of N_2^+ must then, according to the preceding paragraph, include an *excited* atom or ion. Assuming a ^2D excited N atom and an unexcited ion, we have $T.E. = 24 \cdot 0 + 2 \cdot 39 = 26 \cdot 4$ volts for dissociation from state X', 2·39 volts being the energy interval between the low ^4S and ^2D states of the N atom. The observed value of $T.E.$ for state X', as obtained by Birge and Sponer by linear extrapolation of the ω_n curve, is 26·0 volts. Experiment and theory are therefore in excellent agreement if $D = 9 \cdot 5$ and if, as Herzberg has suggested, unexcited N_2^+ gives $N^+ + N'$ (N′ indicates N excited to the ^2D state), while excited N_2^+ in state A' gives $N^+ + N$ (unexcited), on adiabatic dissociation.

The following table shows how the $T.E.$ values compare with values calculated according to each of the assumptions $D = 9 \cdot 5$ and $D = 11 \cdot 8$ volts. The agreement is good only if $D = 9 \cdot 5$. If the assumed dissociation products for states X' and A' are reversed, the agreement is very poor for D equal to *either* 9·5 or 11·8.

Electron Levels.		Total Energy to Excite and Dissociate (Volts).		
Designation.	Volts.	Observed.	Calculated.	
			$D = 11 \cdot 8$	$D = 9 \cdot 5$
$X'(^2S)$	16·9	26·0	28·7(N′ + N+)	26·4(N′ + N+)
$A'(^2S)$	20·1	24·0	26·3(N + N+)	24·0(N + N+)
Hogness and Lunn (^2S?)	24	> 24	28·7(N′ + N+), or higher	26·4(N′ + N+), or higher

In the case of Hogness and Lunn's 24-volt level, $T.E.$ for adiabatic dissociation is doubtless at least 26 volts. The energy of 24 volts becomes available, however, in *collisions*, and suffices in these circumstances for dissociation into $N^+ + N$. This fact is in good agreement with $D = 9 \cdot 5$, but is incompatible with $D = 11 \cdot 8$.

A study of experimental data on $T.E.$ values in relation to theoretically possible dissociation products for the electron levels of *neutral* N_2 gives additional evidence for the value $D = 9 \cdot 5$ volts. Details will not be given here, but may be found in the references cited, together with other evidence both for and against the value $D = 9 \cdot 5$.

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Oct. 2.

The Polarisation of Compton Scattering according to Dirac's New Relativistic Dynamics.

ACCORDING to the quantum-dynamical treatment of Dirac and Gordon, the state of polarisation of light scattered by free electrons is the same as on the classical theory. This result seems to be in agreement with experiments of Kallmann and Mark (*Zs. f. Phys.*, **36**, p. 120; 1926) and of Lukirsky (NATURE, p. 275, Aug. 25, 1928).

On the basis of the new relativistic quantum dynamics of Dirac, Dr. Klein and I have calculated the intensity of light scattered by free electrons at rest under the influence of a plane monochromatic radiation. The result for unpolarised incident radiation was given in a note in NATURE (Sept. 15, p. 398). Here the deviation from the Dirac-Gordon formula is not small for γ-rays at large angles of scattering, although existing experimental results seem unable to decide between the two theories. Recently I have examined on the new theory the question of polarisation of the scattered light more closely.

Experiments to determine the polarisation of the Compton scattered radiation are usually done in the following way. An incident beam of unpolarised light of intensity I_0 and frequency ν, sent along the x-axis is scattered by an electron at the origin. The scattered light again falls on another electron which lies on the y-axis at a distance r from the origin. The intensity of light, which is thus doubly scattered, in the plane parallel to the x-z plane through the second electron is examined at a distance r' from this electron. Thus, for example, if the polarisation of the scattered light is the same as on the classical theory, the intensity in the z-direction will be zero. On the new theory, however, the result is different, and we get the following expression for the intensity in the plane mentioned in a direction forming an angle θ with the z-direction:

$$I = \frac{e^8}{2m^4c^8r^2r'^2}\frac{I_0}{(1+\alpha)^6}\left\{\sin^2\theta + \frac{2\alpha^2+2\alpha^3+\alpha^4}{2(1+\alpha)^2}\right\},$$

where $\alpha = \frac{h\nu}{mc^2}$, e, m denoting charge and mass of the electron, c the velocity of light, and h the Planck constant. The formula differs from that of Dirac and Gordon by the second term, which is independent of θ and is of the order of magnitude α^2, as was the case with the deviations between formulæ of the two theories given in our previous note. For a given frequency, therefore, a constant amount is superposed on the intensity of the Dirac-Gordon formula for all angles. The additional term is small for ordinary X-rays, but is of about the same order of magnitude as the first term for γ-rays. Thus for $\alpha = 1$, and 2, which correspond to the wave-lengths of 2×10^{-10} cm. and 1×10^{-10} cm. respectively, the second term is about 0·6 and 2 times the first at $\theta = 90°$ respectively.

The experimental results of Kallmann and Mark cannot decide between the two theories, since the wave-length used is too long to make the difference appreciable. On the other hand, Lukirsky's results seem to be in favour of the Dirac-Gordon theory, if the wave-length used in his experiment is between 0·07 A. and 0·1 A., as was mentioned in his note. For by using the mean value of these frequencies in our formula, we find the intensity at $\theta = 0°$ to be about 6·5 per cent of that at $\theta = 90°$, instead of 2·5 per cent as was found by Lukirsky. If the wave-length used were 0·14 A., his result would be in agreement with our formula. More accurate measurements with X-rays of short wave-lengths as well as with γ-rays are desirable for the test of the present theory.

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Natural Pyramids on a Beach in the New Hebrides.

WHILE engaged recently in biological research in the New Hebrides (in the Pacific Ocean) under the Percy Sladen Trust, I came across a curious geological phenomenon on the black sandy beach to the east of the mouth of the R. Yoro in Big Bay, Espiritu Santo. I have never heard of anything resembling it in any part of the world. Possibly there are readers of NATURE who can explain it.

All the way along the beach for three or four miles there extends a row of piles of pebbles. Most of these piles are a couple of feet high in the middle and a dozen paces across. They are covered at high tide and wholly or nearly wholly exposed at low tide. The constituent pebbles, of black volcanic rock, are mostly oval in shape, somewhat flattened, and perhaps three or four inches long. Between each pile of pebbles and