Long before the complex pressure-temperature phase diagram of plutonium (shown below) was determined, Cyril Stanley Smith's suggestion that adding small amounts of some impurity atoms to liquid plutonium might retard its undesirable transformation to the brittle alpha phase enabled the fabrication of the world's first nuclear device tested successfully in New Mexico on July 16, 1945.

A Top Secret Project Changes the World

The horrific destruction in Hiroshima and Nagasaki in August 1945 demonstrated the awesome power of nuclear weapons. At the Trinity Test site in New Mexico, where the world's first nuclear charge was exploded, the director of the Manhattan...
Project, J Robert Oppenheimer, uttered the following poignant words: “We waited until the blast had passed, walked out of the shelter and then it was extremely solemn. We knew the world would not be the same. A few people laughed, a few people cried. Most people were silent. I remembered the line from the Hindu scripture, the Bhagavad Gita: Vishnu is trying to persuade prince Arjuna that he should do his duty and to impress him he takes on his multi-armed form and says, “Now I am become Death, the destroyer of worlds”. I suppose we all thought that, one way or another.” These words are particularly relevant today as we try to prevent the proliferation of nuclear weapons and the nexus of nuclear weapons and terrorism.

Nuclear weapons were first developed during World War II in the United States under a top-secret program called the Manhattan Project. These weapons were developed because of the fear that Nazi Germany was developing such weapons, but after Germany’s surrender, they were used to end the war with Japan. University of California, Berkeley physicist J Robert Oppenheimer directed this project under the supervision of General Leslie Groves of the US Army Corps of Engineers. Many distinguished scientists from the United Kingdom, Canada, and refugees from fascist regimes in Europe assisted the Project. Table 1 summarizes some landmark events surrounding this project and Figure 1 shows some of its leaders.

The development of nuclear weapons, however, was not the only achievement of Oppenheimer and the Manhattan Project. At the peak of World War II, the mountains of Northern New Mexico saw a gathering of minds the likes of which the world had not

**Figure 1.** A few of the leaders of the Manhattan Project. From left: First director of Los Alamos National Laboratory, Robert Oppenheimer. Cyril Stanley Smith was in charge of metallurgy. He suggested adding impurity atoms to stabilize the δ-phase of plutonium. Seth Neddermeyer started the implosion program. Hans Bethe led the theorists in predicting critical masses and explosive yields. George Kistiakowsky developed the explosive lenses that enabled implosion.