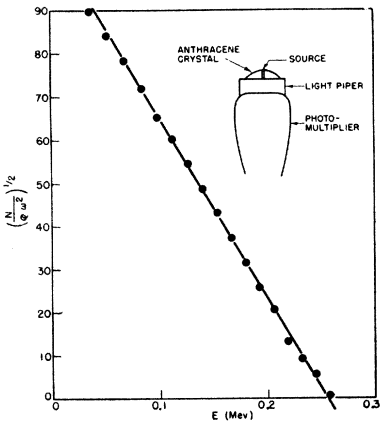

FIG. 2. Kurie plot of Ca^{45} obtained with the experimental arrangement shown on the figure.

equal to that of each crystal alone, 6.5 percent half-width at half-height. The Kurie plot of Ca^{45} shown in Fig. 2 was obtained with the source mounted between 25 $\mu g/cm^2$ Formvar films placed between the two crystals which were in contact. The resolution correction has been made. Since the plot is linear from 50 kev to the end point, one can now rely largely upon points obtained with good statistics to obtain the end point. The value obtained is 255 ± 4 kev in good agreement with the value previously reported,[5] as is also the spectrum shape. Thus, it appears that this split crystal spectrometer can give reliable information about the shapes and maximum energies of low energy beta-emitters.

Credit for the success of this study is due in large part to helpful discussions with C. J. Borkowski, A. R. Brosi, and H. Zeldes and to R. A. Dandl and E. Fairstein who designed and calibrated the electronic circuits.

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Decay of Y^{87} and Sr^{87m}

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Y^{87} and its daughter Sr^{87m} were investigated by using a double thin-lens beta-ray spectrometer, scintillation counters, and Geiger counters in coincidence. The activities were produced by bombarding strontium with deuterons. (The authors are indebted to the cyclotron staff at both the University of Washington in St. Louis and the University of Chicago for these bombardments.)

Decay of ground state of Y^{87}. The half-life of the ground state[1,2] was measured as 80.0 ± 1 hours. At least 98 percent of the 80-hour Y^{87} decays to an excited state of Sr^{87} at 875 kev. This state immediately emits a 485 ± 3-kev gamma-ray and leads to the 390 ± 2-kev isomeric state. In addition to the predominant K-capture process, a very low intensity (less than one percent) positron spectrum exists. The low intensity of these positrons made an accurate energy determination impossible; the data are consistent with the value of 0.7 Mev reported by Robertson, Scott, and Pool.[2] Assuming this energy, the measured K-capture to positron ratio is much higher than the theoretically predicted value of 7 for an allowed transition. The value of $\log(f_K+f_{\beta+})t=5.9$ and Mrs. Mayer's shell structure theory[3] indicates an allowed transition.

The K conversion coefficient of the 485-kev gamma-ray was measured by comparing the number of its conversion electrons to those of the 390-kev gamma-ray and using the measured K conversion coefficient (0.25) of the latter. The value of $3.3\pm0.5\times10^{-3}$ is consistent with the theoretical values only[4] for either electric quadrupole, magnetic dipole, or a mixture of both.

Upper state of Y^{87}. The upper isomeric state[1,2] of Y^{87} decays with a half-life of 14 ± 1 hours. (When the details of its decay are completely investigated, a paper will be written on the entire decay scheme.) About 50 percent of the 14-hour activity leads to the 80-hour ground state. Although the growth of the 80-hour activity makes this certain, the radiation corresponding to this transition has not yet been identified. The remainder of the 14-hour activity has 374-kev conversion electrons associated with it. There are no 485-kev gamma-rays emitted by 14-hour Y^{87}. The 14-hour activity also has a low intensity positron spectrum whose maximum energy was measured as 1.1 ± 0.1 Mev. The experimental K to positron ratio is 50 while the theoretical value for an allowed transition is 1.6. The log $(f_K+f_{\beta+})t$ value is 5.5.

Decay of Sr^{87m}. The half-life[1,2,5] of Sr^{87m} was measured as 2.80 ± 0.05 hours. This state emits a 390 ± 2-kev gamma-ray which is partially converted. The K conversion coefficient was determined by using coincidence techniques and was found to be $N_e/N_\gamma=0.25\pm0.04$. This is consistent with the theoretical values only[4] for either magnetic 2^4 pole, electric 2^5 pole, or a mixture. The ratio of K- to L-conversion as determined in the spectrometer was 6.9 ± 0.4.

The data on the excited states of Sr^{87} are consistent with internal conversion theory, nuclear isomeric theory,[6] and Mrs. Mayer's shell theory if the three energy levels are assigned as $g_{9/2}$, $P_{1/2}$, and $P_{3/2}$. (The spin of the ground state is known[7] to be 9/2.) The assignments of the Y^{87} states and a comparison with beta-decay theory cannot be made until the investigation of 14-hour Y^{87} is complete.

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Double Development of Nuclear Emulsions

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ONE of the most valuable features of the nuclear emulsion technique is the ability of a photographic emulsion to integrate the images of nuclear events which were registered by the emulsion before its development. Generally we have no means of determining at what time or in what order individual tracks were recorded, although this may be of interest in certain cases. Some information can be obtained on this subject from the study of the fading of the track images. The fading is dependent, however, on a number of factors and takes place only gradually and

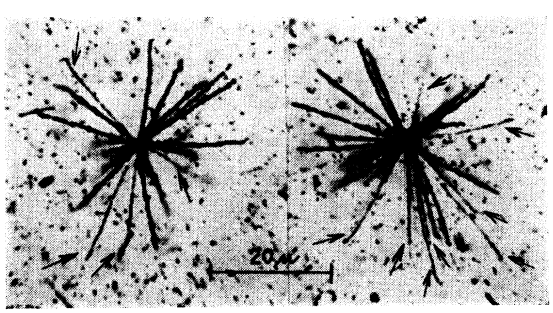

FIG. 1. Two microphotographs of Io (Th^{230}) stars showing distinctly two sorts of tracks registered during two successive one-day periods. The thin tracks registered during the second day are marked by arrows.