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Letters to the Editor

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NOTES ON POINTS IN SOME OF THIS WEEK'S LETTERS APPEAR ON P. 918.

CORRESPONDENTS ARE INVITED TO ATTACH SIMILAR SUMMARIES TO THEIR COMMUNICATIONS.

The Slowing Down of Neutrons by Protons

FERMI and his co-workers have pointed out that if a neutron source is surrounded by a material rich in hydrogen the neutrons lose energy to the protons on collision, and, after about twenty impacts, their energies are reduced to the order of those due to thermal agitation. They tried to discover whether temperature affects the density of such a neutron 'gas' by measuring the activation produced in rhodium by a neutron source surrounded by hydrogenous substances at room temperature and at 200° C. No difference in activation was detected[1].

We have performed a somewhat similar experiment by measuring the activity produced in a silver cylinder surrounding a neutron source when both were surrounded (1) by air, (2) by water at room temperature, (3) by liquid hydrogen (– 253° C.). The silver was activated to its equilibrium value, and its radioactivity was measured by an ionisation chamber and electrometer. The activities in arbitrary units on removal of the silver from the neutron source were found to be :—

Arrangement	Maximum activity	Increase in activity divided by the activity produced when in air
In air	29	—
Surrounded by 1500 c.c. water in a Dewar flask	93	2·2
Surrounded by liquid hydrogen in the same Dewar flask	58	1·1

Because the silver tube separated the neutron source from the liquids, neutrons would pass through it in a manner exactly the same as when the liquids were not present. It is therefore reasonable to measure the effect of the liquids by the *increase* in activity which they produced rather than by the total activity.

The hydrogen in water has a density of 0·11 gm./c.c. while that of liquid hydrogen is 0·07 gm./c.c., that is, in a ratio 1·6 : 1 compared with a ratio of increase of activity of 2·2 : 1. The conditions were not quite so favourable for the production of radioactivity in the case of the liquid hydrogen since it was not possible to make up the loss due to evaporation, so that during the last few minutes—those most important for the activation of the silver—the volume present was less than that of the water. It would, therefore, seem probable that the measure in activation of the silver was in proportion to the density of protons which surrounded the silver and the neutron source and that it was not affected by the change in temperature.

Our thanks are due to the Union Minière du Haut Katanga for the loan of the neutron tube and to the staff of the McLennan Laboratory for help with the experiments.

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[1] *La Ricerca Scientifica*, **2**, No. 11–12, Dec. 1934.

Collisions between Neutrons and Diplons

WHEN a stream of neutrons passes through a sheet of matter, neutrons are lost from the beam both by absorption and scattering. The latter can be avoided by placing the source of neutrons in the centre of a spherical scatterer, since with this arrangement as many neutrons must be scattered into the beam as are lost from it by scattering. In these circumstances any diminution of the number of neutrons in the beam must be attributed to absorption by the material of the sphere. The usual method of estimating the intensity of a neutron beam is to measure the induced radioactivity produced in a thin layer of matter such as aluminium or rhodium by means of a tube counter. The radioactivity so produced is proportional to the length of the neutron path in the detecting substance and will be given by $k.n.d.$ sec θ_m (k, number of radioactive atoms produced per cm. path; n, number of neutrons in the beam; d, thickness of the sheet; and θ_m, the mean angle of incidence).

For this reason absorption measurements using a spherical absorber do not necessarily give the true