not hampered by an already closed community, and its truth is generally assumed; but as one rarely sees data which prove the point, it seems of interest to recount the facts given above, which serve as a proof for this particular case and within the limits of the rough method adopted.

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Absorption of Strain Energy in Metals

WHEN a metal is strained, the work done is partly stored up as strain energy and partly used up by internal absorption. The ratio (ϕ) of the energy absorbed to the energy stored is a constant, characteristic of the material, but sensitive to changes in structure and temperature. It is often assumed that the absorption can be represented by a damping force proportional to the velocity of deformation, but such an assumption is not in agreement with the experimental facts.[1]

There appears, however, to be a linear relation between the Debye temperature θ of a metal and the logarithm of ϕ. This is shown by the graph below in which the values for Debye temperatures (calculated from specific heats) have been taken from the "Handbuch der Metall-Physik", vol. 1, p. 252 (Leipzig, 1935), and the values of ϕ from a paper by A. L. Kimball and D. E. Lovell[2]. It should be noted that apparently Kimball and Lovell took no special precautions to ensure constancy of temperature.

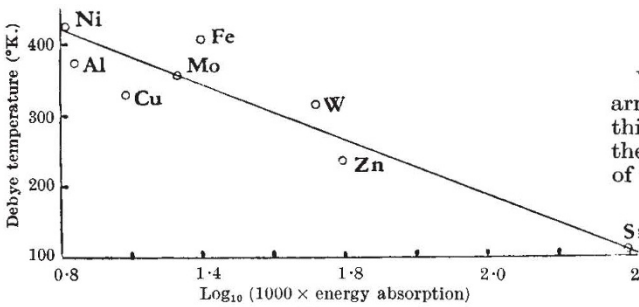

Fig. 1.

This relation suggests that the process of absorption may be one of scattering of phonons of elastic strain energy by those atoms or molecules which are vibrating at the Debye frequency. Such a process would be analogous to the scattering of photons in the Raman effect.

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Electrical Stimulation of the Cochlea

IF the external auditory meatus is filled with saline solution and an alternating current is passed through the ear by means of an electrode immersed in it, a tone is heard. The pitch is determined by the frequency of the alternating current and may correspond to its fundamental or first harmonic[1,2,3,4,5,6]. If at the same time the stem of a vibrating tuning-fork is placed on the head, it is easy to obtain regular beats by adjustment of the A.C. frequency. This shows that the 'electric' stimulus and the bone-conducted stimulus travel along a common pathway before they enter any all-or-none-mechanism. As v. Békésy[7] has shown the same regarding air conduction and bone-conduction, it is clear that in electrical stimulation of the cochlea the same peripheral mechanism is involved as in stimulation by air-borne sounds.

This seems to give further support for the 'movement' theory advocated by Stevens[5] and by Hallpike and Hartridge[6]—but only if one assumes that pitch-discrimination in normal hearing is effected by mechanical resonance (which, incidentally, is my belief). It may, however, be pointed out that even if pitch-discrimination were effected by electrical resonance *ad modum* Zotterman[3], one should expect the transient effects described by Hallpike, Hartridge and Rawdon-Smith[8]. As is well known, the behaviour to transients of a resonator of given pitch and selectivity is the same, whether it is constructed from electrical or mechanical components.

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Diurnal Variation of Cosmic Ray Shower

WITH a three-fold coincidence apparatus, counters arranged in a triangle and with a lead plate 1·5 cm. thick placed above the upper counter, I have registered the intensity of a cosmic ray shower during a period of 110 days. The result of these measurements, performed at sea-level, does not show any connexion between the variation of the shower-intensity and the diurnal periodicity of the horizontal intensity of the earth's magnetic field, as is the case with vertical coincidences[1].

Assuming that a primary shower produces radiation composed of electrically charged particles, we should expect under the influence of the earth's magnetic field a much larger diurnal variation, for the greater barometer effect of the shower seems to suggest that the shower-producing primary radiation is softer than the radiation producing the vertical coincidences. The non-existence of any correlation between shower intensity and the earth's magnetic field can likewise be interpreted in the sense that the primary shower-producing radiation is not composed of electrically charged particles. On the other hand, the experiments indicate a very good agreement between the variation of the shower intensity and that of the temperature of the outer air; both having a maximum in the late afternoon. (Priebsch found at 2,300 m. altitude the maximum of the daily period to be at noon[2].) The positive correlation coefficient between shower intensity and temperature was found to be $r = 0{\cdot}72 \pm 0{\cdot}10$, and the temperature effect $TE = 0{\cdot}074 \pm 0{\cdot}010$ per cent per degree C.

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