LETTERS TO THE EDITOR.

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Uniformity in Lantern-slides.

IN illustrating a scientific lecture it is important that lantern-slides produced from photographic negatives should be of uniform density, and should well exhibit the details which they are intended to illustrate. To blame the lanternist for faults which are not his own may give relief to the lecturer's feelings of disappointment, but this plan does not conduce to the success of the lecture.

For some time past I have been experimenting on photometric methods of comparing exposures in printing from negatives of widely different density, and I find that if the tests are made with sufficient care the results exhibit a remarkable degree of uniformity.

A simple photometer can be made of a sheet of white cardboard folded into the shape of an isosceles prism or double inclined plane, the faces of which are illuminated by sources of light placed on opposite sides of the prism, the distances of the sources being regulated according to the law of inverse square. Now let two negatives under comparison be placed side by side in front of the two faces, and examined by the transmitted light reflected from the cardboard. Then, when the negatives look to be of the same density, their exposures will be proportional to the illuminations of the faces, and can be easily compared. If the negatives differ in contrast, this difference will be at once evident on adjusting the illuminations, and either the necessary modifications of treatment can be decided on or badly contrasted negatives can be set aside for intensification or omitted from the series. By a method identical in principle with the above I have been successful in testing the development of negatives and in calculating exposures in bromide enlarging. Two negatives exposed in succession with calculated exposures of twenty-five seconds and fifty minutes have given under similar development equally good prints of almost exactly the same darkness.

G. H. BRYAN.

A Probable New Fluting in the Spectrum of Magnesium Oxide.

THERE appears to be a well-marked, though faint, fluting in the spectrum of magnesium oxide which has not been hitherto recorded, consisting of seven principal edges and several fainter lines. No mention of it has been found anywhere, and Prof. Kayser, who has seen a photograph, says that it is unknown. If so, this is probably due to the fact that it would be quite invisible against even a weak continuous spectrum.

The wave-lengths of the principal edges have been determined by comparison with lines of zinc, cadmium, and manganese, and are approximately as follows:—4823, 4819, 4810, 4801, 4791, 4780, 4771. The first of these is very faint, and although almost coincident with the Mn line at 4823, appears to have a slightly greater wave-length, and is probably not due to Mn as impurity. The edge at 4780 is rather diffuse, and two faint lines have been measured between it and 4791. Between 4771 and 4731, five lines have been measured, which may also belong to the system.

The fluting is obviously related to that beginning at 5007; the spacing between the edges is of the same order, and it is only well seen when the latter is very intense. Although first observed about twelve months ago, it was only successfully photographed last February. Some of the negatives also show that the series of faint, fine lines on the less refrangible side of the violet magnesium triplet extends much further into the visible spectrum than catalogued by Eder and Valenta.

E. E. BROOKS.

Leicester Municipal Technical School, June 18.

The Halos round Zircons in Biotite.

WITH reference to the action of radium on glass, and its removal by exposure to sunlight, the following unintentional experiment may possibly be of interest. Many years ago I had a section of a piece of granite prepared, and then another after the stone had been made red hot in an ordinary bright fire.

In the unheated rock the zircons in the brown mica show good halos, and these have not been obliterated by the strong heating. This may be worth mentioning, as the experiment may possibly not have been attempted by anyone else, either from lack of motive or the difficulty of getting a good slice after the rock has been made brittle by the heat.

A. R. HUNT.

Southwood, Torquay, June 20.

LORD KELVIN'S PHILOSOPHY.[1]

Explanation in Terms of Force or of Motion? Action across Empty Space or through a Medium?

ONE of the most interesting and important outcomes of last year's meeting of the British Association at Leicester was the declaration by Lord Kelvin, during a memorable discussion on the constitution of the atom, in Section A, that he had found it necessary to abandon the attempt to contemplate the material universe explicitly in terms of æther and motion, and for his own part preferred to resort to the Boscovich doctrine of centres of force acting on each other according to some curiously complex law, without specific attention to the hypothetical medium in which such forces may exist.

Now undoubtedly these ancient postulates of matter and force represent the dynamical method first made feasible by Newton's achievement in celestial physics, whereby phenomena were correlated by unexplained particles of matter acted upon by unexplained forces, of statical origin and unknown mechanism, according to a specified law of distance. This was how Newton successfully solved the problems of gravitation, and constructed the working theory of astronomy; but it had been hoped, and by some is still hoped, that the time had now come for seeking to represent, in terms of something simpler and more fundamental, the nature of matter and the origin or inner mechanism of its various forces.

The most powerful and hopeful lever wherewith to attack this great philosophical problem was the kinetic theory of elasticity and rigidity, introduced by Lord Kelvin himself. By this means it has been hoped to express force in terms of the still simpler conception of motion; in fact, to explain all the forces with which physicists have to do—electrical and chemical attraction, elasticity, magnetism, cohesion, and perhaps gravitation—in terms of the internal motions of a universally connecting fluid plenum.

But now the question arises, is it at all certain that the material universe can really be understood in terms of motion alone—motion of an all-pervading continuous fluid known as the æther of space? And would such a solution be satisfactory?

To many it has seemed that this reduction to simplicity was the closest approach to ultimate explanation and unification that could be hoped for in the domain of mathematics and physics; and during the last half-century many steps, apparently in the direction of such an achievement, have been taken by the leaders in these branches of human knowledge.

The mathematical foundation was laid by Helmholtz, when he reduced rotational or vortex motion in perfect fluid under the domain of mathematics; it was followed up by Lord Kelvin's kinetic or gyrostatic theory of elasticity and rigidity; so that mathematicians, such as FitzGerald, Heaviside, Larmor,

[1] Being thoughts suggested by the meeting of the Mathematical and Physical Section of the British Association at Leicester in August, 1907; and referred to in Sir Oliver Lodge's recent Presidential Address to the Faraday Society, May 26, 1908.