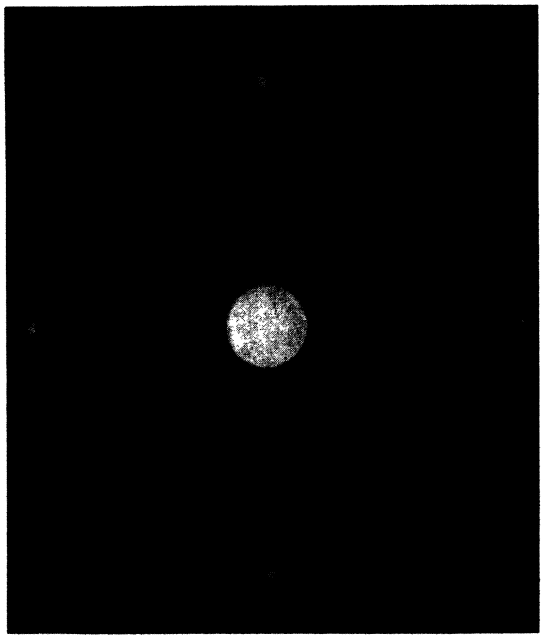

FIG. 1. Laue photograph showing neutron diffraction by NaCl.

Since photographic film (in our case x-ray double emulsion film) is quite insensitive to neutrons, it is necessary to use some type of sensitive screen in conjunction with the film. For this purpose, a sheet of indium 0.5 mm thick has been placed in contact with the film, and the beta-particles resulting from neutron capture in the indium produce the photographic effect. A 1½-inch hole was cut in the center of the indium sheet to reduce the darkening in the vicinity of the primary beam, and the outline of this hole can be seen in Fig. 1. The film was backed by a ¼-inch boron carbide plastic shield through which a ¾-inch hole was cut for the primary beam. The white area in the center of the photograph arises from neutrons and gamma-rays backscattered from the film cassette into the region not covered by the boron carbide shield.

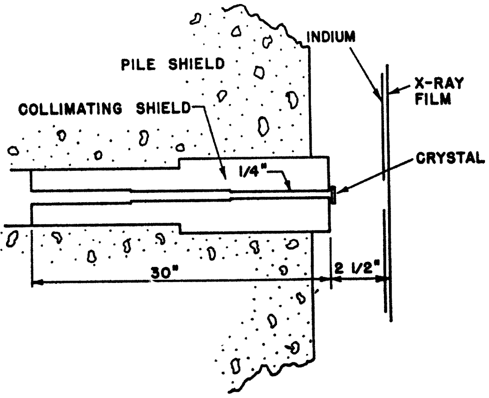

FIG. 2. Schematic diagram of Laue camera for obtaining neutron diffraction patterns.

The photograph in Fig. 1 was obtained with a NaCl crystal 0.35 cm thick, with the incident beam parallel to one of the cube axes and with a crystal to film distance of 6.40 cm. An exposure time of 10 hours was used. By the usual gnomonic projection the Laue spots have been identified as (402), (422), and their permutations for the outer series, and (311) and permutations for the inner series. Other spots such as the (442) and (513) are visible on the original negative but are too weak to show on the reproduction. The relative intensities of the spots on the pattern are in agreement with those expected from the distribution of intensity in the neutron spectrum of the incident beam.

Patterns have also been obtained for a variety of other crystals, including quartz, calcite, LiF, and $NaNO_3$, and several activating materials other than indium have been tried. Details on these and related studies will be published later.

Note on Angular Distributions in Nuclear Reactions

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IN a recent paper[1] of the same title a proof is given of the general theorem that in a nuclear reaction produced with an unpolarized beam of given orbital angular momentum incident on an unpolarized target, the angular distribution of the outgoing intensity cannot be more complicated than that of the incoming intensity. In the last two paragraphs of that paper, an error is made in the application of the treatment to reactions which lead to an arbitrary number of particles of arbitrary spin.

The theorem may be applied to the angular distribution of one of the outgoing particles provided no other independent outgoing particle direction and no state of polarization of any of the particles is specified. This distribution is obtained by summing the absolute square of the wave function describing outgoing particles over all of the unspecified variables. It is shown in the original paper that the absolute square of the wave function may be analyzed into products of the form $\psi_{j'}^{\mu'}\psi_l^M\psi_{l'}^{-M'}\psi_s^{M''}\psi_s^{-M'''}\cdots$, where the first factor describes the angular distribution of the particle under observation and the remaining factors describe the orbital and spin distributions over which the integration is to be performed. Because of the orthogonality relations for the $\psi_l^M\psi_s^{M''}$, the integration eliminates all terms except those for which $\mu'=m-m'$ with $-L\leq m\leq L$, $-L\leq m'\leq L$, where L is the orbital angular momentum of the incident particle. At this point the basic argument of reference 1 may be applied, with the consequence that only terms with $j'\leq 2L$ remain in the intensity expression after integration (rather than before integration as originally stated).

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[1] E. Eisner and R. G. Sachs, Phys. Rev. 72, 680 (1947).