

LETTERS TO THE EDITOR.

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The Descent of a Sphere in a Viscous Liquid.

STOKES'S formula for the terminal velocity of a sphere descending in a viscous liquid under the action of gravity has been recently tested by Prof. John Zeleny and Mr. L. A. Keehan ("British Association Report," 1909, p. 407), and they found that the values of the velocity furnished by it were considerably larger than those which they obtained from their experiments. Since Stokes's formula is obtained on the hypothesis of no slipping, it furnishes an inferior limit to the velocity, and consequently the discrepancy between theory and observation cannot be explained on any hypothesis that slipping takes place.

I think that a possible explanation is the following. The equation determining the current function contains the term $d\psi/dt$, the origin being some fixed point in the line of motion of the sphere; and if the motion be referred to the centre of the sphere as a moving origin, $d\psi/dt$ must not be put equal to zero when the motion is steady, but must be replaced by $Vd\psi/dz$, where V is the constant velocity of the sphere. The retention of this term creates no difficulty so far as the integration of the differential equation for ψ is concerned, but the solution is quite different from that given by Stokes.

A. B. BASSET.

Fledborough Hall, Holyport, Berks, June 20.

Popular Biological Misconceptions.

THE object of science is to increase the knowledge of mankind in general, and not merely that of the workers in science. The methods of science may be only understood by the workers in each particular branch, but the conclusions are for all, and should be made accessible to all. The methods by which Newton established the law of gravitation can only be understood by good mathematicians, but the results can be put into words that can be understood by any educated man. I think most will agree that students of science should, so far as possible, make known their discoveries in such a way as to be understood by the layman.

In making these remarks I have biology in mind. Nothing is known of biology outside the ranks of biologists. Even Darwin's theory of evolution is most imperfectly understood by the ordinarily educated man. Probably working biologists have no idea how much it is misunderstood. When the late Lord Salisbury at Oxford said that there was nothing except pure chance to ensure the transmission of an advantageous variation, he left out of consideration the survival of the fittest, an integral part of the theory. Sir Oliver Lodge, in "Man and the Universe" (p. 38), speaking of the persistence of favourable variations, says, "given their appearance, their development by struggle, inheritance, and survival can be explained; but that they arose spontaneously, by random change, without a purpose, is an assertion that cannot be justified." This passage shows that the writer has not fully grasped the elements of the theory; the changes take place in every direction, but all variations except those in favourable directions are wiped out in the struggle for existence; such, at any rate, is the theory. When we consider that Darwin's theories are not fully grasped by scholars, it is hardly to be wondered at that the ordinarily educated man has but the vaguest ideas of biology, ideas made still more vague by the ordinarily educated writers in the daily, weekly, and monthly Press. To the ordinary man the word Darwinism means the theory that his ancestors were monkeys; he will have heard the words "survival of the fittest" used as a catch phrase, but he will have no idea of their meaning; "struggle for existence" will have no biological sense for him; "selection" he will think has something to do with sex. Biologists may say either that I am exaggerating or that the educated men of my acquaintance must be singularly few; but I can assure them that such misconceptions are shared

by very many men who have been educated at our public schools and universities, which is generally (though perhaps erroneously) considered the criterion of a good education. It is quite common to come across persons who say that Darwinism is discredited by new discoveries, especially by Mendelism; they have no other idea of the meaning of Mendelism, and, seeing that their notion of Darwinism is no more than I have stated above, they arrive at conclusions that would rather astonish the average biologist.

I think it is the duty of biologists to educate the uneducated in biological matters, to tell them how matters really stand, and to tell them how far old theories are, or are not, modified by new views; but we should be educated by first-class masters, and not by second-hand popular writers. This has been done for a long time for astronomy, and, to a certain extent, for physics; it is very desirable that it should be done also for biology.

C. C.

Anomalous Reading of Hygrometer.

ON June 11 I observed a case of the wet-bulb thermometer reading higher than the dry bulb, which cannot be attributed to a falling temperature, as this anomalous condition continued for more than two hours, during the greater part of which the temperature was slowly rising. A gradually dispersing fog prevailed at the time, and the dry bulb was at first covered with precipitated moisture, but after being wiped dry it continued to read lower than the wet bulb, without any further visible deposition of moisture. This, however, may only imply that evaporation was proceeding too rapidly to allow of the fog particles aggregating into visible drops. This evaporation might account for the temperature of the dry bulb being as low as that of the wet bulb, but not lower. As thermal equilibrium will be attained by each thermometer when its rate of heat-loss is equal to its rate of heat-gain, and as the only loss of heat is by evaporation, which at most can only lower the dry-bulb reading to that of the wet, it is necessary to suppose that the wet bulb absorbs heat more rapidly than the dry. This may be accounted for by the greater thermal diffusivity of the wet bulb with its saturated muslin covering.

Experiments made by Prof. A. W. Porter at University College, London, show clearly that, in the case of steam pipes of small diameter, the effect of a lagging of badly conducting material is to promote the transference of heat from the interior to the exterior, and it is evident that if the external temperature be higher than the internal, the effect will be reversed, and, further, that it will be increased if the covering is not a bad conductor. We have such a covering on the wet-bulb thermometer, and as owing to evaporation the temperature of the thermometers will be lower than that of their surroundings, the direction of heat transfer will be inwards, and its rate more rapid in the "lagged" wet bulb than in the bare dry bulb. We should accordingly expect the former to come to a state of thermal equilibrium at a higher temperature than the latter.

J. ROWLAND.

St. Beuno's College, St. Asaph, June 20.

Pwdrre Ser.

DOUBTLESS many of your readers will suggest that Pwdrre Ser may, in some cases at least, be the jelly-like plasmodium of *Spumaria alba*, D.C., a common British myxomycete. The size, colour, time, and places where found agree well with Prof. McKenny Hughes's description, but how it should be connected with meteors this identification, if correct, would in no way explain.

AGNES FRY.

Failand House, Failand, near Bristol.

THE article on "Pwdrre Ser" in your issue of June 23 has brought to my remembrance a tale of a shooting star which fell upon a connection of mine many years ago. The man was working in the field, when a mass of jelly fell upon him. I discredited the story at the time; but this article seems to lend weight to the story. I believe the man was unhurt. The occurrence happened in Wales.

ROWLAND A. EARP.

Preston Brook, near Warrington, June 27.