position entre les compteurs d'écrans absorbants (20 cm. de plomb) nous ont donné des nombres régulièrement inférieurs de 30 pour cent à ceux obtenus sans écran, la proportion relative de rayons très pénétrants restant donc sensiblement la même (au point de vue des rayons verticaux) sous toutes les latitudes explorées.

Nous avons également étudié la répartition angulaire des corpuscules cosmiques sous différentes latitudes, et trouvé que la symétrie entre les directions est et ouest que l'on observe sous les latitudes supérieures à 30° est détruite au voisinage de l'équateur en faveur des rayons venant de l'ouest, résultat qui est à rapprocher de ceux de Johnson.

La forme de la courbe est également assez différente, comme le montre le diagramme (Fig. 2), dans lequel sont portés les nombres de rayons arrivant sous différents angles à l'est et à l'ouest de la verticale.

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Chemical Separation of Diplogen from Hydrogen

WE may reasonably anticipate that in those reactions which proceed at low temperatures, that is, reactions for which the energies of activation are small enough to render them sensitive to the difference in the zero point energies, diplogen and hydrogen will undergo reaction at different rates.

We have found such a difference in the velocity of the liberation of hydrogen effected by the solution of metals in water or acids, for the liberated hydrogen does not possess an [H]/[D] ratio ([D] signifies the concentration of diplogen or the heavy hydrogen isotope) identical with that of the original water or acid. For example, on solution of zinc in 0·1 *N* sulphuric acid which contains 25 per cent D ([H]/[D] = 3), the hydrogen liberated contains only 8 per cent of D ([H]/[D] = 11·5), that is, the rates of production of H and D are in the ratio of about 4 : 1[1]. On solution of other metals similar differences are obtained, the approximate ratios for aluminium, calcium and sodium being 2, 1·5 and 1·2 respectively. Analogous reactions in which compounds containing hydrogen, such as ammonia, acetylene, etc., are liberated instead of hydrogen, are now being investigated.

It appears possible that a reaction of this type, in which an enrichment of the heavy hydrogen isotope takes place as in the process of electrolysis, may serve as an alternative method for the production of heavy hydrogen and its compounds.

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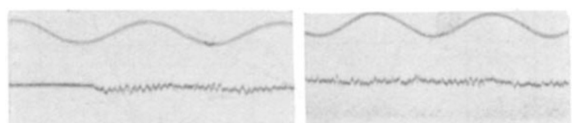
[1] For the method of analysis see NATURE, **132**, 894, Dec. 9, 1933.

Measurement of the Frequency of Longitudinal Vibration of Non-Magnetic Rods

IT has been known for many years[1] that the resistance of a copper wire is increased by loading and that this increase of resistance is in excess of that which can be accounted for by the accompanying change of cross section. It seemed to be probable, therefore, that this phenomenon could be applied to the measurement of the frequency of longitudinal vibration of non-magnetic rods, since the method which has been described previously[2] cannot be used for such rods.

In order to test this possibility, a rod of the material was suspended in a long solenoid and clamped at the upper end. A load was fixed at the lower end and the rod was connected in series with the solenoid winding, which was excited from a 30 volt battery of accumulators. Surrounding the rod near the central part of the solenoid was a search coil of about 20,000 turns, and this coil was connected through a valve amplifier to an oscillograph. The rod was then set in a state of longitudinal vibration by means of a slight tap on the lower clamp. In consequence of the corresponding variations of stress in the rod the resistance changed and the current in the solenoid varied accordingly. These variations of the exciting current induced corresponding E.M.F.'s. in the search coil and the vibrations of the rod are thus recorded on the oscillogram. The effect is small but definite and the results for two different rods are shown in Fig. 1 *a* and *b*.



a *b*

FIG. 1.

Fig. 1*a* refers to a brass wire $\frac{1}{8}$ in. diameter, the density being 8·4 and the free length 178 cm. The fundamental frequency of the vibrations as found from the oscillogram is 1030 cycles per second. For a rod clamped at both ends, the frequency f is related to the length l cm., the density ρ, and Young's modulus E by the expression

$$f = \frac{1}{2l}\sqrt{E/\rho} \text{ or, } E = f^2(2l)^2\rho \text{ dynes per sq. cm.,}$$

from which it is found that the value of E for a brass wire is $11{\cdot}2 \times 10^{11}$ dynes per sq. cm., or $16{\cdot}3 \times 10^6$ lb. per sq. inch.

Fig. 1*b* refers to a rod of duralumin $\frac{1}{4}$ in. diameter, the free length being 209 cm. and the density 2·8. The fundamental frequency of longitudinal vibrations as found from the oscillogram is 1180 cycles per second, from which it follows that the value of E for a rod of duralumin is $6{\cdot}8 \times 10^{11}$ dynes per sq. cm., or $9{\cdot}9 \times 10^6$ lb. per sq. inch.

This investigation is being continued with the view of obtaining a larger amplitude for the wave due to the longitudinal vibrations. A higher frequency for the time calibration wave is also being used.

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[1] Ency. Brit., 9th Ed., Vol. 8: Art. "Electricity", p. 52.
[2] NATURE, **132**, 351, Sept. 2, 1933.