuals can find themselves in real difficulty: if I say at the age of 55 that I favour (the enlightened teaching of) traditional syllabuses then I can obviously be written off as an old stick-in-the-mud; and if I say that I favour reform then clearly I am making a pathetic attempt to keep up with the times and avoid premature retirement.

This division of teachers into two camps ought to be a complete figment of the imagination, since indeed few of us belong wholly and all the time to one or the other. It does however seem to have taken a very tangible form in the existence and style of the Mathematical Association on the one hand and the Association of Teachers of Mathematics on the other. Rightly or wrongly the Mathematical Association is associated by many, *pace* its founders, with a conservative approach, and its prominent members as a body of high priests ready to guard the ark of the mathematical covenant with withering mathematical repartee.

To take some of the mounting pressure off Mr. Pargeter, I quote from Lady Jeffreys' Presidential address (Vol. LIV, p. 209):

"... it has seemed to me of late that in certain directions there is an enfeeblement of mathematical skills. However this need not be a result of taking the S.M.P. A-level papers." Like many quotations out of context this one is unfair to the author, but Lady Jeffreys will I hope understand that my concern is with the future of the Mathematical Association as an association of all teachers of mathematics, and I do not believe that its future expansion and development is being promoted by destructive criticism of the detail of some new experimental work.

How much I welcomed Professor T. J. Willmore's suggestion that "the responsibility for making reliable value judgements on what is important in current mathematics must belong to the professional mathematician who is himself engaged in creating new mathematics and new mathematical ideas". (Vol. LIV, p. 216). This is one line which I would like to see the Association pursue with vigour. Let us urge the professional mathematicians to commit themselves positively to a programme of what should essentially be taught at the present time to promising mathematicians at school; and let us have some relief from the spate of criticism of those who are doing what they believe to be right in the absence of such clear leadership.

I conclude with comments on points made by Mr. Pargeter in his letters. In the first (Vol. LIV, p. 164) he makes an analogy with music. I entirely agree with him. I have often however made exactly the same point in connection with the teaching of 'traditional' mathematics; mastery of scales, arpeggios, and fingering, and constant practice, are needed to play the piano—but they do not make music. He also writes "the mere contemplation and elaboration of structure is a sophisticated pursuit, and ultimately an arid one ..." On the first of these points many feel that the study of structure is best done by looking backward, but that it is a good idea to prepare for this by providing examples of structures of different types in elementary work. On the second point, that the study is arid, I simply do not know whether Mr. Pargeter has reached the frontiers of the subject and found a dead end; or whether like me he finds some of the standard works unspeakably dull; or what.

Mr Pargeter's second letter (Vol. LIV, p. 165) concerns notation, particularly notation for functions. I too am allergic to some of the modern notation, but I have found it stimulating and useful to be forced to think about functions, and the applications of the new approach in statistics have been helpful to me. (My personal bleat is

in the obliteration of "many-valued functions" without any simple phrase to replace what we were talking about.)

The Editor tells me that other correspondents deal with Mr. Pargeter's third letter.

Yours sincerely,

Hele's School,
Exeter

J. V. WILD

OBITUARY

ARTHUR JOHN MOAKES, M.A.

A. J. Moakes (Jack) came to St. Paul's School as a scholar from Thornton Heath Preparatory School in 1923 and went to Trinity College Cambridge as a science scholar in 1926. He gained a first class in Part I of the Maths Tripos in 1927, was a wrangler in 1928, and went on to take the Natural Sciences Tripos in 1929. After a short time teaching at Berkhamsted he returned to St. Paul's as a master and spent almost the rest of his teaching life there. He left St. Paul's in 1967 and took a part-time post at Southlands College of Education until he retired in 1969.

He taught mathematics and physics in the eighth forms where his success as a teacher was reflected by the many scholarships and subsequent firsts won by his pupils. He was scoutmaster of one of the school troops where his wide tolerance, friendliness and sense of humour endeared him to boys of every type. His interest in sea scouting led to annual camps on the Norfolk Broads—for both scouts and non-scouts—which are still a feature of life at St. Paul's. During the war he accompanied the school on its evacuation to Crowthorne and served with the Home Guard. He became head of the mathematics department in 1956.

In recent years Moakes was acknowledged as one of the leaders of the movement to liberate school mathematics, and most of the important things that he carried out were to this end. He developed an interest in desk calculating machines which led to his first book *Numerical Mathematics* published in 1963. It is a tribute to this early work that these machines have been accepted as a teaching aid at all levels in schools throughout the country.

The beginning of the last decade saw Moakes, worried by the widening gap between the traditional mathematics of that time and the developing University courses, writing his second book *The Core of Mathematics* which was designed to help the sixth former across that gap. At the same time he was leading St. Paul's to be one of the original members of the School Mathematics Project (S.M.P.). He became unhappy about the way S.M.P. was developing at 'A' level in those early days, so he joined the North London Schools Branch of the Mathematics in Education and Industry (M.E.I.) Project and played a vital part in the development of the 'A' level syllabuses produced by that group.