at which concentration the synthetic substance still shows an inhibitory effect. These remarks do not rest solely upon the measurements cited, but also upon the general behaviour of the seedlings.

As the divergencies of action seemed to point to the presence of some impurity in the synthetic ascorbic acid, we recrystallized it from petrol-ether and methanol. Although incomplete, the results obtained with the material recrystallized from methanol suggest that some impurity was indeed present.

LÁSZLÓ HAVAS.
IMRE GÁL.

Hungarian Biological Research Institute,
Tihany.

[1] L. Havas, NATURE, **136**, 435 (Sept. 14, 1935).
[2] L. Havas, NATURE, **136**, 989 (Dec. 21, 1935).

Range of Action of Surface Forces

IN connexion with recent letters under the above heading[1], the following experiments may be of interest.

If two optically plane glass surfaces be worked into close contact, they seize with a force which varies inversely as the square of the distance between the plates[2]. Let rectangular plates be worked to about $1{\cdot}5 \times 10^{-5}$ cm. apart, as shown by the white of Newton's colours of thin plates. The tangential forces of seizure may then be about 100 gm. weight per sq. cm. If now a little water be applied round the edges, it creeps in between the plates, and they are forced apart by increase in the pressure of the trapped air. If the water be applied only at one of the straight edges, it creeps in at a varying rate: for horizontal plates the time t to travel a distance l is proportional to l^2. If, after all air has been forced out, the surplus water be removed from the edges with blotting paper until a narrow Newton-white border is seen all round, it will be found that the plates, with water between, seize with a force much greater than when air is between the plates. A tangential force as great as 1,700 gm. per sq. cm. has, in this way, been found to be borne apparently by a water layer $1{\cdot}5 \times 10^{-5}$ cm. thick.

This is, of course, no proof that the water layer was withstanding this great shear stress, since the glass surfaces were being held apart at the Newton-white distance by 'dirt' props, and since it is possible that the reduction in pressure within the water layer (due to surface tension at its edges) may distort the glass so that the surfaces are closer together in the water than the Newton-white distance observed at the border, and so give greater seizure in accordance with the approximate inverse square law.

It may be of further interest to point out that μ, the coefficient of viscosity of water, can be calculated approximately from its surface tension T, by timing the flow of water into the narrow gap. For a rectangular sheet of water, $\mu \doteqdot TDt/3l^2$, where D is the distance between the plates and t the time to flow in a length l. For a circular capillary tube, diameter d, $\mu \doteqdot Tdt/4l^2$. With a tube 0·036 cm. diameter, an experiment gave a good enough value for μ, namely, 0·010 C.G.S. at 16° C., but with plates about $2{\cdot}5 \times 10^{-5}$ cm. apart, μ came out at 0·11 C.G.S. Whether this high value has to be regarded as a genuine indication of increased viscosity in thin films or as an effect of 'dirt' props and of seizure forces it is hard to say. Sir Joseph Larmor[3] has recalled Kelvin's suggestion that there was experimental evidence of "a new type of intimate friction, entirely different from the smooth viscosity" of hydrodynamic theory.

JAMES M. MACAULAY.

Physical Laboratory,
Royal Technical College,
Glasgow.
Aug. 25.

[1] Derjaguin, NATURE, **138**, 330 (Aug. 22, 1936). Bowden and Bastow, NATURE, **135**, 828 (May 18, 1935).
[2] Macaulay, *J. Roy. Tech. Coll., Glasgow*, 1935, p. 353.
[3] Sir Joseph Larmor, NATURE, **138**, 74 (July 11, 1936).

Constancy of Wave-length of Light

THE recent correspondence in NATURE regarding the constancy of the velocity of light raises the auxiliary question as to the constancy of the wave-length of light. Experimentally, this is best approached by a study of the wave-length of a spectral line.

Mr. James L. Lawson and I continuously observed the 4358 A. line of mercury from June 24 until August 27, 1935, using a Fabry and Perot étalon. The wave-length of this line was found to be constant to within two parts in a million.

While this work was neither so accurate nor so comprehensive as that of R. J. Kennedy, it possessed the advantages of having the interfering beams of light travelling in identical paths and of having been taken at a time when the velocity of light should have been changing rapidly according to Edmundson's empirical law.

More complete information on these observations will soon appear in the *Astrophysical Journal*.

GUY C. OMER, JUN.

Blake Physical Laboratories,
University of Kansas.

Colloidal Silica in Natural Waters and the 'Silicomolybdate' Colour Test

IN the estimation of silica by the colorimetric method of Diénert and Wandenbulcke[1], the yellow colour produced by the addition of ammonium molybdate in acid solution has hitherto been attributed to the ions of a heteropolyacid. The fact, easy to establish, that silica sols do not, under these conditions, give an intensity of colour proportional to the silica present, has led to the belief that colloid micellæ of silica do not give the reaction, and that the colour intensity is proportional to the crystalloid silica. We believe this view to be incorrect.

We have made colorimetric determinations of the silica content of Nile and certain well-waters, and compared the results with gravimetric data, kindly supplied to us by Dr. W. T. H. Williamson of the Egyptian Ministry of Agriculture. In general, the former results were low. Better agreement was obtained, however, by warming the samples, before test, to 80° C. with a little silica-free caustic soda in a platinum vessel, the amount of acid added being correspondingly increased.

To see whether the colour intensity could be taken as an indication of the content of crystalloid silica, we tested the samples again after passage through Zsigmondy-Bachmann ultra-filters of different grades.