LETTERS TO THE EDITOR

Prompt publication of brief reports of important discoveries in physics may be secured by addressing them to this department. Closing dates for this department are, for the first issue of the month, the twentieth of the preceding month; for the second issue, the fifth of the month. The Board of Editors does not hold itself responsible for the opinions expressed by the correspondents.

Communications should not in general exceed 600 words in length.

Continuation of Work on Scattering of Slow Neutrons

Some time ago the authors[1] published a report on the scattering of slow neutrons by various metals using a thin silver sheet as a detector. The experiments have been extended to include a number of other materials as scatterers so that data now exist on the scattering cross section for some sixteen elements distributed throughout the periodic table.

The experimental arrangement in all of the experiments described below was the same as that previously used. Neutrons, from a radon-beryllium source, which had passed through 6 cm of paraffin, struck a silver foil 6×10 cm and then were scattered from blocks of metal the same size as the silver foil, placed above it. The scattering was measured by observing the increase in the radioactivity of the silver foil caused by the presence of various thicknesses of scatterer. In the case of Hg the liquid, and in that of Mn and Cr the powdered, elements were used. These were contained in a box, the scattering from which was accounted for. The results of a typical experiment are shown in Fig. 1 in which the percentage scattering is plotted as ordinate against the thickness of scatterer as abscissa. The curves represent the scattering of Ni, C, Ag and Al with a silver detector.

It will be seen from the figure that Ni and C are good scatterers whereas Ag and Al are not. Relative scattering cross sections may be obtained by placing the slope of the curve, in its initial linear portion, equal to $N\sigma^2$, where N is the number of atoms per cc used, σ^2 the relative scattering cross section. The results for all elements so far investigated

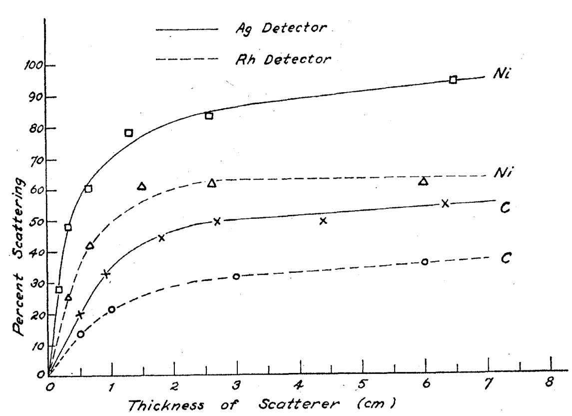

FIG. 1. Percent scattering of slow neutrons from Ni, C, Ag and Al (Ag detector).

TABLE I. *Percent scattering of slow neutrons of various elements.*

ELEMENT	AT. NO.	$\sigma^2\times10^{24}$cm² SCATTERING	$\sigma^2\times10^{24}$cm² D, P. F & M	MAX. PERCENT SCATTERING
C	6	3.2	4.1	57
Mg	12	2.8	3.5	(34 at 6 cm)
Al	13	0.9	1.5	(20 at 6 cm)
S	16	0.8	1.4	(17 at 6 cm)
Cr	24	1.3	4.9	12
Mn	25	2.0	14.3	16
Fe	26	9.9	12.0	88
Ni	28	17	15.4	95
Cu	29	7.7	7.5	55
Zn	30	3.4	4.7	37
Ag	47	5.9	55	8
Cd	48	(1.2)	3300	(2.4 at 4 mm)
Sn	50	3.8	4.0	32
Hg	80	4.4	380	20
Pb	82	7.2	8.6	52
Bi	83	9.5	8.2	40

are shown in Table I. In column 3 of the table is given the value of σ^2 observed in these experiments; in column 4 the values for the "absorption" cross section observed by Dunning, Pegram, Fink and Mitchell;[2] and in column 5 the maximum percentage scattering observed by the present authors.

It should be noted that in all cases except Ag, Hg, and Cd the scattering cross section is about the same as that measured by the "absorption" method. The metals Ag, Hg, and Cd are known to have large capture cross sections for slow neutrons. Measurements made by the "absorption" method give the sum of capture cross section plus scattering cross sections. It will be seen from the table that the scattering cross section shown by these elements is of the same order of magnitude as that shown by the other elements investigated and is not anamolously large as is the capture cross section. Furthermore, the scattering cross sections for the various elements, with the exception of Ag, Hg, Cd and possibly Mn, are approximately the same as the "absorption" coefficients observed by Dunning *et al.* This gives additional confirmation to the idea that the observed "absorption" of most of the metals investigated is largely due to scattering.

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New York University,
University Heights,
February 10, 1936.

[1] A. C. G. Mitchell and E. J. Murphy, Phys. Rev. **48**, 653 (1935); **47**, 881 (1935).
[2] J. R. Dunning, G. B. Pegram, G. A. Fink and D. P. Mitchell, Phys. Rev. **48**, 265 (1935).