Richard P. Feynman

By Nyssa Hartman

May 11th, 1918, Richard Feynman entered the world in New York City, NY. He attended the Massachusetts Institute of Technology, achieving his Bachelor of Science degree in 1939. Feynman then progressed to Princeton University to receive his Ph. D in 1942. He taught at both Cornell University and the California Institute of Technology. As a teacher, he disapproved of many techniques used to teach students, going as far to say: "When it came time for me to give my talk on the subject, I started off by drawing an outline of the cat and began to name the various muscles.

The other students in the class interrupt me: "We [know] all that!"

"Oh," I say, "you [do]? Then no [wonder] I can catch up with you so fast after you've had four years of biology." They had wasted all their time memorizing stuff like that, when it could be looked up in fifteen minutes." He took part in the Manhattan project, and met many famous physicists that would later influence him. Feynman was a comedic and humble man; his lectures and speeches often included jokes and simple explanations. Feynman avoided all self-important ideas, and instead believed that scientists should not be so proud. He married his first wife Arlene Greenbaum in 1942 that died in 1945 of an incurable illness. Feynman fell into a depression, a repeated occurrence that would riddle his life. He married Mary Louise Bell in 1952. Their marriage ended in a divorce and no children. In 1960, he married his third and final wife, Gweneth Howarth. They had one son, Carl Richard on April 22nd, 1961. They later adopted a daughter, Michelle Catharine, born on August 13th, 1968.

For his work in Physics, Richard P. Feynman received a variety of awards and recognition, including the Nobel Prize of 1965. In 1954 he received the Albert Einstein Award

at Princeton, followed by the Einstein Award from the Albert Einstein Award College of Medicine. In 1962, he was given the Lawrence award as well In 1988, the brilliant mind of Richard Feynman was lost to the world, but his ideas and research remained to influence the world. He was diagnosed with two rare forms of cancer, and passed following a surgery. His final words were "I'd hate to die twice. It's so boring".

Richard P. Feynman received the Nobel Prize of 1965 along with two other men, Sin-Itiro Tomonaga and Julian Schwinger. The prize was awarded for the work on quantum electrodynamics he contributed. Feynman presented two vital pieces to the understanding of quantum electrodynamics: path-integral formulation and the Feynman diagrams. Path-integral formulation presented a way to understand a sum for all possible paths of an electron. Unlike a single path, the path-integral formulation considered all possibilities of the ever-moving electron. Feynman diagrams were a picture showing the mathematical expressions for how subatomic particles behaved. The diagrams created a device to conceptualize and calculate interactions between subatomic particles. Feynman created a model of the behavior of all things, and allowed for the understanding of how subatomic particles behave and interact.

One of the main events shaping Feynman as a physicist and as a person was his participation in the Manhattan project. Feynman started as a junior physicist, but his brilliance was recognized and he became a team leader and one of the major physicists in the Manhattan project. The Manhattan project focused on the construction of the Atomic bomb. The United States collected the top physicists available in a race to beat Nazi Germany from constructing the bomb first. During his tenure with the project Feynman was sought out by important physicist Niels Bohr, one of the fathers of atomic theory and quantum mechanics, even considering the fact that Feynman was a junior physicist at the time. Even from the beginning of the project,

Feynman had misgivings, but felt that it was better for the United States to possess the bomb over Nazi Germany. He feared its use would mean the end of the world. After the bomb was dropped on Hiroshima, Feynman entered a temporary depression. The guilt of his work causing the deaths of so many was crippling. In order to distract himself, Feynman focused on complex physics problems. One such problem was involving a twirling, swaying dish. The equations which he developed off the dish became the root of the quantum electrodynamics for which he won the Nobel Prize.

Feynman's focus on Quantum electrodynamics actually, began when he was still an undergraduate student at the Massachusetts Institute of Technology. Feynman started an obsession with the quantum theory of electricity and magnetism, and the holes it contained. He began to try to explain the holes and issues with the theory even that early on in his studies. This obsession with electrodynamics took the backseat to it. Although his focus on Quantum electrodynamics started at MIT, his real research on this specific subject started when he was a graduate student at Princeton. Feynman was a research assistant for a period while attending, giving him access to the material and minds that could start him on his way. He continued studying and toying with the ideas of quantum electrodynamics while he taught as the Professor of Theoretical Physics at Cornell University from 1945 to 1950. His most significant work took place while he taught at the California Institute of Technology.

His work was first published in 1948 in his first paper on the subject of quantum electrodynamics. A series of scientific papers followed; a couple in 1949, one in 1952, and another in 1961. When Feynman received the Nobel Prize in Physics in 1965, his acceptance speech was filled with short quips and small jokes as well as the process of his discovery and work. Feynman published a book on his work in 1968, three years after receiving his award.

Feynman was well-known for doing all his work in his head. He was the type of student math teachers despise, the one that had no need to show his work on paper. Feynman came up with his research purely through mathematical equations. Layers upon layers of equations that explained specific principles and actions began to build up, until he presented a way to sum all of the activity in a single, simple(to Feynman) equation. He then devised a diagram off of it, making understanding the complex equation(s) easier. As Albert Einstein once said, "If you can't explain it simply, you don't understand it well enough." An example of the brilliance of Feynman's ability to address a problem in a simple and understandable manner. After the Challenger exploded in 1986, President Reagan appointed him to investigate what caused the explosion. He explained the cause in a television presentation by conducting an experiment using a glass of ice water and a piece of the failed O ring.

Feynamn addressed many of the holes in the quantum theory of electricity and magnetism. He provided a simple way to understand how subatomic particles behave and interact, giving understanding to the basis of all matter. Feynman equation and diagram not only explained the known science of his time, but also proved relevant and accurate when involving future discoveries, even leading to some directly.

Works Cited

Beaty, Bill. "Dr. Richard P. Feynman." *eskimo.com*. N.p., 2005. Web. <http://www.eskimo.com/~billb/feynman.html>.

Bhatt, Bhuvanesh, and Leonardo Motta. "Feynman Diagram." *scienceworld.wolfram.com*. Eric W. Weisstein, 2007. Web. <http://scienceworld.wolfram.com/physics/FeynmanDiagram.html>.

Feynman, Richard. *Surely You're Joking, Mr. Feynman! Adventures of a Curious Character Quotes* . W.W. Norton, 1985. Print

"Richard P. Feynman - Biography". Nobelprize.org. N.d. Web. <http://www.nobelprize.org/nobel_prizes/physics/laureates/1965/feynman-bio.html>

“Richard P. Feynman - Nobel Lecture". Nobelprize.org. N.d. Web. <http://www.nobelprize.org/nobel_prizes/physics/laureates/1965/feynman-lecture.html>