the sound of "Pu"--for the reason you might suspect. We decided on "Pu," and, I might add, we expected a much greater reaction after it was declassified than we ever received.

Fission of Plutonium

Almost concurrent with this work was the search for, and the demonstration of the fission of, the isotope of major importance--94-239, the radioactive daughter of 93-239. Emilio Segrè (Figure 4) played a major role in this work together with Kennedy, Wahl and me. The importance of element 94 stems from its fission properties and its capability of production in large quantities. This work involved, the 60-Inch Cyclotron, the Old Chemistry Building, the Crocker Laboratory, and the 37-Inch Cyclotron, all of which have by now been removed from the Berkeley campus (Figure 5). The 0.5-microgram sample on which the fission of 94-239 was first demonstrated was produced by transmutation of uranium with neutrons from the 60-Inch Cyclotron; it was chemically isolated in rooms in Old Chemistry Building and Crocker Laboratory and in Room 307 Gilman; and the fission counting was done using the neutrons from the 37-Inch Cyclotron.

A sample of uranyl nitrate weighing 1.2 kilograms was distributed in a large paraffin block (neutron-slowing material) placed directly behind the beryllium target of the 60-Inch Cyclotron in the Crocker Laboratory and was bombarded for two days with neutrons produced by the impact of the full 16 Mev deuteron beam on beryllium. The irradiated uranyl nitrate was placed in a continuously-operating glass extraction apparatus, and the uranyl nitrate was extracted into diethyl ether. Neptunium-239 was isolated from the aqueous layer by use of the oxidation-reduction principle (described in the next section) with lanthanum and cerium fluoride carrier and was reprecipitated six times in order to remove all uranium impurity. Measurement of the radiation from the neptunium-239 made it possible to calculate that 0.5 microgram was present to yield plutonium-239 decay. The resulting alpha activity corresponded to a half-life of 30,000 years for the daughter plutonium-239, in demonstrable agreement with the present best value for the half-life of 24,110 years.

The group first demonstrated, on March 28, 1941, with the sample containing 0.5 microgram of plutonium-239, that this isotope undergoes slow neutron-induced fission with a probability of reaction comparable to that of uranium-235. The sample was placed near the screened window of an ionization chamber that could detect the fissions of plutonium-239. Neutrons were then produced near the sample by bombarding a beryllium target with deuterons in the 37-Inch Cyclotron of Berkeley's "Old Radiation Laboratory" (the name applied to the original wooden building, since torn down to make way for modern buildings). Paraffin around the sample slowed the neutrons down so they would be captured more readily by the plutonium. This experiment gave a small but detectable fission rate when a six microampere beam of deuterons was used. To