As for Mr. Rossiter's second comment, no one, so far as I know, has ever regarded Hooke as a stratigrapher; the claim is merely that he foreshadowed a principle which was later re-discovered and applied by others. Hooke wrote ("P. W.", p. 335) that "no one scruples to affirm" that excavated coins and other relics are of such and such nature, "nor that they are Roman, Saxon, Norman, or the like". He then turns to the "medals of nature", fossils, says that there is similarly no reason to doubt their authenticity, and completes the parallel by adding "nor will there be wanting media or criteria of chronology". Taken in conjunction with the other similar passages, it does not seem unreasonable to conclude that Hooke had an inkling of the value of fossils as indexes of age. There certainly seems little doubt that he had in mind an *extensive* revision of the "chronologies of the scripturists". Hooke's belief in the extinction of species and his statement that the fossils of one region differed from those of another should also be remembered.

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Scattering of Fast β-Rays

IN two previous notes[1] some results have been described which were obtained with a beam of fast β-rays ($1500 < E < 3000$ ekv.) in a nitrogen-filled expansion chamber. It is clear from the photographs that these β-rays are considerably scattered in the gas. By selection of those cases where there is a perceptible change in the direction of path (whenever the deflection exceeds 20°) and by measurement of the angle of deflection with a Pulfrich stereo-comparator, Curve I in Fig. 1 was obtained for the single scattering in a gas at angles greater than 10°–20°.

The ordinates of Curves I and II represent the number of collisions resulting in a deflection through a given angle δ for the interval of 10°. Curve I gives the statistical distribution of 212 collisions on a total of 180 metres of electron tracks. Curve II gives the same values, calculated for the same length of path (with a velocity of 2,000 ekv.) using the formula given by Mott[2] for scattering at 'relativistic' velocities. The mean error of an observation is of the order of 3°.

Curve I shows a very considerable anomalous excess scattering for angles greater than 20°. On Curve III the ratio of the observed and calculated values has been plotted. Above 30°, the observed values are seen to be very much greater (10–100 times) than those calculated.

If, as is commonly held, the relativistic treatment of the problem, based on Dirac's wave equation, contains no fundamental error, then, in contradiction with current ideas, the above-mentioned facts would imply that, for light elements and high velocities, the scattering is mainly due not to the Coulomb extranuclear field, but to a quite different cause.

The hypothesis that the scattering is due to some radiative forces must also be rejected on theoretical grounds. The effective cross-section for the observed excess scattering is of the order of 2×10^{-22} cm.^{2} for the nitrogen nucleus, whilst according to Bethe and Heitler's theory[3], the effective cross-section of a radiative effect must be certainly less than 5×10^{-24} cm.^{2}.

In the majority of cases, the deflections of the β-rays are not accompanied by a noticeable decrease in energy, but in a few cases non-elastic collisions occur with the loss of a considerable part of the energy. The dotted stepped line in Fig. 1 shows the distribution of fifteen cases where the energy loss exceeds $\frac{1}{2}$ or $\frac{2}{3}$ of the original energy. The full stepped line gives the number of deflections where the loss amounts to 0·9 of the original energy (the instances of almost complete energy loss, mentioned in our previous notes[1], are not included). It may be added that the directions, in this case, appear to be distributed isotropically. The assumption that the non-elastic collisions shown in the diagram are accompanied by the emission of an electro-magnetic radiation would lead to unreasonably large values of the yield (cf. our previous notes).

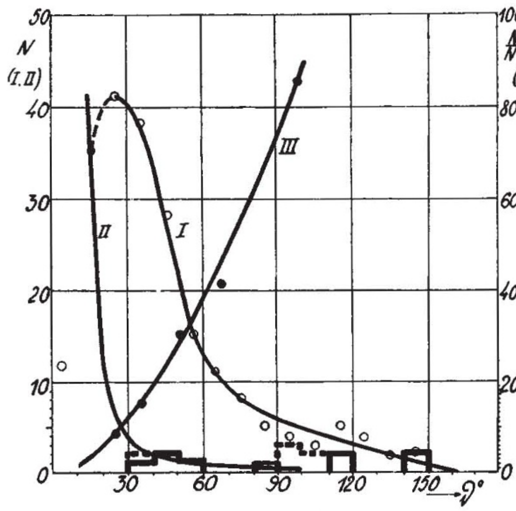

FIG. 1.

In this connexion, it may be of interest to note that in 1929 Henderson[4], when examining much slower β-rays ($\bar{E} = 340$ ekv.), observed an anomalous scattering in the light elements (which in hydrogen amounted to about 80 per cent of the normal effect for angles ranging from 10° to 30°). This he believed to be due to electronic scattering. In our case, however, it would be quite impossible to ascribe the excess scattering to any collisions with electrons. Henderson's interpretation is probably incorrect; he may have been observing an effect similar to ours.

In all probability, we are dealing here with a kind of 'intranuclear' effect. The wave-length of the electrons was of the order of $\lambda = 5 \times 10^{-11}$ cm. From the point of view of quantum mechanics, it seems likely that the effective cross-section is of a higher order than the square of the radius of an atomic nucleus, and will be almost of the order of λ^2 if considerable nuclear interaction takes place.

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[2] N. F. Mott, *Proc. Roy. Soc.*, A, **124**, 425 (1929).
[3] H. Bethe and W. Heitler, *Proc. Roy. Soc.*, A, **146**, 83 (1934).
[4] M. Henderson, *Phil. Mag.*, **8**, 847 (1929).