2011-2012 School year

5th 6 weeks

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PIB Physics 1

28 November 2011

Wolfgang Pauli

On April 25th 1900, Wolfgang Pauli was born to Wolfgang Pauli Sr. and Bertha Schütz. From the beginning, education and science were prominent pieces of Wolfgang's life; with Wolfgang Sr. being a chemist and Bertha being a writer. Pauli's childhood was always surrounded by intellectual stimulation. For the duration of Pauli's pre-secondary education, he was educated in Vienna (nobelprize). It was in primary school where Pauli began an intense study of science and mathematics. After finishing high school in Vienna, Pauli attended Ludwig-Maximilians University in Munich, Germany. In 1920, Pauli wrote his first paper on quantum physics. Later, in 1921, Pauli received his PhD for his thesis on the quantum theory of ionized molecular hydrogen. From here, Pauli's career as a scientist took. Soon after getting his PhD, Pauli wrote a paper on relativity which garnered praise. Soon after, he became the assistant to Niels Bohr. Years later, as Austria was annexed into Germany in the days preceding World War II, Pauli found himself in a situation where he wasn't sure what to do. As tensions in Europe were building, Pauli moved to the United States and worked various positions at different research institutions. Around the breakout of World War II,

Pauli was offered a position at Princeton University and promptly took the position (biography).

In the 1940's, science was making great strides in all areas. Project Manhattan was underway, leading to the creation of the atomic bomb, fission of heavy nuclei was discovered, and penicillin was discovered, to say the least. Quantum mechanics, on the other hand, had basically been formed in the previous century. It is agreed by many that quantum mechanics began with Gustav Kirchhoff's proving of a theory revolving around black-body radiation in 1859. He proved that blackbodies absorb energy and thus appears black to observers. Over the next decades, with large revelations continuing to be made, with Max Planck's first quantum theory in 1900, followed by Einstein with his photoelectric effect, and in 1926 Plank's law was largely completed. At this point in time, science was undergoing numerous discoveries as always, and quantum physics was flourishing. Soon, Pauli's name would be seen up there as another fundamental piece to quantum physics.

Today, Pauli is best known for the Pauli Exclusion Principle. The road to his principle began in 1924. In 1924, Pauli hypothesized that a quantum number is necessary to specify electron energy states. Now, Pauli was attempting to understand the correlation between electrons and stability of an atom. It had already been evident that certain atomic numbers lead to more stable atoms. His efforts at success were furthered when he read a paper which stated the number of energy levels present in alkali metals. He realized at this point that atomic orbital's can describe two electrons at most. He also introduced electron spin to describe electrons. Spin described the direction of an electron within a state. Spin has only two directions, clockwise or counterclockwise. From spin, the electron magnetic dipole moment of an atom can be understood as well. All such research was conducted in Vienna,

Austria, where Pauli lived for much of his life. The time from Pauli's first proposal to his discovery was roughly a year. Before discovering the Principle, Pauli was attempting to understand why the number of electrons in an atom signified the stability of the atom. Although Pauli discovered the Principle in 1925, it wasn't until much later that he received significant praise.

In 1945, Albert Einstein, best known as a figure fundamental to physics as we know it, nominated Wolfgang Pauli for the Nobel Prize in physics. His nomination was for Pauli's fundamental Pauli Exclusion Principle. Obviously, Pauli was the recipient for the 1945 Nobel Prize in Physics. The prize recognized the importance of the Pauli Exclusion Principle. The idea that no two electrons can occupy the same quantum state completely revolutionized the idea of the atom. This Principle proved crucial to the periodic table of elements we see today. Through the Pauli Exclusion Principle, atoms were able to be understood much better. Due to the Exclusion Principle, we understand today electron shells. Before the Pauli Exclusion Principle, it wasn't fundamentally understood as to why there are an equal number of electrons and protons found in an atom. It is the Pauli Exclusion Principle which makes distinguishing elements so much easier (halexandria). The Principle explains how two electrons can exist in the same energy level, but must have a different spin. The Principle also states when an electron is to enter an ion, it knows which quantum state and energy level to enter. At the time, this could be seen as groundbreaking as it implied that elements had some level of consciousnesses. Before this, it could not be believed that electrons and atoms were forming such ions purposely. Electrons always avoid entering a wrong orbital due to their symmetry requirement. All these facts of the Pauli Exclusion Principle changed the periodic

table fundamentally and how we view elements. There are, however, many other ways in which the Exclusion Principle was revolutionary.

As mentioned previously, the Pauli Exclusion Principle was revolutionary in many ways. The Pauli Exclusion Principle help put Wolfgang Pauli on the quantum physics map. In quantum mechanics, there is no distinguishing between all the particles being dealt with. This property, known as indistinguishability, has been improved through the Pauli Principle (Oberlin). It is through the Pauli Exclusion Principle that we can explain many points of interest in quantum mechanics. The principle proves important in quantum physics as it not only applies to electrons, but most particles from which an atom is made; this includes neutrons and protons. In fact, the Pauli Exclusion Principle applies to all fermions, which also includes neutrinos and quarks. The fact that the Pauli Exclusion Principle helps to describe all fermions, which is one of the main subjects of quantum mechanics, makes the Pauli Exclusion Principle fundamental to quantum mechanics.

In conclusion, Wolfgang Pauli was the recipient of the 1945 Nobel Prize in Physics award. Pauli was attempting to research connection between amount of electrons and stability of an atom. Through this, Pauli came up with the Pauli Exclusion Principle. It was for the Pauli Exclusion Principle for which he won the Nobel Prize and changed the periodic table and quantum physics as a whole. Today, the science we study has been impacted greatly by Wolfgang Pauli. Wolfgang Pauli will forever be remembered as a great when it comes to quantum physics.

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