

### Absorption of X-Rays in Various Elements.

RECENT investigations of the absorption of X-rays in different elements (aluminium, nickel, copper, silver, and platinum) and extended over a great region of wave-lengths (0.7 to 12 Å.), using strictly monochromatic radiation, have led me to the following general laws:

1. The jump  $\delta_K$  of the absorption coefficient on passing the  $K$ -absorption limit is:

$$\delta_K = E_K/E_{L_1},$$

where  $E_K$  and  $E_{L_1}$  are the energy-levels corresponding to the  $K$ - and  $L_1$ -levels respectively (see Siegbahn's "Spectroscopy of X-Rays," pp. 184-185). The total jumps at the  $L$ - and  $M$ -absorption limits are in the same way determined by the formulæ:

$$\delta_L = E_{L_1}/E_{M_1} \text{ and } \delta_M = E_{M_1}/E_{N_1}.$$

2. If the absorption is calculated per electron  $\mu_e$

instead of per mass unit  $\mu/\rho$  ( $\mu_e = \frac{\mu}{\rho} \cdot \frac{M}{N \cdot L}$ ;  $M$  is the

atomic weight of the absorbing element,  $N$  its atomic number, and  $L$  the Loschmidt-number), it can be shown from my own measurements and from earlier investigations that  $\mu_e$  is a function of the product  $N\lambda$  for every branch of the absorption curve.

3. By using these two laws it is possible to give in a diagram, with  $\mu_e$  and  $N\lambda$  as co-ordinates, one single continuous curve for the absorption at all wave-lengths and for all elements.

The new measurements and the results here mentioned will be given in a doctor's thesis (now in print) at the University of Upsala.

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Sept. 15.

### The Electric Arc in High Vacuum.

WITH reference to the interesting letter by S. Ratner on the electric arc in high vacuum, published in NATURE of Oct. 15, p. 548, this type of arc has been observed previously by me under conditions very similar to those used by the author (see *Phil. Mag.*, vol. 2, p. 796; 1926). I found that it could be excited in residual gases or in hydrogen at very low pressures, provided that an initial electrical discharge was sent between one of the iron electrodes and a third electrode.

The radiation emitted showed no trace of the iron lines, but gave a bright continuous spectrum together with lines and bands from the various gases present. There were really two types of arc—the ordinary arc, where the current rose in some cases above 10 amperes, and a brilliant glow during which a small current passed between the electrodes. Both these types could be excited at such low pressures that there was no trace of luminosity due to the electrical discharge.

Such an intermittent arc would form a convenient type of relay if the initial electrical discharge required were feeble, and if the arc would strike each time that this feeble discharge was sent through the tube. It was found, however, that these conditions were not fulfilled, the state of the electrode surface being an important factor.

The phenomenon is very interesting, and considering that the electrodes are cold, there seems to be no satisfactory explanation.

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### Psychological Dissociation as a Biological Process.

IN "Instinct and the Unconscious" the late W. H. R. Rivers suggested that the mechanisms of psychological dissociation familiar in human psychopathology have played a large part in the adjustment of the behaviour of animals during metamorphosis and in other changes of environment. The subject clearly had a great fascination for Rivers, and he reverted to it in a later paper ("Psychological Dissociation as a Biological Process," *Scientia*, vol. 35, p. 331; 1924). The purpose of this letter is to direct attention to the significance of a discovery which goes far to confirm these speculations.

In a recent paper on "Loss of Memory accompanying Metamorphosis in Amphibia" (*P.Z.S.*, pt. 1, p. 155; 1927), Major S. S. Flower records that salamander larvæ tamed to feed from the hand lost all their tameness at metamorphosis and had to be trained again *de novo*. In the main this abrupt disappearance of larval behaviour is just what Rivers predicted, though it appears to be correlated with the internal rather than the environmental changes of metamorphosis, the salamanders being apparently still partially aquatic when the change occurred.

It is much to be hoped that Major Flower's most interesting observations will be extended and amplified. One would like to know, for example, if pre-metamorphic training facilitates or prejudices the acquirement of the behaviour after metamorphosis. Some quantitatively observable conditioned reflex would be invaluable in the investigation.

In conclusion, it may be emphasised that the abrupt change corresponds more to repression (= 'suppression' of Rivers) than to gradual growth out of a childish habit, and suggests that the former is, as Rivers suggested, a normal biological process not confined to human pathology.

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Johannesburg, Oct. 12.

### Geological Survey of Uganda.

AN unfortunate error has crept into the Annual Report of the Geological Survey of Uganda for the year 1926, whereby the reader is informed that Mr. A. D. Combe, of this Survey, is of opinion that there is a continuous succession through the Transvaal System into the Waterberg System in the Cape Province of South Africa. May I be permitted to make use of the columns of NATURE to correct this error? Perhaps readers of this journal who have copies of the report will kindly turn up page 32, delete line 34 and delete all of line 35 except the last word and the comma in front of it, and re-write thus:

"Mr. Combe suggests that in the Katanga Province there may be a continuous conformable succession through the equivalents of the Transvaal and Waterberg Systems without an unconformity, similar to the grand conformable succession, in parts of the Cape Province, through the Cape and Karroo Systems."

WILLIAM C. SIMMONS.

### Green Lightning.

DURING a thunderstorm last night, a flash of lightning started from the top white, and about half-way down turned to a vivid green. Possibly I am very unobservant, but I do not remember ever to have seen green lightning before.

H. H. STEPHENSON.

Y.M.C.A.,  
Brantford, Ontario, Oct. 7.