Table I shows the cadmium differences obtained in counts/minute after correcting for various backgrounds.

The statistical accuracy is ± 10 counts per minute. Values other than zero are given only where a consistently positive effect was found. The efficiency of the detector was such that a one-millibarn (γ, n) cross section was the lowest that could give a positive effect, assuming that one percent of the capture gamma-rays are effective.

As more information is obtained about capture gamma-ray spectra, it may be possible to obtain values of photo-disintegration thresholds and cross sections for various elements in the region 6–10 Mev. With the present available thermal neutron beams, the above reactions do not seem to be useful sources of fast neutrons.

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The Nuclear Gyromagnetic Ratio of V^{51} *

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RESONANCES due to V^{51} have been observed in $Pb(VO_3)_2$ and in V_2O_5, both in dry powder form and in acid solutions, using an automatic recording *r-f* spectrometer similar to that described by Pound.[1]

The resonance frequency for V^{51} was compared to that for Na^{23}, for fixed magnetic field, in a mixture containing V_2O_5, NaCl, and dilute HCl. This procedure eliminated the necessity of exchanging samples for comparison, and allowed one to be certain that the individual resonances occurred in the same region of the magnetic field. The magnetic field was stabilized by an electronic control which maintained the current constant to approximately one part in 10^5 over the time required for a series of measurements of comparison frequencies.

The ratio of the uncorrected *g*-values is given by the observed frequency ratio, which is:

$$g(V^{51})/g(Na^{23}) = 0.99394 \pm 0.00003.$$

Using Bitter's[2] value for the frequency ratio Na^{23}/H^1, and the value of Taub and Kusch[3] for $g(H^1) = 5.5870$ nuclear magnetons, the frequency ratio V^{51}/H^1 and $g(V^{51})$ are, respectively:

$$V^{51}/H^1 = 0.26290,$$
$$g(V^{51}) = 1.4713 \pm 0.0003 \text{ nuclear magnetons.}$$

For the latter value, a diamagnetic correction of 0.171 percent has been introduced (see discussion in reference 3).

Kopfermann and Rasmussen[4] have published a probable value of 7/2 for the nuclear spin of V^{51}, although this value is not certain. No previous value for $g(V^{51})$ has been published. Assuming the spin to be 7/2, one obtains the following value for the nuclear magnetic moment

$$\mu(V^{51}) = 5.150 \text{ nuclear magnetons.}$$

As is well known,[5] a plot of μ as a function of I for the odd proton nuclei shows two rather distinct groupings of the nuclei. The above value for V^{51} falls close to the region containing the upper group.

* Work performed at the Brookhaven National Laboratory under contract with the AEC.
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Angular Distribution of Neutrons from Targets Bombarded by 18-Mev Deuterons

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RECENT measurements[1-3] on the angular distribution of fast neutrons from targets bombarded by deuterons of energy less than 20 Mev indicate that the neutrons are mostly emitted in the forward direction (i.e., the direction of the original deuteron beam). This letter reports a series of measurements on the spatial distribution of these neutrons with targets of different elements and copper as a threshold detector for all the elements investigated. In all cases there is a fairly sharp forward peak in the distribution of the emitted neutrons. Similar measurements[4] at 190-Mev deuteron energy have been carried out and the results are in good agreement with the stripping process worked out by Serber.[5] Although the present day theories are inadequate to explain fully the results obtained in this experiment, there is good agreement in the case of copper and beryllium targets with the stripping theory.

Deuterons of approximately 18-Mev energy were allowed to impinge on different targets and the resulting neutron intensity was detected by means of copper threshold detectors enclosed in cadmium boxes and placed in an arc of a circle of about $10\frac{1}{4}$-inch radius with target as the center. The target materials used were Be, Na, Cu, Ta, Pb, and Th, and were thick enough for the deuterons to be stopped within the target thickness. Most of the activity in copper consisted of the ten-minute period showing thereby that the neutrons are emitted with sufficient energy to produce the reaction $Cu^{63}(n, 2n)Cu^{62}$ which has a threshold of 11 Mev.[6] The activity of the samples was measured by means of an ionization chamber with a F.P. 54 electrometer-tube.

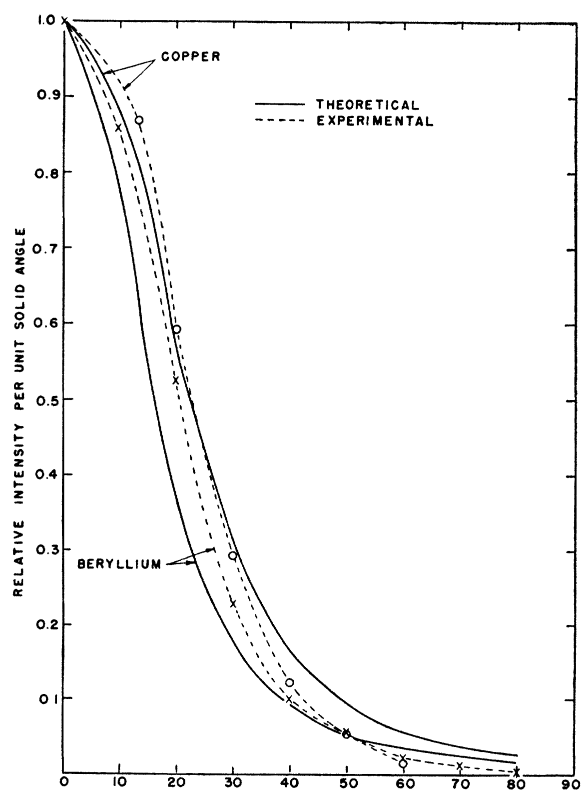

FIG. 1. Angular distribution of neutrons from Be and Cu. The theoretical curves are calculated from Serber's theory.

TABLE I. Summary of results obtained for the half-width.

Target	Half-width in degrees Experimental	Stripping theory
Be	41°	31°
Cu	45°	46°
Pb	47°	70°

The distribution curves for Be and Cu, along with the curves calculated from Serber's theory, are reproduced in Fig. 1. In the case of Be and Cu there is a small amount of background (3 percent and 10 percent respectively of the maximum) for which correction is made in comparing the experimental curve with that obtained on the basis of stripping process. The agreement in the case of copper is good, but for beryllium the observed half-width (i.e., full width at half-maximum) is somewhat greater than that given by stripping theory. This indicates that in the case of Be, processes other than stripping might also be responsible for the observed distribution. In the case of Pb, there is a larger isotropic background (about 25 percent of the maximum) and after subtraction of the background there is a large discrepancy between the observed and calculated distributions in that the experimental half-width is considerably smaller than the theoretical half-width. Although there seems to be a perceptible increase in the half-width with increase in atomic number, the rate of increase is definitely not in agreement with stripping theory. Similar results on the variation of half-width with atomic number have been reported by Falk *et al.*[3] Professor V. F. Weisskopf has pointed out that for heavy elements the deuteron loses so much energy in climbing the potential barrier that the neutron can obtain sufficient momentum to cause the Cu(n, $2n$) reaction only by adding its internal momentum in the deuteron parallel to its external momentum. This will cause a sharp forward peak for essentially energetic reasons, the stripping neutrons at larger angles being of lower energy. Table I gives a summary of the results obtained for the half-width.

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