

a vacuum due to the momentum of the impinging helium ions, could be caught on a second thin gold catcher foil. This second gold foil, which contained recoil atoms and was relatively free of the einsteinium target material, was dissolved and was used for later chemical operations.

The preparation of the ^{253}Es target for this recoil experiment was another technical tour-de-force. After approximately five failures to prepare the target by vaporization of ^{253}Es from a hot filament, the essentially weightless deposit of ^{253}Es was electroplated onto the Au foil within a very small area.

An extremely reliable ion exchange separation scheme had to be developed to unambiguously chemically identify atoms of a new element that were made. It took several months, involving hundreds of column elutions to develop the appropriate procedure. The final choice was the use of a Dowex 50 ion exchange column run at an elevated temperature (87°C) with an alpha-hydroxyisobutyrate eluant. The procedure was so well developed that the discovery team could tell exactly in which drops of eluant the interesting activities would appear. Finally the 60-inch cyclotron $^4\text{He}^{2+}$ beam was increased by an order of magnitude in intensity to 100 microamperes per cm^2 .

The earliest experiments were confined to a search for short-lived, alpha-emitting isotopes that might be due to element 101. For this purpose it was sufficient to look quickly at the actinide chemical fraction as separated by the ion-exchange method. No alpha activity was observed that could be attributed to element 101, even when the time between the end of bombardment and the beginning of the alpha particle analyses had been reduced to five minutes. The experiments were continued and, in one of the subsequent overnight bombardments, two large pulses in the electronic detection apparatus due to spontaneous fission were observed. With probably unjustified self-confidence, it was thought that this might be a significant result. Although such an attitude might ordinarily have been considered foolish, it must be recalled that rapid decay by spontaneous fission was--up until that time--confined to only a few nuclides, none of which should have been introduced spuriously into the experiment. In addition, background counts due to this mode of decay should be zero in proper equipment.

The major question, of course, was whether the experiment could be repeated. In a number of subsequent bombardments, one or two spontaneous fission events were observed in some, while none was observed in other experiments. This, of course, was to be expected, because of the statistical fluctuation inherent in the production of the order of one atom per bombardment. Furthermore, more advanced chemical experiments seemed to indicate that spontaneous fission counts, when they did appear, came in about the element 100 or 101 chemical fractions.

The definitive experiments were performed in a memorable, all-night session, February 18, 1955. To increase the number of events that might be observed at one