

Before the Fallout: From Marie Curie to Hiroshima

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Before the Fallout is a historical narrative covering atomic physics from the discovery of radium by Marie Curie to the development of the atomic bomb and its ultimate use at Hiroshima. The book chronicles these fascinating discoveries with a cleverly written narrative blending history, science, and often-amusing anecdotes. Although this book is written for the layperson, nuclear medicine physicians, radiologists, and physicists will find it captivating and yet technical enough for understanding the radiologic sciences that developed from these early discoveries.

The book begins with a quotation from the illustrious physicist Richard Feynman: "Our imagination is stretched to the utmost, not, as in fiction, to image things which are not really there, but just to comprehend those things which are there." Feynman encapsulates the spirit of the book, which portrays the advancement of nuclear science as the work of creative and imaginative minds. However, the book never shirks from reminding us, as well, of the terrible dangers that this discovery brought about.

After the quotation, the book opens with a prologue: During Japan's festival of light, a young mother, Futaba Kitayama, looks up to see an airplane as pretty as a silver treasure flying east to west. A parachute drops, floats, then explodes into an indescribable light. "Little Boy" detonated with an explosive force of 15,000 tons of TNT over Hiroshima, Japan. The theme of daily life in Hiroshima continues throughout the book. At different historical points in the book, the author skillfully returns to the Japanese city to describe the municipal, historical, and cultural developments of this port city.

In the chapter on Marie Curie, we learn of the great obstacles and hardships she overcame during her life, the most important of which were her struggles with being a woman in a male scientific environment. We learn not just of her relentless hard work but of her scandalous affair with a married man, Physicist Paul Langevin, which ultimately led for many to the questioning of her credibility as a scientist.

The author colorfully describes the work and personal lives of Ernest Rutherford, Joseph John Thompson, Albert Einstein, and James Chadwick, among other great scientists in nuclear physics. During the First World War, work on atomic physics halted while the scientific minds of Europe turned to war-related inventions such as chemical weapons,

antisubmarine tactics, and x-ray equipment. We see during the Great War how the traditional rules of warfare deteriorated, leading to the bombing of innocent civilians.

In describing the interval between the wars, the book covers the signs that radioactive material was dangerous. French radiologists and researchers died of leukemia and severe anemia. Gruesome photographs were published showing amputations and dreadful suffering. Painters of luminous watch dials were reported to experience radium necrosis. The casual handling of radioactive materials produced devastating effects. Even Marie Curie's home cookbooks, discovered 50 y after her death, had high radiation levels.

As the Second World War approached, the close group of atomic physicists found their Jewish compatriots fleeing from Hitler's control of Germany. The Nazi threat to science was well manifested. Slowly, the urge to discover nature's deepest secrets turned into fear once nuclear fission became theoretically possible and the war in Europe became imminent. The book follows the efforts of Leo Szilard, who tried to alert the scientific community not to publish papers on nuclear chain reactions, only to have Joliot-Curie's team at the Collège de France submit a paper to the British journal *Nature* that started the German race for the atomic bomb.

The last and main part of the book traces efforts in Great Britain and later the United States to develop the first atomic bomb. The book focuses on how Robert Oppenheimer, a purely theoretic physicist with no experience in directing any operation, undertook the enormous task of overseeing the American construction of the bomb. At the same time, other attempts were made—including a British commando raid of a heavy water plant in occupied Norway—to stall the progress of the work of German physicists.

Overall, I found this book easy to read, fast moving, and well written. *Before the Fallout* offers anyone in the field of nuclear medicine or radiology a valuable perspective on the development of radiation. When I was in residency training, I would have loved to have this book to read during my free time.

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