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# Nobel Prize Winning Physicist: Wilhelm Wien

BIO:

Wilhelm Wien, perhaps the man with the longest given name of all time- Wilhelm Carl Werner Otto Fritz Franz Wien, was born on January 13, 1864 in Gaffken, in the Fischhausen district, East Prussia (in present day Parusnoye, Russia). He was born to Carl Wien, patriarch of a wealthy landowning family. Originally planning to inherit the land that belonged to his father, economic hardship led to the leaving and selling of this land. The Wien family then moved to the Drachstein region of East Prussia in 1866. Through the year 1879 he attended school in Rastenberg for that period of time. After that he attended the City University at Heidelberg from 1880 until 1882. From there he continued his higher education by attending the University at Göttingen studying subjects of mathematics and the natural sciences. During this same year he also attended the University of Berlin and immediately after he worked in the laboratory of Hermann Von Helmholtz.

In 1886 he received a doctorate after writing a thesis on his experimentation on the diffraction of light off of metals and the metals affect on the color of the refracted lights. In the year 1893 he discovered a law that had a correlation between the length of wavelengths and temperature which later became the law of displacement. In 1894 he took the terms of entropy and temperature and used them to find what was later known as the black body, which is the ideal body that absorbs all the present radiation in a specific location. In 1896 he published a formula bearing his name, which stated the formula for

deriving the composition of the radiation of present on a black body. Wien discovered the proton in 1898, and studied beams of positive ions, electron beams from cathode ray tubes, and also x-rays. From 1896 until 1899 he lectured at University of Aachen. In 1900 he moved to the University of Würzburg and received the title of Professor of Physics. During this same year he wrote a text on the properties of Hydrodynamics, called *Lehrbuch der Hydrodynamik.* In 1902 and 1906 he was given the opportunity to succeed other Professors as the head of physics for both the University of Leipzig and the University of Berlin. However he turned both of these job opportunities down. In 1898 he married Luise Mehler of Aix-la-Chapelle and they had four children together.

Later on it was shown that the formula of Wien did not qualify for all forms of radiation and only worked for short waves. Even though it didn't work completely it led the way for a more complete solution to being found out by Maxwell Planck who made strides for thermal equilibrium equations and gave birth to the genesis of modern quantum physics. Because of this great discovery based off of information that Wilhelm Wien himself had discovered, he was honored with the Nobel Prize in Physics in 1911. These works helped lead to knew ways of illumination and also allowed for the measurement of objects at extremely high temperatures.

After a long career as an acclaimed physicist Wien died in Munich on August 30, 1928. Because of his works in the field of Physics throughout his lifetime, Wien is considered to be one of the integral physicists that helped to transition from Newtonian Physics to Quantum Physics.

REASON:

In 1911 Wilhelm Wien was awarded the Nobel Prize in Physics for his work conducted on Heat Radiation. This process, also known as thermal radiation or radiant heat, is electromagnetic radiation generated in objects due to the introduction of high thermal or kinetic energy to the charged particles of the mass. All matter, which is at a state above that of absolute zero, emits thermal radiation. A layman's example of thermal radiation is with a bonfire. Even though the fire is not within direct contact with the person, meaning conduction is not taking place, there is still transfer of heat energy through radiation.

From this Wien created the law which was named after him, Wien's Displacement Law. This states that "the wavelength distribution of thermal radiation from a black body at any temperature has essentially the same shape as the distribution at any other temperature, except that each wavelength is displaced on the graph". This means that there is an inverse relation between the wavelength and the temperature of the body. Wien considered adiabatic expansion of a cavity containing waves of light in thermal equilibrium. He concluded that under slow expansion or contraction, the energy of light reflecting off the walls is directly related to the frequency. He also stated that a thermal equilibrium state, when expanded very slowly, will remain in thermal equilibrium. This is basically describing what is now known for adiabatic expansion, that while no heat is transferred in or out of the system it can expand at a constant rate if done slowly. These findings laid down some of the groundwork for the laws of thermodynamics that are well known today.

The work that Wien conducted this during was while he was still the Professor of Physics at University of Würzburg. There were no extenuating factors that played into the discovery of this property, nor any geopolitical interference or relevance at this time. At the turn of the century Germany/Prussia was under the control of Kaiser Wilhelm II and the Imperial Navy was undergoing the process of building up its power. The First World War started three years after he was awarded the Nobel Prize. In 1911, the year he was awarded the prize, the first strategic bombing took place over Tripoli. During the Italo-Turkish war, two Italian pilots in a bi-plane dropped thirty 1-pound bombs over the side by hand over Turkish troops while on a reconnaissance run. There were no historically important events taking place that affected his research on this data.