

land had been acquired at Oak Ridge, Tennessee, and millions of dollars had been obligated.

Three years before the December 2nd experiment, it had been discovered that when an atom of uranium was bombarded by neutrons, the uranium atom sometimes was split, or fissioned. Later, it had been found that when an atom of uranium fissioned, additional neutrons were emitted and became available for further reaction with other uranium atoms. These facts implied the possibility of a chain reaction, similar in certain respects to the reaction which is the source of the sun's energy. The facts further indicated that if a sufficient quantity of uranium could be brought together under the proper conditions, a self-sustaining chain reaction would result. This quantity of uranium necessary for a chain reaction under given conditions is known as the critical mass, or more commonly, the "critical size" of the particular pile.

For three years the problem of a self-sustaining chain reaction had been assiduously studied. Nearly a year after Pearl Harbor,⁵ a pile of critical size was finally constructed. It worked. A self-sustaining nuclear chain reaction was a reality

Years of Preliminary Research

Years of scientific effort and study lay behind this demonstration of the first self-sustaining nuclear chain reaction. The story goes back at least to the fall of 1938 when two German scientists, Otto Hahn and Fritz Strassman, working at the Kaiser Wilhelm Institute in Berlin, found barium in the residue material from an experiment in which they had bombarded uranium with neutrons from a radium-beryllium source. This discovery caused tremendous excitement in the laboratory because of the difference in atomic mass between the barium and the uranium. Previously, in residue material from similar experiments, elements other than uranium had been found, but they differed from the uranium by only one or two units of mass. The barium differed by approximately 98 units of mass. The question was, where did this element come from? It appeared that the uranium atom when bombarded by a neutron had split into two different elements, each of approximately half the mass of the uranium.

Before publishing their work in the German scientific journal *Die Naturwissenschaften*, Hahn and Strassman communicated with Lise Meitner

⁵The Japanese attacked the American naval base at Pearl Harbor, Hawaiian Islands, December 7, 1941; this attack brought the United States into World War II.