# CORRESPONDENCE

To the Editor, *The Mathematical Gazette*

DEAR SIR,—During the discussion on the shortage of teachers at the Annual Meeting in 1964 it was suggested that, if the Universities would accept single-subject " A " level mathematics as a qualification to read Honours Mathematics, more students would be available. The single-subject papers however have the disadvantage that neither pure mathematics nor applied mathematics can be covered adequately if the syllabus is not to become overloaded.

Surely a better solution (and, from conversations I have had, one more acceptable to the Universities) would be that either a good " A " level pure mathematics and " A " level physics, or a good " A " level pure mathematics and an " A " level arts subject, should be accepted by the Universities for an Honours Mathematics degree. The former combination would cater for pupils who wish to do mathematics and science in the sixth form before committing themselves to reading mathematics, and the latter combination would cater for pupils, perhaps mostly girls, who want to do mathematics in an Arts sixth form, and who would not do any mathematics otherwise.

In either case the University might have to have a preliminary applied mathematics course for one term before starting the normal syllabus, but the added facility in pure mathematics would make this much easier than at school.

" A " level pure mathematics and " A " level arts subject is also an excellent qualification to read Honours Mathematics and Education (York University), Honours Mathematics and Economics (Nottingham), Honours Pure Mathematics (Warwick).

Perhaps other Universities will also start such degree courses (Mathematics and Psychology, for instance). These degrees would appeal particularly to women and would perhaps provide for potential teachers.

Yours sincerely,

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To the Editor, *The Mathematical Gazette*.

DEAR SIR,—As a Professor of Applied Mathematics it is occasionally my lot (a not unhappy one) to be consulted by my colleagues in other fields regarding mathematical problems which arise in their particular disciplines. A recent experience may be of some interest and afford some amusement to your readers.

Two or three weeks ago I was approached by a colleague in the Geology Department and asked about the pressure gradient which would be necessary to push a given amount of viscous fluid through a broad but shallow cleft in a given time. He had consulted a book on hydraulics

and found quoted there the solution for steady viscous flow in a pipe of circular cross-section. He wondered if he could, without substantial error, think of his broad shallow cleft as an assemblage of pipes laid parallel to one another and so use this result. I informed him that this would introduce an unnecessarily poor approximation as there existed a simple two-dimensional viscous flow which was just what he was seeking but that this had not been included in the particular book to which he had referred because hydraulic engineers saw no need to incorporate in their texts data concerning the mathematician's much-despised " two-dimensional pipe ". The formula he required was the amount of fluid $F$ per unit distance along the cleft which passed a given point per unit time, namely

$$F = \frac{2h^3P}{3\mu},$$

where $2h$ is the depth of the cleft, $P$ the (constant) pressure gradient in the direction of flow and $\mu$ the coefficient of viscosity. We found that the numbers obtained from this formula checked well with the measured results in the problem he was investigating and he asked me for a reference which he could quote in the paper he was writing. I immediately thought of Lamb's " Hydrodynamics " and plucked my own copy (3rd edition) from my shelves to look up the appropriate equation. I found to my surprise that, except for the $P$ in the formula quoted above, the numerator and denominator had inadvertently been interchanged and I therefore advised him against using this particular source. I realised that his own colleagues reading a geological journal might well be suspicious of mathematics in the first place and that a reference to a formula in a text on Hydrodynamics, accompanied by some remark to the effect that it would have to be turned upside down first, was hardly likely to win their confidence!

Thinking that the error would have been corrected in a later edition, I hurriedly consulted the copy (6th edition) in the library of our own Mathematics Department. My relief that it had been corrected was soon tempered by my realization that a new error had crept in due to the fact that the " pipe " was now taken to extend from $z=0$ to $z=h$ instead of from $-h$ to $h$ as previously but that the necessary amendments had not been carried out consistently with the result that the final formula still contained an error although now a quite different one.

Eventually I found some other standard reference on Hydrodynamics from which he could quote correctly. I think I managed to persuade him that he had been the victim of two unfortunate coincidences but I greatly fear he has the impression that mathematics provides a most haphazard and unreliable background against which to examine his geological problems—and I must confess I feel some sympathy for him.

Yours faithfully,

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