LETTERS TO THE EDITOR.

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Polarisation of Light Scattered by Helium Atoms.

ABOUT a year and a half ago I published an experimental investigation of the *degree of polarisation* in the light scattered at right angles by various dust-free gases (Proc. Roy. Soc., A, vol. xcv., p. 155). I believe the results then obtained to be in the main quite correct, but there is an important point on which I have completely to withdraw what I then said. This refers to the results on helium, which was then found to behave differently from the other gases, giving much less complete polarisation than any of them. The result given was that the weak image (vibrations parallel to incident beam) had 42 per cent. of the intensity of the strong image (perpendicular vibrations). This was given on the results of two independent series of photographs, which were, indeed, obtained under conditions much more difficult than those for the common gases, but were considered at the time to give adequate evidence. I do not even now know what was wrong with them; but on repeating the work with a much improved apparatus, which it has taken many months to design and construct, I have obtained an entirely different, I might say opposite, result.

I now find no intensity large enough to be observed in the weak image, and certainly not 3 per cent. of the intensity in the strong image. It may be possible to lower this limit still further; but, in any case, if helium is outstanding at all, it is in the direction of polarising more, and not less, completely than the generality of gases. The details will be published later, but I write to make the correction as soon as possible, so that no one who speculates theoretically on the subject may be misled by reliance on my former result.

RAYLEIGH.

December 21.

Gravitation and Light.

IT should perhaps be stated, in connection with Mr. Cunningham's remarks (NATURE, December 18, p. 395), that my difficulty with regard to Dr. Einstein's theory must extend to the deviation of light by the sun as well as to its change of period. According to the theory, the velocity of light *diminishes* near the sun; on the other hand, the scale of time is increased, so that the wave-length is not altered. Now, the space being nearly flat, the path of a ray is, with such heterogeneous time, determined fundamentally by minimum number of waves, and not by minimum time; therefore, it should not be altered.

On the other hand, passing from kinematics to dynamics, Dr. Einstein requires in another connection that light should consist of discrete bundles or *quanta* of energy. Let it also be granted that inertia and gravitation are attributes of all energy. It seems to follow that each of these bundles of energy will swing round the sun in a hyperbolic orbit, and that its velocity will be *increased* when near the sun. It is well known that this would account for half the observed deflection. But, again, physical optics could not exist without the idea of transverse waves and their phases, which must be grafted on somehow to the bundles of energy. Now the supposed gravitational derangement of the fourfold extension from the flat being very slight, it can be agreed that the change in extent of each element of it is of the second order. The expansion of scale of time near the sun requires thus a compensating shrinkage of radial lengths; and this second-order effect, the cause of the adjustment for Mercury, will, on the phase-principle of Huygens, just double the previous result. This would amount in all to the observed deflection of the rays.

But amid these uncertainties and apparent contradictions the view asserts itself that the very important astronomical determination is to be regarded as a guide towards future theory rather than as the verification of the particular theory which suggested it.

JOSEPH LARMOR.

Cambridge, December 20.

Radio-activity and Gravitation.

IN connection with the interesting letter of Prof. Donnan in NATURE of December 18, it may be of interest to mention some experimental results which have a bearing on this question. Some years ago Dr. Schuster suggested to one of us that it would be of interest to test whether the rate of transformation of radio-active substances was influenced by the intensity of gravitation. An accurate method of testing the rate of decay of radium emanation over a period of about a hundred days was developed, and it was intended to compare the rate of decay of samples which had been transported to suitable portions of the earth's surface. The outbreak of the war interfered with this plan.

Since, according to Einstein's theory, a gravitational acceleration is in no sense different from a centrifugal acceleration, experiments have been performed in the Cavendish Laboratory to test whether the rate of decay of radio-active substances is affected by subjecting them to the high centrifugal acceleration at the edge of a spinning disc. For the purpose of measurement the γ-ray activity was determined by a sensitive-balance method. Although the radio-active material was subjected to an acceleration of more than 20,000 times gravity, the change observed, if any, was certainly less than one part in a thousand.

This result is not in disaccord with the relation deduced by Prof. Donnan, for a simple calculation shows that his relation predicts an effect very much smaller than can be detected by measurements of this character.

E. RUTHERFORD.
A. H. COMPTON.

Cavendish Laboratory, December 19.

Mortality among Snails and the Appearance of Blue-bottle Flies.

THE residential parts of Calcutta are remarkably free, as a rule, from both house-flies (Musca, spp.) and blue-bottles. This is doubtless due to the excellence of the municipal sanitary arrangements, for at Sibpur, a few miles away, blue-bottles (*Pycnonoma* or *Lucilia dux*) are not only extremely troublesome in the houses, but are also probably connected with frequent epidemics of enteric, unknown in the better parts of Calcutta. For some years past I have noticed in the compound of the Indian Museum that Pycnonoma from time to time becomes relatively numerous, and on several occasions I have been able to trace the flies to their breeding-ground. This has always been the dead bodies of the snail *Achatina fulica*, the largest land mollusc in Bengal.

A. fulica, the shell of which may attain a length of at least 4 in., is not an indigenous species, but was introduced for purposes of dissection by a keen