lar absorption experiment, and by Leighton, Anderson and Seriff, and by Thompson, who made many accurate momentum measurements of the decay electrons with cloud chambers. They are also consistent with the currently popular idea that each decay process results in an electron and two neutrinos. E.P.H.

On the Disintegration Products of the 2.2 μsec. Meson. By E. P. Hincks and B. Pontecorvo. *Phys Rev. 77:102, January 1, 1950.*

Acoustical Anisotropy

The anisotropy of an acoustc medium gives rise to several interesting phenomena. For any given direction there are in general three possible modes of sound propagation. The particle displacements for these modes are mutually perpendicular, but these displacements are not necessarily perpendicular or parallel to the wave normal, as is the case for purely compressional and transverse modes. The modes are so coupled that energy transfer may occur following a normal reflection (as well as for other angles as in the case of isotropic solids). The energy does not in general travel in a direction normal to the wave front and thus one observes a phenomenon analogous to optical birefringence.

In the investigation reported here all these effects were observed. Rectangular single crystals of ammonium dihydrogen phosphate (ADP) and potassium dihydrogen phosphate (KDP) constituted the anistropic media. For each a complete set of elastic constants were obtained using a pulsed ultrasonic technique. With a carrier frequency of 10 megacycles per second and a pulse length of about 3 microseconds, single crystal specimens, an inch or two on an edge, present essentially an infinite medium to the sound waves. It was possible to calculate the directions of propagation of all three modes and to check against experiment. For a particular direction of propagation in ADP an anomalously large beam spreading was predicted and observed. The pulsed ultrasonic technique is in many ways well suited to the investigation of the elastic properties of small specimens and is particularly useful in demonstrating these phenomena peculiar to acoustically anisotropic media. W.J.P.

Acoustical Properties of Anistropic Materials. By W. J. Price and H. B. Huntington, *J. Acous. Soc. Am. 23:32, January, 1950.*

Exchange

Recent high energy experiments on the scattering of neutrons by protons support the theory that the fundamental nuclear force between these particles is of the "exchange type." An elementary, nonmathematical discussion is given of what is meant by such exchange forces. Their anomalous behavior when viewed classically is shown to appear more natural when the wave aspects of the elementary particles are taken into account as required by the quantum theory. The evidence about nuclear forces which led to the prediction of exchange of forces long before an experimental test was possible are summarized. Finally, the role of the meson in accounting for the nuclear force is sketched and illustrated with various neutron-proton reactions involving the emission of mesons. D.L.F.

Exchange Forces. By David L. Falkoff. *Am. J. Phys. 18:30, January, 1950.*

Image Formation

According to the reciprocity law of photochemical reactions, the photoproduct produced is dependent only upon the product of light intensity and exposing time, and is independent of either of these factors separately so long as they are varied reciprocally. The photographic process does not obey the law, there being one intensity level for which a given exposure produces a maximum effect, the effect declining at either higher or lower intensities. It is now generally believed that the low-intensity reciprocity-law failure in photographic exposure is due to instability of the latent image speck when it starts to form due to thermal motion. Experimental evidence indicates that the latent image is built up in a series of steps individually initiated by successive absorptions of light quanta. The quanta produce free photoconductivity electrons in the photographic grains that diffuse through the crystal to pre-existing sensitivity specks capable of trapping the electrons. For each electron trapped, a silver ion migrates to the speck to form a silver atom. It appears that after a certain number of these steps, the photoproduct speck attains a critical size that is stable, but not yet developable. Thus, the formation of a stable sublatent image at low light intensities is inefficient because there is more time for the speck to evaporate before it reaches its critical size.

Experimental results are given to show that the energy depth of the traps for the initially trapped electrons in latent image formation can be determined from measurements of reciprocity-law failure at different temperatures. The average value for the energy depth is found to be of the order 0.75 ev. The present paper is concerned principally with a theoretical interpretation of the results as they are related to the exposure required to establish the stable, but not developable, sublatent image. It can be said at once that at least two quanta must be absorbed by a grain in a certain critical time element, τ, to establish the stable subspeck. Using probability formulas, theoretical reciprocity curves are calculated based on the requirement that, in general, a multiplet, s, of quanta must be absorbed in the critical time, τ, to form the stable subspeck. The calculation leads to the conclusion that the slope of the reciprocity curve at low intensities approaches the value $-(s-1)$. A comparison of the slopes of the theoretical and experimental reciprocity curves at low intensity then affords a method of determining the value of s. Experimental slope values for reciprocity curves would indicate that s has the value 2. J.H.W.

Low-Intensity Reciprocity-Law Failure in Photographic Exposure: Energy Depth of Electron Traps in Latent-Image Formation; Number of Quanta Required to Form the Stable Sublatent Image. By J. H. Webb. *J. Opt. Soc. Am. 40:3, January, 1950.*