(1) Deuteron contamination of the ion beam, $Pu^{239}(d,3n)\ Am^{238}$

(2) $Pu^{239}\ (\alpha,p4n)Am^{238}$

(3) $Pu^{239}\ (\alpha,5n)\ Cm^{238} \xrightarrow[\text{short}]{K} Am^{238}$

D. Mass Assignments.

The isotopes of americium discussed in the previous parts of this section should, on the basis of their method of formation, have mass numbers in the range from 237 to 240. There is no genetic relationship between the two as might have been possible since the 12-hour activity could decay by isomeric transition. If the 50-hour activity were produced by decay of the 12-hour isotope, the logarithmic decay of the gamma activity, shown in Figure 12, would not be observed, but rather the curve would be convex due to the superposition of a 12-hour growth component for the 50-hour activity upon the decay of the initial independently formed 50-hour activity.

Neptunium and plutonium fractions were removed from portions of the americium fractions from the deuteron bombardment of Pu^{239}, after allowing time for the growth of daughter activities. The methods were sensitive enough to have detected Np^{236} (17 hour; beta particle emission) as the daughter of the 12-hour alpha activity if the latter were due to Am^{240}, but it has not been observed. The only other daughter isotope capable of being formed with sufficient yield to be detected as a result of growth from the americium activities, is Pu^{238} (ca. 90 year; alpha particle emission) if formed from Am^{238} by electron capture. The amounts of this isotope expected from the most radioactive samples of americium obtained were just on the limit of detection and positive evidence of its formation is lacking.

A quantitative evaluation of relative yields of different isotopes as a function of bombardment energy may often give an idea of their mass