Int. J. Heat Mass Transfer. Vol. 12, pp. 129–136. Pergamon Press 1969. Printed in Great Britain

PIONEER PAPER

INTRODUCTION

THIS journal has, in the past, reprinted various papers which had a profound influence on our understanding of heat- and mass-transfer processes. The first paper in this series was one by Osborne Reynolds: On the Extent and Action of the Heating Surface of Steam Boilers (*Scientific Papers of Osborne Reynolds*, Vol. I, pp. 81–85. Cambridge University Press, London, 1901) reprinted in Vol. 3, No. 2 of this journal. The paper presents considerations which lead to the establishement of the analogy between convective heat and momentum transfer usually referred to as Reynolds analogy. Just one hundred years ago, in 1868, Osborne Reynolds was appointed to a chair at the University of Manchester. To commemorate this event, we are publishing a second paper: On the Two Manners of Motion of Water (*Proceedings of the Royal Institution of Great Britain*, 1884). This contribution summarizes Reynolds studies on the transition from laminar to turbulent flow which had been published in detail in the paper An Experimental Investigation of the Circumstances Which Determine Whether the Motion of Water Shall Be Direct or Sinuous, and of the Law of Resistance in Parallel Channels (*The Philosphical Transactions of the Royal Society*, 1883). A knowledge of the conditions for transition is a prerequisite to heat transfer analysis. It is revealing what insight into the factors causing transition Reynolds already had.

E. R. G. ECKERT

University of Minnesota
Minneapolis
Minnesota 55455

PAPERS ON MECHANICAL AND PHYSICAL SUBJECTS

OSBORNE REYNOLDS, F.R.S., Mem. Inst. C.E., L.L.D.
Professor of Engineering in the Owens College, and Honorary Fellow of Queens' College, Cambridge

Reprinted from Various Transactions and Journals.
Volume II, 1881–1900.
Cambridge, at the University Press (1901)

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ON THE TWO MANNERS OF MOTION OF WATER

(From the *Proceedings of the Royal Institution of Great Britain*, 1884)

(*Read March* 28, 1884)

INTRODUCTION

IT HAS long been a matter of very general regret with those who are interested in natural philosophy, that in spite of the most strenuous efforts of the ablest mathematicians, the theory of fluid motion fits very ill with the actual behaviour of fluids; and this for unexplained reasons. The theory itself appears to be very tolerably complete, and affords the means of calculating the results to be expected in almost every case of fluid motion, but while in many cases the theoretical results agree with those actually obtained, in other cases they are altogether different.

If we take a small body such as a raindrop moving through the air, the theory gives us the true law of resistance; but if we take a large body such as a ship moving through the water, the theoretical law of resistance is altogether out. And what is the most unsatisfactory part of the matter is that the theory affords no clue to the reason why it should apply to the one class more than the other.