Atom	State	μ	μa	μb	μc	Total electronic binding energy calc.	obs. (eV.)
Li	$(1s)^2(2s)$, ^2S	0·658	2·69	2·26	—	201·72	203·43
Be	$(1s)^2(2s)^2$, ^1S	0·979	3·69	3·28	—	395·87	399·04
B	$(1s)^2(2s)^2(2p)$, ^2P	1·322	4·69	4·20	1·20	666·24	670·8
C	$(1s)^2(2s)^2(2p)^2$, ^3P	1·652	5·69	5·13	1·56	1023·12	1029·8
N	$(1s)^2(2s)^2(2p)^3$, ^4S	1·970	6·68	6·08	1·91	1475·78	1485·7
O	$(1s)^2(2s)^2(2p)^4$, ^3P	2·289	7·68	7·06	2·22	2027·01	2043·3
F	$(1s)^2(2s)^2(2p)^5$, ^2P	2·611	8·67	8·02	2·55	2690·6	2715·2
Ne	$(1s)^2(2s)^2(2p)^6$, ^1S	2·934	9·66	8·97	2·88	3475·6	—

The wave functions used in this work[2] are appropriate sums of determinants of the usual type in which the component orbitals are defined to be:

$$\psi(1s) = \sqrt{(\mu^3 a^3/\pi)}\, \exp(-\mu a r).$$
$$\psi(2s) = \sqrt{(\mu^5/3\pi N)}\, [r \exp(-\mu r) - (3A/\mu) \exp(-\mu b r)].$$
$$\psi(2p_0) = \sqrt{(\mu^5 c^5/\pi)}\, r \cos\theta \exp(-\mu c r).$$
$$\psi(2p_\pm) = \sqrt{(\mu^5 c^5/2\pi)}\, r \sin\theta \exp(-\mu c r \pm i\varphi).$$

N is a normalizing factor and A is chosen so that $\psi(2s)$ and $\psi(1s)$ are orthogonal. The appropriate values of μ, μa, μb and μc (which are directly related to the effective nuclear charges for the different types of orbit) are also given in the table. They differ slightly from those first suggested by Morse, Young and Haurwitz[2] owing to certain errors, both numerical and analytical, which have crept into their work.

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[1] *Proc. Roy. Soc. Edin.*, **62** A, 37 (1944).
[2] *Phys. Rev.*, **48**, 948 (1935).

A Measurement of the Velocity of Light

In a letter in *Nature*, **142**, 833 (1938), I described a new method of measuring the velocity of light in which Fizeau's toothed wheel was replaced by a piezo-quartz crystal. When placed in an alternating electric field, this has the property of acting as an intermittent diffraction grating. The light in the first-order spectrum is then interrupted two hundred times as rapidly as by Fizeau's toothed wheel.

I have now made a determination of the velocity of light in air by this method. After passing through the quartz, the light travelled a distance of about 39 metres and was reflected back on its path through the quartz to the eye of the observer. For a particular length of path the intensity is a minimum.

The result, reduced to vacuum, is 299,775 km. per sec. The accuracy appears to be about the same as that of other recent determinations; but it is evident from the results that the range could be increased ten times, in which case the accuracy would be ten times as great. A full description of the work will be published elsewhere.

The velocity of light has hitherto been avoided by British physicists, the only other determination made in Great Britain being dated 1881.

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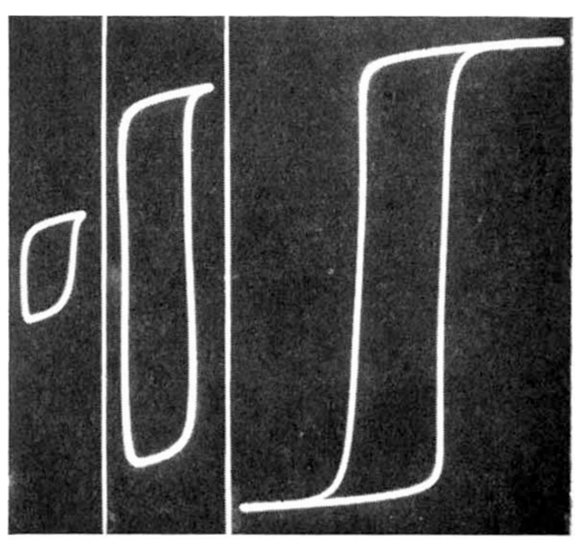
Unsymmetrical Hysteresis Loops in a Nickel–Iron Alloy

In the course of investigations of grain-oriented nickel–iron alloys, a very pronounced asymmetry has been observed in the dynamic hysteresis loop of one particular sample. The effect is demonstrated by momentarily applying a large D.C. magnetizing force to the core and then examining the subsequent hysteresis loops produced by smaller A.C. excitation. Depending on the magnitude of the exciting current the loops appear as in Fig. 1, the magnetizing pulse having previously been applied in the positive direction. The deeper loops result from larger exciting currents.

By means of a flux meter (reading average values) it was found that these loops are not symmetrically located about the origin and become so only when the A.C. excitation produces saturation as in Fig. 2, curve 4. On reducing the excitation the loops again become unsymmetrical. Fig. 2 shows the relative position of these smaller loops with respect to the saturation hysteresis loop of the material. So long as the A.C. excitation is less than the D.C. magnetizing pulse the asymmetry persists. Reversal of the temporary D.C. magnetizing pulse merely reverses the position of the loops. The core may be completely disconnected for days or weeks; on reconnexion the effect is immediately evident again. Observation of the loop as a magnetizing pulse is applied reveals a time delay of about a second as the very distorted loop settles down to one of the shapes shown in Fig. 1. Conversely, on sudden application of the exciting current, a short time is required for the loop to build up to its greatest asymmetry.

Referring now to Fig. 2, consider a value of exciting current such that loop 3 is being traced. It is possible to interrupt this exciting current so that the remanent induction of the core, point a, is the negative of that which the last magnetizing pulse would have produced. Re-application of a reduced exciting current causes a small loop to be formed with a as a starting point. This whole loop then moves upward and finally rests at some position like loop 1. As observed with the flux meter, this process is an actual building up of positive flux.



(a) (b) (c)

Fig. 1. (a), (b) and (c) show three successive increases in exciting current. Reduction of the exciting current reverses the steps