= Arthur Compton =

Arthur Holly Compton (September 10 , 1892 ? March 15 , 1962) was an American physicist who won the Nobel Prize in Physics in 1927 for his discovery of the Compton effect , which demonstrated the particle nature of electromagnetic radiation . It was a sensational discovery at the time : the wave nature of light had been well @-@ demonstrated , but the idea that light had both wave and particle properties was not easily accepted . He is also known for his leadership of the Manhattan Project 's Metallurgical Laboratory , and served as Chancellor of Washington University in St. Louis from 1945 to 1953 .

In 1919 , Compton was awarded one of the first two National Research Council Fellowships that allowed students to study abroad . He chose to go to Cambridge University 's Cavendish Laboratory in England , where he studied the scattering and absorption of gamma rays . Further research along these lines led to the discovery of the Compton effect . He used X @-@ rays to investigate ferromagnetism , concluding that it was a result of the alignment of electron spins , and studied cosmic rays , discovering that they were made up principally of positively charged particles .

During World War II , Compton was a key figure in the Manhattan Project that developed the first nuclear weapons . His reports were important in launching the project . In 1942 , he became head of the Metallurgical Laboratory , with responsibility for producing nuclear reactors to convert uranium into plutonium , finding ways to separate the plutonium from the uranium and to design an atomic bomb . Compton oversaw Enrico Fermi 's creation of Chicago Pile @-@ 1 , the first nuclear reactor , which went critical on December 2 , 1942 . The Metallurgical Laboratory was also responsible for the design and operation of the X @-@ 10 Graphite Reactor at Oak Ridge , Tennessee . Plutonium began being produced in the Hanford Site reactors in 1945 .

After the war , Compton became Chancellor of Washington University in St. Louis . During his tenure , the university formally desegregated its undergraduate divisions , named its first female full professor , and enrolled a record number of students after wartime veterans returned to the United States .

= = Early life = =

Arthur Compton was born on September 10 , 1892 in Wooster , Ohio , the son of Elias and Otelia Catherine (née Augspurger) Compton , who was named American Mother of the Year in 1939 . They were an academic family . Elias was dean of the University of Wooster (later The College of Wooster) , which Arthur also attended . Arthur 's eldest brother , Karl , who also attended Wooster , earned a PhD in physics from Princeton University in 1912 , and was president of MIT from 1930 to 1948 . His second brother Wilson likewise attended Wooster , earned his PhD in economics from Princeton in 1916 and was president of the State College of Washington , later Washington State University from 1944 to 1951 . All three brothers were members of the Alpha Tau Omega fraternity .

Compton was initially interested in astronomy , and took a photograph of Halley 's Comet in 1910 . Around 1913 , he described an experiment where an examination of the motion of water in a circular tube demonstrated the rotation of the earth . That year , he graduated from Wooster with a Bachelor of Science degree and entered Princeton , where he received his Master of Arts degree in 1914 . Compton then studied for his PhD in physics under the supervision of Hereward L. Cooke , writing his dissertation on " The intensity of X @-@ ray reflection , and the distribution of the electrons in atoms " .

When Arthur Compton earned his PhD in 1916 , he , Karl and Wilson became the first group of three brothers to earn PhDs from Princeton . Later , they would become the first such trio to simultaneously head American colleges . Their sister Mary married a missionary , C. Herbert Rice , who became the principal of Forman Christian College in Lahore . In June 1916 , Compton married Betty Charity McCloskey , a Wooster classmate and fellow graduate . They had two sons , Arthur Alan and John Joseph Compton .

Compton spent a year as a physics instructor at the University of Minnesota in 1916 ? 17 , then two years as a research engineer with the Westinghouse Lamp Company in Pittsburgh , where he

worked on the development of the sodium @-@ vapor lamp . During World War I he developed aircraft instrumentation for the Signal Corps .

In 1919 , Compton was awarded one of the first two National Research Council Fellowships that allowed students to study abroad . He chose to go to Cambridge University 's Cavendish Laboratory in England . Working with George Paget Thomson , the son of J. J. Thomson , Compton studied the scattering and absorption of gamma rays . He observed that the scattered rays were more easily absorbed than the original source . Compton was greatly impressed by the Cavendish scientists , especially Ernest Rutherford , Charles Galton Darwin and Arthur Eddington , and he ultimately named his second son after J. J. Thomson .

For a time Compton was a deacon at a Baptist church . " Science can have no quarrel " , he said , " with a religion which postulates a God to whom men are as His children . "

= = Physics professor = =

= = = Compton effect = = =

Returning to the United States , Compton was appointed Wayman Crow Professor of Physics , and Head of the Department of Physics at Washington University in St. Louis in 1920 . In 1922 , he found that X @-@ ray quanta scattered by free electrons had longer wavelengths and , in accordance with Planck 's relation , less energy than the incoming X @-@ rays , the surplus energy having been transferred to the electrons . This discovery , known as the " Compton effect " or " Compton scattering " , demonstrated the particle concept of electromagnetic radiation .

In 1923 , Compton published a paper in the Physical Review that explained the X @-@ ray shift by attributing particle @-@ like momentum to photons , something Einstein had invoked for his 1905 Nobel Prize ? winning explanation of the photo @-@ electric effect . First postulated by Max Planck in 1900 , these were conceptualized as elements of light " quantized " by containing a specific amount of energy depending only on the frequency of the light . In his paper , Compton derived the mathematical relationship between the shift in wavelength and the scattering angle of the X @-@ rays by assuming that each scattered X @-@ ray photon interacted with only one electron . His paper concludes by reporting on experiments that verified his derived relation :

<formula>

where

<formula> is the initial wavelength ,

<formula> is the wavelength after scattering ,

<formula> is the Planck constant ,

<formula> is the electron rest mass ,

<formula> is the speed of light , and

<formula> is the scattering angle .