		Group V.A.			
As	11·5	2·52	29·0	2·36	27·2
				or 2·52	or 29·0
P	13·3			2·37	31·5
				or 2·57	or 34·2
		Group VI.			
S	8·30	2·05	17·0	2·50	20·8
	or 12·2	2·05	or 25·0	2·50	or 30·4
		Group VII.A.			
I	10·1	2·80	28·3	2·95	29·8
	or 8·0	2·80	or 22·4	2·95	or 23·6
		Inert Gases.			
He	25·4			2·86	73·0
Ne	16	1·30	20·8	2·67	42·8
A	12	2·05	24·6	3·03	36·4

In the first group of the periodic table the products shown in each of the fourth and sixth columns of the above table are fairly concordant, so that we may conclude that the work done in the removal of an exterior electron is nearly proportional inversely as the radius.

The same remark applies to four elements of the second group, while the members of sub-group B diverge considerably from the values for the A group. According to Urbach (*Phys. Zeit.*, February, 1921, p. 116), the elements of the B sub-group have a double ring of electrons in the outer zone, while those of the A sub-group have a single ring. In the case of the inert gases, neon and argon, the diameters estimated by Bragg give products in the fourth column in far better accord with theory than those found from the cube-root of the atomic volume set forth in the sixth column.

The values for certain elements in groups iii.–vii. are given in the table for comparison, but our knowledge of ionising potentials is as yet too fragmentary to permit of any definite conclusions.

The ultimate solution of this problem may involve calculations of the character given by Sir J. J. Thomson in his recent paper in the *Philosophical Magazine* (March, 1921, p. 526).

I am indebted to Prof. A. Ll. Hughes for his assistance in endeavouring to collect the most trustworthy values for the ionising potentials.

A. S. EVE.

Macdonald Physics Building,
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A Novel Magneto-Optical Effect.

THE interesting observation recorded by Prof. Elihu Thomson in NATURE of June 23, p. 520, seems likely to have a bearing on the old Reichenbach experiments, which were for the most part disbelieved by orthodox science, but on which Sir William Barrett and others made some careful observations, to ascertain what truth there might be in them. The effects could not be denied, but they were capricious; and in view of Prof. Elihu Thomson's discovery, it seems possible that the luminosity may have been visible to sensitive percipients when there was a trace of magnetic dust in the room and when other light was not excluded. The obvious precaution of excluding other light may have been the condition which militated against the examination of the phenomenon, which it was then thought was presumably of a subjective character. OLIVER LODGE.

June 25.

Helicopters.

ONE often sees published statements to the effect that a helicopter has been invented and that wonderful things are expected of it. If the design gets as far as an actual trial a few alterations are found to be required, and then nothing more is heard of the matter.

To make a machine which without an extravagant expenditure of power will raise itself vertically and remain poised in the air is possible and most desirable, and the many failures in the attempt to do this are all attributable (omitting mistakes in mechanical design) to the same cause, namely, that of giving an insufficient area to the lifting surface.

The sort of area required may be gathered from the following illustration. Let two aeroplanes facing in opposite directions be connected by a few hundred yards of light line joining their wing-tips. The machines so connected could rise and circle round each other without much difficulty. When in the air the line might be hauled in until the wing-tips were almost in contact, and in this condition the combined machines would form a helicopter. There would be no banking, as the connecting line would take the centrifugal force, but more power would be required than when the machines were flying independently on account of the lower speed and efficiency of the inner pair of wings.

The function of a screw or lifting surface is to generate a downward current of air, the reaction of which on the surface shall be equal to the weight supported. If L^2 is the cross-section area of this current (dependent on, though not identical with, the area of the lifting surface), V its velocity, and W the weight, $L^2V^2 \times$(constant somewhat greater than half the density of air)$=W$. Hence LV is a constant, and V is inversely proportional to L.

The power required to maintain the current is WV, and can therefore be reduced by making L/V large.

For instance, if W can be sustained on a current of area L^2 by P horse-power, only half this power would be required if the current area were $4L^2$.

A. MALLOCK.

A Physical Interpretation of the Energy Quantum.

THE work of Bohr (*Phil. Mag.*, 1913–15) indicates that we may assume stability only for *some* electronic orbits, *i.e.* amplitude changes occur discontinuously. We arrive at a similar conclusion in the case of the vibrating atoms of solids if we accept the quantum explanation of the change in their specific heats with temperature.

It is here suggested that the amplitude of a periodic disturbance in the æther can alter only by definite amounts which depend on its frequency, so that as soon as any part of a wave-front meets with something that is capable of inducing a decrease in amplitude, such as a suitably situated electron, that part suffers a definite decrease of amplitude, which extends back into the wave-train (uniformly in all directions in an isotropic medium) to the extent of one quantum. The æther is relieved of its energy of strain, not continuously, but in quanta.

With the modification suggested above the wave theory renders understandable, on one hand, phenomena such as interference, and, on the other, phenomena such as the photo-electric effect, a detailed discussion of which is here impossible owing to lack of space.

More light might be thrown on this subject by a mathematical treatment. IAN AUCKEN.

The County School, Long Eaton,
June 13.