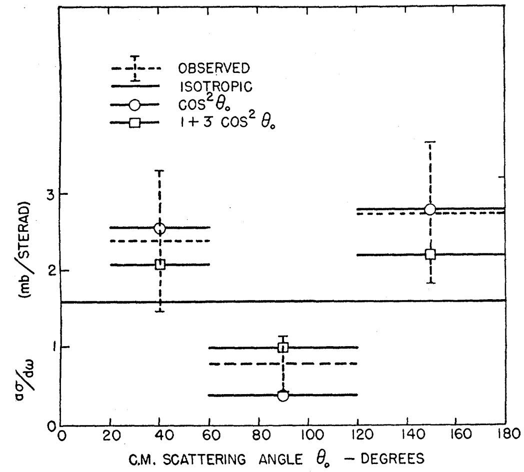

FIG. 1. Experimental π^+-p differential scattering distribution in the center-of-mass system. Distributions of the forms $\cos^2\theta_0$ and $1+3\cos^2\theta_0$ are also indicated besides the isotropic distribution.

dicting a practically isotropic distribution for the low meson energies considered here. The results obtained by the Chicago group[3] have already indicated the validity of a "strong coupling" theory,[6] the characteristic features of which have been pointed out by Brueckner.[7] For pseudoscalar mesons (spin 0) and pseudovector interaction, p-wave scattering must predominate, and the total angular momentum can assume the values $1\pm\frac{1}{2}$. As further pointed out by the Chicago group, the scattering in the angular momentum state $\frac{1}{2}$ should lead to an isotropic distribution, while in the state $\frac{3}{2}$ a distribution of the form $1+3\cos^2\theta_0$ is expected. Furthermore, interference effects can lead to a $\cos\theta_0$ term. Thus, the present result can be tentatively identified as being due to scattering in the angular momentum state $\frac{3}{2}$ alone.

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Photodisintegration of the Deuteron at High Energies

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RECENT experiments[1,2] on the photodisintegration of the deuteron at high energies give evidence of cross sections exceeding what might be expected on the basis of earlier calculations.[3,4] The discrepancy seems to be appreciable for energies above about 80 Mev.

In previous treatments, which admittedly are not applicable at very high energies, the contributions from charged mesons are only taken into account as giving rise to the exchange interactions and the anomalous magnetic moments for the nucleons.[5] It is, however, conceivable that at sufficiently high energies the meson exchange currents in the deuteron will play the dominant rôle in the photoeffect.

Using ordinary perturbation theory we have, therefore, calculated the contribution to the cross section from processes in which a π-meson is emitted by one of the nucleons, absorbs the photon, and is then absorbed by the other nucleon. The nucleons are treated nonrelativistically and plane waves are used in the intermediate and final states. The ground state of the deuteron is described by a wave function of the Hulthén form. Pseudoscalar meson theory is applied.

It turns out that calculations with pseudovector coupling give total cross sections in reasonable agreement with experiment, while pseudoscalar coupling affords too low values. The result may, therefore, serve as a further argument for the pseudovector coupling form of the pseudoscalar theory.

The predominance at high energies of the process considered by us over the direct absorption of the photon by the nucleons may be understood in the following way. Firstly, the absorption of a photon by a meson instead of by a nucleon is favored by the smaller mass of the meson. Secondly, the cross section for the direct absorption contains a factor giving the probability of finding a nucleon in the deuteron with momentum $\mathbf{p}-\mathbf{k}$, where $\mathbf{p}$ is the final momentum of the absorbing nucleon and $\mathbf{k}$ is the momentum of the photon. For increasing energies the cross section is, therefore, rapidly decreasing. On the other hand, in the indirect process the emission of a meson of momentum $\mathbf{q}$ gives rise to a matrix element, the squared amplitude of which measures the probability of finding a nucleon with momentum $\mathbf{p}+\mathbf{q}$ in the deuteron. Since $\mathbf{q}$ may be chosen so as to give a small value of $\mathbf{p}+\mathbf{q}$, large contributions to the cross section will be obtained from meson momenta roughly satisfying $\mathbf{q}\approx-\mathbf{p}$.

A further account will appear in *Arkiv för Fysik.*

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Internal Conversion in Cu^{64} and Fe^{59}†

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MEASUREMENTS of the K-conversion coefficients of the 1.34-Mev γ-ray of Cu^{64} and the 1.11-Mev and 1.30-Mev γ-rays of Fe^{59} have been taken, using the β-ray spectroscope ($\rho=50$ cm) recently constructed at Carnegie Institute of Technology. In all cases the coefficient was obtained by measuring the ratio of the number of conversion electrons to the number of β-rays in a component of the continuous spectrum. This value

TABLE I. Observed K-conversion coefficients, α_K.

Original nucleus	Nucleus emitting γ-ray	Energy of γ-ray (Mev)	α_K	Number of sources used
Cu^{64}	Ni^{64}	1.34	$(1.0\text{–}1.6)\times10^{-4}$	2
Fe^{59}	Co^{59}	1.11	$(1.45\pm0.05)\times10^{-4}$	1
Fe^{59}	Co^{59}	1.30	$(0.84\pm0.05)\times10^{-4}$	1

was divided by the number of γ-rays per β-ray as found from a decay scheme.

To obtain the continuous spectrum below the cut-off point of the counter windows, the Kurie plots for these spectra were extrapolated. It is felt that, for this reason, the α_K value for the Cu^{64} γ-ray was high. The Cu^{64} sources used were rather thick ($\sim$10 mg/cm^2) and this thickness increases the relative number of slow electrons. Using the data of Tyler,[1] a rough estimate was made of the effect of source thickness, and the coefficient given includes this correction.