If some of the above difficulties can be overcome, the use of thallium compounds as γ-ray counters seems quite promising since such crystals are quite dense (TlBr 7.56, TlI 7.09). They are also interestingly complementary to diamond counters[3,4] since pair production and the photoelectric process have a high probability in the thallium salts, while at γ-energies below about eight million electron volts the Compton process is the only one of moment in diamond.

It is also interesting that an "impurity" of bromine in the iodine compound (or *vice versa*) still permits the crystal to count.

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A Calibration for Eastman Proton Plates

R. A. Peck, Jr.
*Sloane Physics Laboratory, Yale University, New Haven, Connecticut**
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A BATCH of Eastman nuclear research plates (NTB emulsion No. 347,126) has been calibrated by determination of the emulsion stopping power as a function of proton energy. Until there is some assurance of the reproducibility of Eastman NTB plates, it seems necessary to repeat the calibration procedure for every new batch received.

A thin boron target was bombarded with 3.7-Mev deuterons from the cyclotron, and Eastman plates were used to record the long-range protons from $B^{10}(d, p)B^{11}$. Several exposures were taken with different thicknesses of aluminum foil interposed in the path of the protons. Thus the same group was measured in each plate, with a different effective proton energy in every case. The extrapolated range of the group was determined from each exposure and identified with the extrapolated air range, suitably reduced according to the absorbers used. In this way the emulsion stopping power was determined at each of several proton energy values. The form of the curve so obtained is independent of the deuteron beam energy and the Q-value of the reaction. The absolute values of stopping power will, however, depend on these parameters.

The calibration function obtained is presented in Fig. 1. The errors shown are those which are effective in determining the form of the curve. To them must be added an uncertainty in the level of the curve as a whole, amounting to ± 1.4 percent at 9 Mev. The stopping power function here obtained is constant down to about 5 Mev, below which it rises with decrease of energy. At 3 Mev the slope is -356 per Mev. Similar data obtained for Eastman Experimental Proton emulsion No. 340,506 (same composition as NTB plates) show a stopping power which is constant over roughly the same region, but which increases somewhat more rapidly at low energy.

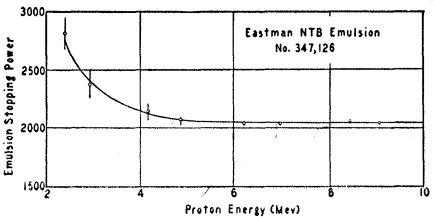

FIG. 1. Stopping power *vs.* energy (Mev) for protons in Eastman NTB emulsion No. 347,126.

For Ilford Nuclear Research emulsions ($B1$ and $C1$) Lattes, Fowler, and Cuer[1] have published a curve which is constant down to 5 Mev, below which it drops with energy decrease. Its slope at 3 Mev is $+70$ per Mev, roughly $\frac{1}{5}$ the corresponding slope for the Eastman emulsion. For Ilford halftone plates Richards[2] found stopping power slightly rising with decreasing energy, and a slope of -19 per Mev at 3 Mev, while Guggenheimer, Heitler, and Powell[3] have observed no energy variation of S for plates of the same type (Ilford halftone) between 2 and 6.5 Mev.

In attempting to account for the difference in direction of the stopping power variation at low energy as found for Ilford and Eastman plates, any slight differences in emulsion composition are of considerable importance. Thus the hydrogen and carbon in the gelatin exhibit a stopping power energy curve with negative slope, while for silver and bromine that slope is positive.[4] Since moisture content influences the amount of hydrogen present, relative humidity also has a considerable effect in determining the effective stopping power of an emulsion. From the different stopping power gradients reported for Ilford emulsions, and the two here found for the Eastman product, it appears that the quanties which vary from batch to batch of plates of a single type are able to evoke some variation in the energy dependence of the stopping power of such plates.

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Saturation Effect in Microwave Spectrum of Ammonia

T. Alexander Pond and Walter F. Cannon
Palmer Physical Laboratory, Princeton University, Princeton, New Jersey
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IN his investigation of absorption line shape in the inversion spectrum of ammonia, Townes[1] has found that at low pressures and powers of the order of 1 μw a saturation effect occurs, causing the absorption to decrease and the width to increase with increase in power. Gordy and