It is a by-product of the considerations reported above that spaces with an odd number of dimensions would behave in a quite different manner from spaces with an even number of dimensions when subjected to inversions (the relations $\gamma^\mu\gamma^5+\gamma^5\gamma^\mu=2\delta_{\mu 5}$, with $\gamma^5=\gamma^1\gamma^2\gamma^3\gamma^4$, can be extended only to the latter). This supports the view expressed by several authors that, should our world become too limited with only four dimensions, the natural generalization of it would be a six-dimensional, rather than a five-dimensional world.

Coming back to physics, we wish to point out, finally, that the rejection of the Majorana theory for the neutrino would not forbid the interpretation of double beta-decay phenomena, should they be definitely proved to occur. Some suggestions have already been made in this direction;[3,9] others may be advanced, in our opinion, but a discussion of this matter is, perhaps, premature.

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An Experimental Search for Self-Trapped Electrons in the Alkali Halides*

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TWO detailed calculations have been made on the self-trapped electron problem in ionic crystals originally proposed by Landau. Frohlich, Pelzer, and Zienau[1] treated the dielectric as a continuous medium with a single vibrational frequency for long longitudinal polarization waves. They concluded that the energy levels of these electrons do not exist below the conduction band and, in fact, differ little from the free electron. Thus, electrons would never be self-trapped but would move through the lattice almost as the free electron. Markham and Seitz[2] considered the dielectric as a discontinuous medium and utilized a self-consistent field method. Their calculations for NaCl gave thermal and optical activation energies of -0.13 ev and -0.68 ev, respectively. Therefore the self-trapping centers should be stable at 4.2°K, provided that the smearing out of the electron over several lattice sites does not permit it to diffuse rapidly through the crystal until it forms a more stable, e.g., F, center.

Since there is a fundamental difference in these approaches to the problem, it seemed advisable to perform an experimental observation on NaCl and KCl at 5°K. Crystals[3] produced by the Harshaw Chemical Company were mounted in a low temperature optical cell[4] and then x-rayed at 5°K[5] using a Machlett C-524A, molybdenum target x-ray tube operated at 50 kv and 48 ma. That this released large numbers of electrons into the conduction band was evidenced by the rapid growth of the F-band. The crystals were x-rayed in the dark for periods up to two hours and their absorption spectrum then measured at 5°K on three instruments to cover the spectrum from the F-band to about 15μ. This was necessary since the calculated optical activation energy of -0.68 ev (about 1.8μ in the absorption spectrum) is only an approximation. The spectral region 0.4μ to 1.2μ was measured on a Beckman Model DU Spectrophotometer taking care not to expose the crystal to any radiation except during the actual measurements. For the region from 1.0μ to 3.5μ a rapid scanning spectrometer[6] was used. A shutter arrangement permitted a complete spectrum to be obtained within 0.01 second after the light from a Nernst glower source first struck the crystal, thus preventing the possibility of optically bleaching the centers before a spectrum was obtained. The spectrum beyond 3.5μ was obtained with a Perkin-Elmer infrared spectrophotometer using a Golay detector. Here it was necessary to expose the crystal to the globar source continuously.

This experiment was repeated three times for NaCl and once for KCl. With the exception of a possible small F'-band in NaCl no bands were found to the infrared side of the F-band. KBr was also x-rayed at 5°K (1 hour at 50 kv and 20 ma) and its spectrum run only on the Beckman and Perkin-Elmer. Again no bands were found to the infrared of the F-band.

These measurements suggests that if the self-trapped electron exists, it diffuses easily through the lattice, even at 5°K, and thus that the binding energy is not greatly affected by the mean location of the electron, i.e., it can jump from a position of minimum binding energy to another even at these low temperatures, as suggested by Markham and Seitz. Perhaps at lower temperatures one might be able to freeze the electron at a lattice point long enough to be observed. In any event, the results appear to provide a strong justification for disregarding the lattice structure of the crystal above 5°K as was done by Frohlich, Pelzer, and Zienau.

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Energy Dependence of $(n, 2n)$ Reactions in Ni^{58}, Cu^{63}, and Tl^{203} from 11 to 19 Mev*

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THE energy dependence of the $Ni^{58}(n, 2n)Ni^{57}$, $Cu^{63}(n, 2n)Cu^{62}$, and $Tl^{203}(n, 2n)Tl^{202}$ reactions has been investigated, using neutrons from the $D(T, n)He^4$ reaction[1] produced by the Los Alamos 2.5-Mev electrostatic accelerator.

A 1-cm long gas target[2] filled to 23-cm Hg pressure of deuterium was bombarded with a monatomic triton beam of approximately 1 microampere having an energy of 1.80 Mev in the center of the target gas volume. This gave a yield of about 1.4×10^7 neutrons/sec. Energies of the neutrons from the reaction varied from 18.5 Mev at 0° to 11.3 Mev at 180°. In the measurements presented here, it has been assumed that the neutron flux is symmetric in the laboratory coordinate system, which is true within experimental error of ±10 percent for triton bombarding energies near 1.2 Mev.

Samples were positioned accurately as to angle and distance from the center of the target gas volume by means of a light aluminum ring clamped near the end of the target tube. The nickel samples were folded strips 0.002-in. thick and weighing about 2 grams, while the copper samples were rolled strips 0.020-in. thick and weighing 20 grams. Four blocks of thallium, about 0.4 cm$\times$1 cm$\times$1 cm and weighing 5 grams each, were stacked at the angular positions corresponding to the neutron energies indicated in Fig. 3. The nickel and thallium samples were irradiated for 26 hours, the copper samples for 20 minutes.

After irradiation each nickel strip was wound in a helix around the outside of a thin-wall Geiger counter, and the activity was followed for 80 hours. In each case the 36-hour Ni^{57} decay was clearly observed as well as an activity of about 2 hours half-life, apparently due to the $Ni^{61}(n, p)Co^{61}$ reaction. Figure 1 shows the