

system consists in utilising the kitchen fire, which is almost constantly kept alight in summer and in winter. "Endeavour is made to prevent the air from entering the house at all except by the inlet provided in the lowest story of the house, with conditions available for the warming, cleaning, disinfecting, or otherwise improving the quality of the incoming fresh air, and regulating its quantity; the fresh air is then conducted into the central private hall, which is protected from smells, and all other means of pollution: it is from this private hall that the rooms draw their supply, even when the doors are shut. Having served its purpose in the rooms, the air is drawn off through the ceiling into the foul air chamber, and thence down and behind the kitchen fire, up the chimney-stack, and discharged high up in the open air, all possibility of back draught being prevented by the length and heat of the exhausting-syphon." It is a work which can be highly recommended to the officer of public health, the architect, and the householder, as a guide to the true principles of healthy ventilation. In "Sewer Gas; a Handbook on House-drainage," we have a very simple and original plan suggested for preventing noxious gases and exhalations from drains entering our houses. It is shown that these gases, being specifically lighter than atmospheric air, frequently ascend in pipes, and that they are also occasionally drawn in by the suction caused by the warmth of a house through accidental crevices in the drain pipes. It is proposed to remedy these evils by doing away with all traps except those connected with the pans of closets, and by placing a large trap in the pipe which connects the house drains with the sewer. A plan of this trap is given, showing that it is easily accessible, and can be cleaned at any time by even an inexperienced workman. The subject is one of even more importance than good ventilation. When we recollect that one of the most valued lives in Great Britain has been so recently imperilled from a mere defect in a system of drainage, we cannot too highly estimate the efforts of those who suggest, both by precept and experiment, the adoption of such measures as will ensure the safety of all sensible householders.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

Hindrances to Students of Mathematics

It was the opinion of Dr. Samuel Johnson that everything ought to be persecuted in order that we may know whether it is worthy to live or not. There is, doubtless, a good deal of truth in this opinion, and the idea or the man that cannot endure and overcome a considerable amount of difficulty is of but little value. Still there must be a reasonable limit to persecutions and difficulties, and hence I hope that the praiseworthy efforts of the English mathematicians to improve their text-books of geometry will be successful. In considering such a matter as the improvement of text-books, an extensive knowledge of the experience of all classes of students will be valuable, and as many of the mathematical books profess to be written for those who are not fortunate enough to have a teacher, an account of the difficulties which such a one has experienced may be of some interest.

I place first among these difficulties the practice common to nearly all mathematical writers, of restricting the number of axioms or fundamental assumptions, making them fewer than they naturally are. It is worse than useless to attempt to prove something that is self-evident, or which is so nearly so that it is impossible to make any proof illustrate it. In all such cases it would be better to state frankly and clearly that we make an assumption, depending on observation to justify it. An example of this superfluous proof may be found in many of the books on rational mechanics, where we are told that a body cannot move out of the plane of the forces, because we know of no reason why it should move to one side rather than the other; therefore, &c. Of useless definitions we have an example in a popular

work on arithmetic, where we are told that "time is the measurement of duration," and a few pages further on that "duration is a portion of time." Allied to this is the contemptible habit of those who explain, with kind condescension and with great detail, all insignificant matters, while at the same time they cover up or dodge by some such phrase as "it is evident" the really difficult points.

2. I do not object to a frequent and thorough application of the differential calculus in a text-book, and such an application seems to me better than the coarse processes under which this calculus is sometimes concealed; but there is a habit, common to young writers, of introducing forced and difficult demonstrations where more simple ones would be better. An illustration may be found in one of our best books on astronomy. In the first edition of this book the author gave a long and difficult demonstration of the well-known formulæ for the transformation of rectangular co-ordinates in a plane. The demonstration was made to depend on the solution of functional equations by means of the differential calculus, and is an awkward thing to place at the beginning of a text-book. In the second edition, having removed this demonstration and supplied its place by a simple one, the author has made the first chapter of his book the best synopsis of spherical trigonometry that I know of.

3. An error of the English text-books written by Cambridge men is, I think, the great number of examples given at the close of each chapter. At least one-half of these should be omitted. It is a great mistake to keep the student lingering over the never-ending questions of conic sections, of maxima and minima, &c., and to give him the habit of solving petty problems, when he should be led forward as soon as possible to the study of the memoirs of those who have created the science. In this connection it seems to me a mistake in treating the differential calculus to confine ourselves rigorously to the notion of a limit. Although the doctrine of limits may be the only logical foundation of this calculus, the student as he advances must soon become familiar with differentials, and it is well that he should make their acquaintance in his text-book.

4. A defect, perhaps of teaching rather than of text-book, is the ignorance of all American students of numerical and logarithm calculations, and from my slight observation I infer that such is the case also with English students. It is not uncommon to hear such calculations spoken of with contempt, but there is nothing that gives one a clearer idea of the meaning of analytical formulæ than to make a numerical application of them. In this matter it seems to me that the assistance of a teacher is of much more importance than in dealing with theoretical difficulties, since with these a student must generally be left to himself, while a little advice from a skilful computer will save the beginner much time and trouble.

5. Finally I mention, as a source of some confusion and perplexity to the student, the changes of notation and the introduction of new names. Some such change and inventions will be necessary with the progress of science, but any which tend to mar the symmetry of analytical expressions, and render less easy the reading of the great mass of mathematical literature that we already possess, should be avoided. To call a well-known function a "wonnunetomy," or a "subcontra-wonnunetomy," does not of course endow it with any new properties, or make its discussion one whit easier, although we may gain a slight advantage in the way of brevity of reference. For my own part I hope that this introduction of words of thundering sound, and the calculation of almost interminable formulæ, for which no more ingenuity is required than for a numerical calculation, is only premonitory to the invention of a calculus of operations which shall furnish us with shorter and more powerful methods of investigation.

ASAPH HALL

Washington, August 16

Jeremiah Horrocks

In the course of research (for literary purposes) concerning Jeremiah Horrocks, the astronomer, born at Toxteth, near Liverpool, 1619, I have been unable to discover his parentage. Could any of your readers help me in this matter?

London, Aug. 12

E.

The "Mors Electrique"

WITH reference to your notice of M. Sidot's "Mors Electrique," I may mention that in India it has been proposed to use Magneto Electricity for the purpose of starting a jibbing horse,