LETTERS TO THE EDITOR.

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Symbol for Partial Differentiation.

IN his first letter (p. 53), Prof. Perry very properly drew attention to the desirability of greater definiteness in the notation for partial differential coefficients in the case of functions of two variables, the essence of his remarks being that it is not enough merely to change d into ∂, but that the variable which is for the nonce held to be constant should also be indicated. Apropos of this, and for the sake of historical interest, I quoted from a paper since published (*Proc.* R.S. Edinb xxiv. pp. 151–194) a short paragraph regarding a passage[1] in Jacobi's writings of the year 1841, and containing a footnote with an old suggestion on the matter of notation. In his second letter (p. 271), Prof. Perry undertakes to show that this latter notation is objectionable so far as thermodynamics is concerned, and not to be compared with that which he himself uses. I regret to have to say that I was quite satisfied with his notation, and had no intention whatever of bringing the two into comparison, mine having been designed for much more complicated cases than those which occur in ordinary text-books on thermodynamics. His words are :—

"I use one letter E where on Mr. Muir's suggestion I must use six distinct symbols if I have to express any differential coefficient of E, and if I have to express all the differential coefficients of v I must use other six symbols ; altogether I must use thirty of these curious symbols instead of five common letters, and, furthermore, I must keep them all in my head."

This is, of course, all a mistake. Without any desire, therefore, to spare Prof. Perry's head, but merely in order to undo a misrepresentation, however unwitting, I am forced to point out that if we are to have a perfectly definite notation in this connection, we must indicate three things, viz. (1) the dependent variable E ; (2) the two independent variables, say v and p ; and (3) whether the differentiation is to be performed with respect to v or p. Now, in the notation of my last letter these three are all cared for, thus

$$E^{1}_{v,\,p};$$

or, since a vinculum contributes a "curious" look to the symbol, let it be written

$$E\,(^{1}_{v,\,p}).$$

The notation used by Prof. Perry, viz.

$$\left(\frac{dE}{dv}\right)_{p}$$

is a trifle lengthier, but, as I have said, is equally definite, the main difference between the two arising from the fact that in the matter of differentiation he is a "dee-ist" ; it is, however, excessively cumbrous when used in the complicated cases for which the other was designed. THOMAS MUIR.

Cape Town, South Africa, August 9.

IT would have been presumption on my part to express my private opinion, which is in favour of Dr. Muir's symbol in general mathematical work, and so I referred merely to its use in thermodynamics where I think that such a use would be bad.

The form he now gives is handier, being a mnemonic for my symbol, but I submit that it is different from what he would use in other applications of mathematics. According to his general system, $p\,(^{1}_{v},\,\phi)$ implies that there is a function of v and ϕ called $p\,(v,\,\phi)$ which is differentiated. But $p\,(^{1}_{t},\,E)$ implies that there is a function $p\,(t,\,E)$, and in thermodynamics $p\,(v,\,\phi)$ is always equal to $p\,(t,\,E)$. If p is a functional symbol there can be no such equality, and I still think that the forms in which I put Dr. Muir's suggestion were the only ones consistent with his instructions. The new form would give no great trouble to a good mathematician perhaps, but it would quite unsettle the ordinary student of thermodynamics.

A man who insists on "dee-ism" in those parts of higher mathematics where it is clumsy is an obstacle to progress. But if Dr. Muir had my experience in dealing with men who know only a little mathematics and who wish to use what they know, he would, I think, be a "dee-ist" in elementary work.

JOHN PERRY.

[1] Well worth reading. It begins at "Ut distinguerentur," on p. 320, and ends at bottom of p. 322 of vol. xxii. of *Crelle's Journal*.

PROF. JOHN JAMES HUMMEL.

JOHN JAMES HUMMEL was born in 1850 at Clitheroe, in Lancashire. His father was a native of Switzerland and his mother English.

His scientific education was obtained at the Zurich Polytechnic, where he studied under Bolley, Städeler, Wislicenus and Weith. On returning to England in 1870, he became chemist in the calico printworks of Messrs. Jas. Black and Co., of Alexandria, near Glasgow, and remained there six years, busily and successfully engaged with new dyeing problems incident to the introduction of artificial alizarine and other coal-tar dyes. He was subsequently connected with other printing and dyeing firms, until in 1879 he decided to gratify his taste for science and teaching by applying for the post of Instructor in the dyeing department established at the Yorkshire College by the Clothworkers' Company of London. On taking up work at the College, Hummel applied himself with the utmost assiduity to devising and developing a system of instruction in dyeing. In this difficult undertaking he relied upon his own ideas, and he will always rank as a pioneer in this branch of teaching. He was a firm believer in the value of pure science, and always protested against that superficial teaching of technology too often attempted in compliance with the wishes of self-styled practical men. The course of teaching which he devised has been adopted very widely in this country and has attracted much attention abroad. The Dyeing School at the Yorkshire College has drawn students from all parts of the world.

Hummel's original contributions to his subject have always been marked by mastery of the subject in hand and scrupulous attention to detail. The burden of teaching and administrative duties severely restricted his time for experimental investigations, but his desire to have such work in progress in his department was gratified in the most handsome way by the Clothworkers' Company, which has associated a research chemist with the professor of dyeing.

The last few years of Hummel's life were devoted to the planning and organisation of important extensions of his department, which is now in possession of extremely ample and well-appointed buildings. In this, as in all other work, Hummel did not spare himself, and the strain doubtless told upon his health.

As an expert on his subject, Hummel was in constant demand. He lectured occasionally on important developments of dyeing before the Society of Arts, the Imperial Institute and other institutions, and he was a juror at the last Paris Exhibition. As an author, he was best known by his admirable text-book of dyeing, which has had a very large circulation and has been translated into a great variety of languages.

His labours have done much for the college with which he was associated and for the important industry that he so earnestly desired to serve. Fortunately, he has left a large number of disciples who, in different parts of the world, are carrying on the work which he originated.

A. S.