Fred Whipple: Famed Astronomer with a Childlike Wonder

Famed astronomer Fred Whipple's lifetime truly encompassed the 20th century. He was born in 1906 and died in 2004. He continued to work as an astronomer well into his 90s, and maintained a childlike wonder throughout his lifetime.

Whipple didn't start out with ambitions of being an astronomer. He was born November 5, 1906, in Iowa. His parents, Harry and Celestia, were farmers. When he was a teenager, his family moved to Long Beach, California, where his father's occupation changed from that of a farmer to that of a grocer.

As a young man, Whipple dreamed of a career in tennis, but a childhood case of polio ultimately made this dream impossible. Instead, he studied at Occidental College in Los Angeles, and then transferred to UCLA in 1924. It was there that he discovered his love of astronomy.

While at UCLA, Whipple took a course in astronomy from famed astronomer Frederick C. Leonard, who ultimately went on to head the Meteorological Society. The science of the universe and its contents proved fascinating for Whipple. He had begun college as a math major, in part because it gave him time to pursue his dream of becoming a tennis champion. However, it quickly became clear that he was going to have to give up this dream. He began to focus more and more on astronomy, although he did complete a mathematics degree in 1927. Ultimately, Leonard helped him secure a fellowship in astronomy, and Whipple began to teach astronomy at the University of California, Berkeley.

While at Berkeley, Whipple helped compute celestial bodies' orbits, such as planets, comets, and meteors. In fact, he helped calculate the newly discovered Pluto's orbit as well. He graduated with his doctorate in astronomy in 1931, and then headed Harvard's College Observatory. He stayed there for more than 70 years.

Upon arriving at Harvard, Whipple was most interested in studying galaxies, but that was a job that his then boss claimed for himself. Whipple decided to focus on comets, which became his ultimate pursuit. Over the course of a decade he examined "sky patrol" photographs that were taken regularly at the observatory. During this time, he discovered and computed the orbits of six new comets. He also began to study comets' behaviors. He photographed them as they moved in their orbits, which he determined to be egg-shaped. During World War II, Whipple worked in the Office of Scientific Research and Development at the Harvard Radio Research Laboratory. He was there from 1942 until 1945. He contributed to the war by developing radar countermeasures. He was among the inventors who helped develop a device, razor-sharp, that cut aluminum foil into tiny slices called "chaff." American bombers dropped this chaff as they approached enemy territory, so that enemies' radar readings would be muddled. The tiny aluminum pieces made it appear as though there were many more bombers in the sky than there really were. In 1948, Whipple earned a Presidential Certificate of Merit for his contribution to this invention.

After World War II's completion, Whipple returned to the Harvard Observatory and continued to study comets. He was among those who believe that spaceflight was just about to be developed. In 1946, he invented something called a "meteor bumper", which would be used to protect spacecraft and satellites when hit with space debris. This is known as the "Whipple Shield," and is made up of 10 layers of metal surrounding the spacecraft's body, some of these only a few inches away from the surface. The bumper absorbs impact from objects that hit the craft. This device is still being used on almost every spacecraft put into orbit, with few modifications. Whipple thought of himself as both an inventor and an astronomer. He once said, "I'm an engineer at heart."

As he continued to study comets, he surmised that at their core, they were comprised of ice. Most scientists at the time thought that comets were dusty orbiting clouds of sand, rock, and vapor. They thought of comets as "floating sandbags" that were loosely held together by gravity, but that didn't have solid cores of their own. A small number of scientists believed that comets were rocks that had been thrown out by volcanoes on Jupiter and Saturn. However, they didn't really know what to make of comets' tails. It didn't seem possible that a comet could continually emit material to make up its tail without slowly disappearing over time. Whipple theorized instead that comets were really balls of rock, dust and gas, but that they had an icy nucleus. This so-called "dirty snowball" theory was first published in March of 1950 in the Astrophysical Journal. However, it remained controversial.

As he continued his studies, Whipple found that comets did not act like other solar system bodies. They didn't follow simple Newtonian mechanics as other bodies did. They

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couldn't be predicted. Some comets came to Earth earlier than predicted, while others came later. Whipple thought because of this that comets were probably affected by something other than gravity, and that they were large dust and ice masses that vaporized as they approached the sun, and re-froze as they went away from it. The theory was that when a comet approached the sun, it began to evaporate and release its frozen water, which produced a vaporous tail. This also propelled the comet forward and independently altered its orbit. This continued to be debated until 1986, when the spacecraft Giotto, of the European Space Agency, got near enough to Halley's Comet to snap a picture and prove once and for all that it had an icy core.

Whipple's theory has been thought to be one of the most important contributions to solar system studies in the 20th century. Whipple's colleagues thought it amazing that he had made the leap to this discovery mostly based on intuition, but without much data. One astrophysicist remarked that he simply had "uncommon sense and looked at things with a fresh eye," unlike other physicists.

Whipple was a full Harvard professor of astronomy by 1950 and was director of the Smithsonian Astrophysical Observatory by 1955, when it moved to Cambridge, Massachusetts from Washington, DC. He was in that position until 1973. While at Harvard, he wrote many books and papers and inspired many future scientists, including the lauded astronomer Carl Sagan. His 1941 book, *Earth, Moon and Planets*, also helped explain the solar system in layman's terms.

He was one of the first to see how important satellites were going to be in the future. In the late 1950s, he set up a satellite tracking program called Moonwatch. Several stations around the world also participated, as did a global network of amateur astronomers. When Sputnik was launched in 1957 (the world's first artificial satellite), Moonwatch was able to track its progress around the globe. Almost all information about Sputnik that went to the media, and therefore to the public, came from Moonwatch. Whipple received the Distinguished Federal Civilian Service Award in 1963 from President Kennedy for this work. It remained the award he was proudest of.

Whipple continued to work until he was well into his 90s, although he officially retired in 1977. As professor emeritus, he continued to visit his Cambridge, Massachusetts office daily. Until he turned 90, he rode his bike the three miles to his office almost every day. He continued his work at the observatory almost to the end of his life. Appropriately, his easily recognized car bore the vanity license plate, "COMET." He passed away in Cambridge, Massachusetts, at the age of 97.