XX. On the damping of long waves in a rectangular trough

Robert A. Houstoun Ph.D. D.Sc.

To cite this article: Robert A. Houstoun Ph.D. D.Sc. (1910) XX. On the damping of long waves in a rectangular trough , Philosophical Magazine Series 6, 19:109, 205-206, DOI: [10.1080/14786440108636792](https://doi.org/10.1080/14786440108636792)

To link to this article: <http://dx.doi.org/10.1080/14786440108636792>

Published online: 21 Apr 2009.

Submit your article to this journal [↗](#)

Article views: 2

View related articles [↗](#)

The formula (p. 709) which the authors quote and use in their calculations is not quite accurate. It should read:—

$$f=1+\frac{1}{3}\frac{x}{a}+\frac{1}{45}\frac{x^2}{a^2}+\frac{2}{945}\frac{x^3}{a^3}+\dots$$

Schuster gave $(73/53760)(x^3/a^3)$ as the fourth term in the expansion of f_1 , when x/a is small; but I find by using the Euler-Maclaurin sum formula that the approximate formulæ for f_1 and f agree, at least as far as the fifth term which is $(17/14175)(x^4/a^4)$.

I am,

Faraday House,
Nov. 15, 1909.

Yours faithfully,
ALEXANDER RUSSELL.

XX. *On the Damping of Long Waves in a Rectangular Trough.* By ROBERT A. HOUSTOUN, *Ph.D., D.Sc., Lecturer on Physical Optics in the University of Glasgow*.*.

UNDER the above title I recently published a paper in this Journal†, in which some experiments on the damping of long waves in a rectangular trough were described. The observed logarithmic decrement was as a rule more than twice as great as my calculated value, and I suggested that the difference was mainly due to a film forming on the surface of the water.

Since then Mr. W. J. Harrison‡ has attempted to show that the discrepancy is due to the sides. I have delayed replying in the hopes of making further experiments, but as that now appears out of the question, I take this opportunity of stating my views on Mr. Harrison's paper.

Mr. Harrison finds it impossible to attack the problem in the ordinary way, using the general equations of motion for a viscous fluid and writing down the condition of no motion at a fixed boundary. It was because this method was not possible that I confined myself to long waves. As my trough measured 152.4 cm. by 20.3 cm., and the depths used varied from 1 to 10 cm., this approximation seemed justifiable. Mr. Harrison, on the contrary, abandons the usual boundary conditions, and assumes in their place that the sides are perfectly smooth. On solving and approximating he then

* Communicated by the Author.

† Phil. Mag. [6] vol. xvii, pp. 154-164.

‡ Phil. Mag. [6] vol. xviii, pp. 483-491.

finds an expression for the period, of a different type from mine, and hence concludes that my analysis is not suitable for two horizontal dimensions. He forgets, though, that while my waves are of type

$$u = \sin \frac{q\pi x}{a} \sin \frac{r\pi y}{b},$$

u being the velocity in the direction of x , and the sides being given by $y=0$ and $y=b$, his are of the type

$$u = \sin \frac{q\pi x}{a} \cos \frac{r\pi y}{b}.$$

I do not see why our results should agree as our boundary equations differ. I also do not think much weight can be placed on conclusions based on the assumption that there is slipping at the sides, an assumption which manifestly does not correspond with facts.

On examining my results it certainly struck me as remarkable that the influence of the sides should be so small. But this seems borne out by facts, although the experiment is not decisive. On reducing the breadth to one-half its former value (*cf.* page 162 of my former paper) the logarithmic decrement increased only 10 per cent. Had the discrepancy been mainly due to the sides, I should have expected a larger change.

XXI. *Proceedings of Learned Societies.*

GEOLOGICAL SOCIETY.

[Continued from vol. xviii. p. 937.]

April 28th, 1909.—Prof. W. J. Sollas, LL.D., Sc.D., F.R.S., President, and afterwards Prof. W. W. Watts, Sc.D., F.R.S., Vice-President, in the Chair.

THE following communications were read:—

1. 'The Boulders of the Cambridge Drift.' By Robert Heron Rastall, M.A., F.G.S., and James Romanes, B.A.

For several years past a large number of boulders have been collected from the Glacial drifts of Cambridgeshire, and from the post-Glacial gravels which have been derived from the drifts. These specimens have been classified geographically and then subjected to a careful petrological examination, with a view to the determination of their origin. Some special collections from