

was a good classical scholar, and could converse with perfect fluency in English, French, German, Danish, and Italian; and could read with ease nearly all the modern European languages. He made some strong friendships among his colleagues, and his acknowledged ability and his manner and address, which were eminently those of a polished gentleman and man of the world, won for him universal respect and esteem.

Altogether I looked upon Rudolf von Willemoes-Suhm as a young man of the very highest promise, perfectly certain, had he lived, to have achieved a distinguished position in his profession, and I look upon his untimely death as a serious loss not only to the expedition in which he took so important a part, but also to the younger generation of scientific men among whom he was steadily preparing himself to become a leader.

C. WYVILLE THOMSON

H.M.S. *Challenger*, Tahiti, Oct. 1

THE PENIKESE SCHOOL

OUR readers will regret to hear that the Anderson School of Natural History in Penikese Island, U.S., has come to an untimely end, and will no doubt regret still more that it has done so amid much unpleasant feeling between those chiefly concerned. We shall endeavour to state fairly the facts of the case.

Mr. Anderson, who is a wealthy merchant, made a gift of Penikese Island and 50,000 dollars in cash to the late Prof. Agassiz, in order to enable him to start a school for the practical teaching of natural history. This sum, it may well be believed, was only sufficient to start the school, erect buildings, furnish apparatus, and other necessities. No one can complain that Mr. Anderson did not also endow the school, and during the life-time of the elder Agassiz there seems to have been no difficulty as to funds. On his death, his son, Mr. Alexander Agassiz, undertook to carry on the school. This he did, we believe, very unwillingly, as he knew there were no funds available for the daily business of the school, and he did not consider the island a suitable location for such an institution unless largely endowed. Moreover, it was his father's earnest wish that he should devote most of his time and energy to the Museum at Cambridge. However, he consented to conduct the school on condition that Mr. Anderson would contribute the sum of 10,000 dollars towards its support for the next three years. The first intimation of any dissatisfaction on the generous donor's part seems to have been made to the trustees at the end of 1874, when he sent them 1329.60 dollars to pay off debts which had been incurred, announcing at the same time that this was the last contribution he would make. The trustees seem, nevertheless, to have made every effort to carry on the school. A member of Prof. Agassiz's family contributed a guarantee fund of 3,000 dollars, and appeals were made in all directions, but without anything like success. Clearly the trustees and the teachers themselves could not be expected to carry on the school at their own expense, and all that they had any right to look for from Mr. Anderson was the balance of the 10,000 dollars which he promised; why he failed to contribute this, we are unable to say. Had he done so, those interested in the success of the school would have had time to set about raising something like an endowment fund, and a fine opportunity would have been afforded to the U.S. Government to show their appreciation of practical scientific teachers and scientific research. As it was, the only course which seemed left to the trustees, when everything is taken into account, was to close the school and sell off the furniture and aquaria. Mr. Anderson seems to have considered himself ill used and insulted by the trustees, and Mr. Agassiz in particular; but so far as the facts are known to us, we certainly believe he is mistaken. Mr. Agassiz has duties of the highest importance to attend to in connection with

the Cambridge Museum, and he could not possibly be expected to waste his time and energy on an undertaking in whose success no one seemed to be interested. He seems to us to have acted in a straightforward and honourable manner, and only to have given up the school when he saw there was no possible hope of getting funds to carry it on. Mr. Anderson, for some reason which does not appear, seems to have lost his temper, and may naturally have been annoyed that the public did not come forward in support of the school which he so generously founded. The result is certainly to be regretted, but we hope that Mr. Agassiz and Mr. Anderson may come to a better understanding, and that even if the school be not again started, the latter will see that the former has acted all along in the interests of science, whose servant he is. To have touched the Agassiz Memorial Fund, now 347,000 dollars, as some one suggested should have been done, was simply impossible; it was collected for a special purpose.

Mr. Agassiz took two of the most promising Penikese pupils into his laboratory at Newport, and intends, we believe, as soon as the necessary means can be collected, to establish a school at some more suitable locality.

THE THEORY OF "STREAM LINES" IN RELATION TO THE RESISTANCE OF SHIPS *

II.

IT might at first sight appear that I have now the materials for the proof of my chief proposition, the assertion of the unresisted progress of a submerged body; for such a body might be assumed to be surrounded by a system of imaginary pipes, as shown in Fig. 8; and each of these pipes being in equilibrium

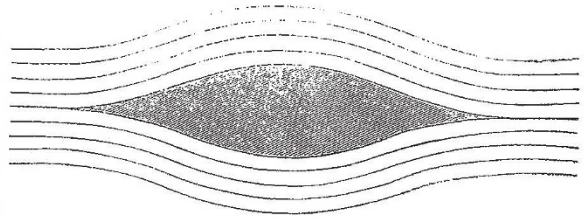


FIG. 8.

endways, that is to say, the flow of fluid through it not tending in the aggregate to move it endways, neither, it might be said, would the flow of fluid tend to move the submerged body endways. But this reasoning would not be sound. The pipes we have hitherto been considering have been of uniform sectional area throughout their length, an assumption which has been necessary to the treatment pursued, as the velocity has in each case been assumed to be uniform throughout the pipe. The section of the pipe may have been square, circular, trapezoidal, or any other form; but the area of the section has been assumed to be the same throughout the length of the pipe.

But pipes of uniform sectional area do not truly represent the flow of a fluid past a submerged body. I shall presently ask you to consider the fluid as flowing past the body through a system of imaginary pipes; but to render the assumption admissible, the sides of the imaginary pipes must not be so placed as to interfere with the established course of the fluid, whatever that may be; in other words, if, for the sake of illustrating the behaviour of the fluid, we assume that it is divided into streams or filaments flowing through imaginary pipes, we must accept such a form for those imaginary pipes that their sides exactly follow the paths of the adjacent particles of fluid.

Now such a rule may, and probably will, require the imaginary pipes to be of varying sectional area throughout their length. Therefore, before we can apply the analogy of the flow of fluid through pipes to the flow of a fluid past a submerged body, it is necessary to consider the behaviour of fluid in pipes of varying sectional area.

It is, I think, a very common but erroneous impression, that a

* Address to the Mechanical Section of the British Association, Bristol, August 25, 1875; by William Froude, C.E., M.A., F.R.S. President of the Section. Revised and extended by the author. Continued from p. 52.