LETTERS TO THE EDITOR

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Prof. Tyndall on Germs

I AM very glad I wrote to you putting my questions to Prof. Tyndall. It has drawn from him a letter, full of all sorts of hints and prophecies and information and pleasant observations on details with which I had not thought of troubling him; and there is even a delicate bit of flattery for poor me, of whom the Professor knows nothing. It is really quite a gem of a letter, a beautiful example of that "tour piquant" referred to by M. Pasteur, which the Professor gives to everything he touches, and which we at home know how to value as well as any Frenchman. There is only one fault in it, and that is that the Professor, in the exuberance of his kindness, has unfortunately forgotten to answer my modest questions. But why does he liken himself to Horatius, and talk of enemies yet to be dealt with? Horatius did not sing his pæan before going into battle. And how can Prof. Tyndall have any enemies? I thought that scientific investigators were all brothers. I regarded Prof. Tyndall as a brother keeping a bright look out due north, and Dr. Bastian as a brother with his eye firmly set towards the south, while Dr. Sanderson seemed to me to be a remarkably silent brother gazing somewhere about sou'-sou'-west-and-by-south-a-quarter-south.

But to be serious. Briefly put, the situation seems to be this.

Prof. Tyndall has propounded a theory—no mere speculation raising a trifling controversy to be settled privately with Dr. Sanderson or Dr. anybody else, but a momentous theory on which, as he says, "the lives of men depend," and the truth of which it concerns all men to sift. It is not addressed to any scientific coterie, but widely published for the benefit of the outside world, the like of me among the rest.

The theory as propounded stands or falls with the assertion that when, with due precautions, an organic fluid is boiled for a few minutes in a flask, which is then hermetically sealed, it is impossible to obtain bacterial putrefaction.

What Prof. Tyndall declares to be impossible, that Dr. Sanderson declares that he has done.

If Dr. Sanderson is right there is an end of the theory, and the lives of men must rest on some other basis.

If Prof. Tyndall is right, Dr. Sanderson (not to put too fine a point upon it) has blundered in his very careful experiments.

Anxious to know where I should look for the truth, I ventured to ask Prof. Tyndall which alternative he adopted. Instead of helping me out of my difficulty he has responded with a flourish of rhetoric about not crossing swords with Dr. Sanderson. It is plainly from no want of courtesy that Prof. Tyndall has declined to satisfy my curiosity. He can't help being courteous; and to the class to which I belong—simple students who hang upon the lips of Professors for their scientific sustenance—he invariably overflows with courtesy.

I am sure he would have answered me if he could.

Even now I should be grateful (and so I believe would many more of us outsiders) if on second thoughts he should resolve to put his rhetorical sword into the unadorned scabbard of common sense, and kindly try to answer three plain questions:—

1. Does he accept Dr. Sanderson's experiments, and give up his theory?

2. Does he reject Dr. Sanderson's experiments as untrustworthy, and why?

3. Can he suggest any third view which will reconcile his theory with established facts?

Unless Prof. Tyndall feels constrained by his regard for human life to give me a reply, I will not press him to do so, if it would be in the least embarrassing. Only, if there is to be an answer, I hope this time it will be direct to the point. Perhaps, after all, it is not absolutely necessary. Silence is sometimes more eloquent than speech.

Feb. 19 INQUIRER

[This letter was unavoidably delayed last week.—ED.]

The Mechanical Action of Light

IN his recent lecture at the Royal Institution upon the Mechanical Action of Light, Mr. Crookes stated that his investigations into this subject had enabled him to measure the repulsive force of light, and he calculated that the sun's light exercised a repulsive force upon the surface of the earth of 3,000 millions of tons, a force sufficient, he said, to drive the earth into space, were it not for the attraction of gravitation.

Let us look for a moment at this conclusion of Mr. Crookes. Granting that gravitation and a (hypothetical) tangential force cause the planets to revolve round the sun, the continuous action of a repulsive force emanating from the sun and impinging upon the surfaces of the planets, would cause them to spin round upon their axes just as a ball spins round when it is propelled along a resisting surface. This rotation would be in the same direction—right to left—as the revolution of the planetary bodies in their orbits.

But such an explanation of the rotation of the planets upon their axes will not, unfortunately, hold good, as upon this hypothesis their axes ought to be perpendicular to their orbits, whereas, with the exception of Jupiter, the equators of the planets are largely inclined to their orbits. If, then, the rotatory movement of the earth is not caused by the friction of a repulsive force emanating from the sun, it is clear that the effect of the 3,000 millions of tons which Mr. Crookes says continuously press against that half of the earth's surface which is exposed to the sun's rays, would be to retard not only the earth's diurnal rotation, but also its annual movement round the sun. Now there is no evidence whatever of retardation from any such cause, either as regards the earth or the planets with whose movements we are most familiar.

I do not in the least question that under certain circumstances light may repel solid, liquid, or gaseous bodies, and, indeed, if Mr. Crookes' general conclusions be confirmed, it may be found that the rapid extension of the tails of comets as they approach the sun may be due to the repulsive action of the sun's rays. As this force would be inversely as the square of the distance, the effect of the sun's light, acting in a straight line upon the highly attenuated matter of which a comet's tail is composed, would repel it with enormous velocity in a direction opposite to the sun as the comet approached its perihelion.

Manchester, February GEORGE HICKS

Metachromism and Allied Changes

THE laws of metachromism, enunciated by Mr. W. Ackroyd (in his recent paper read before the Chemical Society, NATURE, vol. xiii. p. 298), have an apparent parallel in the order of colours shown by various series of combinations; there being but few exceptions to the following rule, in its application to binary compounds. *Increase of the electro-negative element produces a colour change towards the red end of the spectrum, and* vice versâ. Thus the sub-oxides are generally blue, and the per-oxides yellow; the sub-sulphides white or yellow; and the per-sulphides red.

The examples which lead to this generalization are as follows:—

K_4O blue grey, K_2O white, K_2O_4 chrome yellow.
K_2S reddish yellow, K_2S_2 orange, K_2S_5 liver brown.
K_2Cl blue, KCl white, Na and Rb chlorides the same.
Na_4O blue, Na_2O yellowish white, Na_2O_2 orange.
Cs_4O blue, Cs_2O white.
$(H_4N)_2S_2$ yellow, $(H_4N)_2S_5$ orange yellow.
CeO white, Ce_2O_3 fawn red.
U_3O_4 green, U_2O_3 brick red.
$FeCl_2$ white, $FeCl_3$ brown.
Cr_2O_3 green, CrO_2 yellow green, CrO_3 red.
MnO olive, Mn_3O_4 red brown, Mn_2O_3 brown black.
MnS dark green, MnS_2 brown red.
SnO olive brown, SnO_2 yellow.
SnS blue grey, SnS_2 yellow.
MoO purple brown, MoO_2 dark brown.
MoS_2 lead grey, MoS_3 dark brown.
$MoCl_2$ deep blue, $MoCl_4$ dark red.
W_2O_5 blue, WO_3 yellow.
Sb_2O_3 grey white, Sb_2O_5 pale yellow.
Sb_2S_3 blue black, Sb_2S_5 orange yellow.
Bi_2O_3 yellow, Bi_2O_5 brown.
Cu_2Cl_2 white, $CuCl_2$ liver colour.
PbO yellow, Pb_3O_4 red, PbO_2 brown.
PbS lead grey, PbS_2 red.
Tl_2O yellow, Tl_2O_3 brown.
HgI green, HgI_2 yellow or red.
Au_2O dark green, Au_2O_3 brown.
$PtCl_2$ olive, $PtCl_4$ orange.
$OsCl_2$ green, $OsCl_4$ red.