

Dr. Richard Feynman

Richard Feynman was born on May 11, 1918 in New York, NY. He grew up in Far Rockaway where is his father, Melville, who harbored an interest in science, helped inspire him with trips to museums, nature walks, the purchase of an Encyclopedia Britannica, and more.

Feynman raced through New York City's public schools, teaching himself algebra and soon calculus, even inventing his own idiosyncratic notation to streamline his calculations. He entered the Massachusetts Institute of Technology (MIT) in 1935 to begin his undergraduate studies. By his sophomore year Feynman was already enrolling in graduate-level courses in theoretical physics. He soon fell in with an equally precocious friend and study partner, Theodore (Ted) Welton. Together, Feynman and Welton dived into quantum mechanics, physicists' bizarre yet successful description of the atomic domain, and general relativity, Albert Einstein's notoriously difficult theory of gravitation.

From MIT, Feynman went to Princeton University to pursue his PhD, starting in 1939. Immediately Feynman impressed his young mentor, John Archibald Wheeler, who had arrived at Princeton himself, as an assistant professor, only the previous year. Together with Wheeler, Feynman produced groundbreaking work in the exploration of the ins and outs of electrodynamics. Feynman completed his PhD in 1942 and immediately married his high school sweetheart, Arline Green-baum, who suffered from tuberculosis.

War was clearly on the horizon as Feynman finished his undergraduate studies in 1939; just three months after he graduated from MIT, Germany invaded Poland and World War II broke out in Europe.

For years, a small, secret group of scientists in the United States had been studying whether it might be feasible to create a weapon using nuclear fission, the process by which large atomic nuclei can be split apart, releasing large amounts of energy. Immediately after Pearl Harbor, this sleepy commission was transformed into what would become the largest scientific and technical project the world had ever seen: the Manhattan Project. A young physics professor at Princeton, Robert Wilson, was among the earliest recruits for the top-secret project. He, in turn, convinced many members of the department—graduate students and faculty alike including Feynman—to join him in the effort to design and build nuclear bombs.

Feynman arrived at one of the Manhattan Project's site, Los Alamos, early in 1943 while the laboratory was still under construction. He joined the theoretical physics division, or T-division, led by Hans Bethe. Feynman's job now was to figure out some way to calculate how neutrons would behave in various bomb configurations. He quickly impressed both the lab's scientific director, theoretical physicist J. Robert Oppenheimer, and the T-division leader, Bethe. By early 1944 Feynman had been promoted to be a group leader within T-division, making him the youngest group leader in all of Los Alamos.

As the war was ending and Allied victory looked more and more secure, physics departments across the country began jockeying to hire Feynman. In the end, he turned down several attractive offers and followed his wartime boss, Bethe, back to Bethe's home department at Cornell University.

Over the next few decades, Feynman revolutionized nearly every branch of theoretical physics, from QED to nuclear and particle physics, solid-state theory, and even gravitation. He won the 1965 Nobel Prize in Physics for this work (sharing the award with Julian Schwinger and Shin'ichiro Tomonaga). Of all

of Feynman's many contributions, his diagrams have remained his greatest scientific legacy, changing the way most physicists think about the micro world.

Feynman moved to Caltech in 1950 and remained there for the rest of his career. Two years after he moved, he married Mary Louise Bell, whom he had first met at Cornell. They divorced in 1956 and in 1960 Feynman married Gweneth Howarth, remaining with her until his death.

Throughout his career, Feynman was a tremendously popular lecturer. Famously animated, he often acted out how electrons, photons, or protons would behave. During the late 1950s he was invited to teach Caltech's large introductory physics course. With the aid of two Caltech colleagues, who transcribed his lectures for publication, *The Feynman Lectures on Physics* (3 vols., 1963–1965) became one of the most renowned physics textbooks of all time. In later years, Feynman frequently gave informal lectures at nearby industrial laboratories, such as Hughes Aircraft. He also offered a popular class titled "Physics X," open to anyone with questions about science.

Soon after *The Feynman Lectures*, Feynman began to publish a series of successful textbooks and popular books. *The Character of Physical Law* (1965), *Quantum Mechanics and Path Integrals*, with Albert R. Hibbs (1965), *Photon-Hadron Interactions* (1972), *QED: The Strange Theory of Light and Matter* (1985), *Surely You're Joking, Mr. Feynman!* (1985) and *What Do YOU Care What Other People Think?* (1988).

Even as his fame grew, Feynman continued to shun the kinds of worldly, political affairs in which so many of his colleagues engaged. While many of his fellow Los Alamos veterans joined the Federation of Atomic Scientists (later renamed Federation of American Scientists) soon after the war, or the Union of Concerned Scientists twenty-five years later Feynman famously avoided such groups. Ironically, Feynman's fame was capped by just such a position of responsibility. In January 1986 the space shuttle Challenger disaster occurred and President Ronald Reagan convened a blue-ribbon panel to investigate the disaster, which Feynman reluctantly agreed to join.

Frustrated by what he considered the bureaucratic red tape and political niceties that he thought would stymie the commission, Feynman grabbed the spotlight during televised hearings in February 1986. He had been tipped off by an insider that the accident might have stemmed from the effects of cold weather on some O-rings (rubber seals inside the shuttle's solid-rocket boosters). Waiting for just the right moment when the television cameras were focusing on him, Feynman dipped a piece of O-ring in a glass of ice water and demonstrated how quickly it lost its elasticity. Feynman's dramatic demonstration fixed him in much of the public's mind as just the kind of straight-talking, iconoclastic character whom he had described in his autobiographical sketches.

His contribution to the Challenger investigation proved to be his last major work. Two years later he died from kidney failure on February 15, 1988, a complication arising from his long battle with cancer. He was survived by his wife, Gweneth, and their two children, Carl and Michelle.