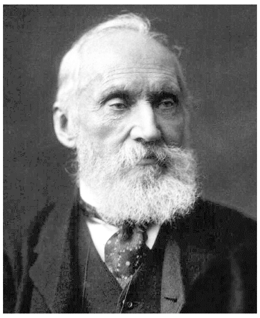
Biography: Sir William Thomson, Baron Kelvin of Largs



It was June 24, 1824 in Belfast, Ireland, where university professor James Thomson and his wife, Margaret had their second son, William. Little did they suspect the many tragedies and triumphs that lay ahead for little William and the world-changing effect that his work in physics and engineering would have. William, later to become Sir William, Baron Kelvin of Largs, achieved a monumental work in his lifetime, publishing 661 scientific papers and achieving 75 patents. He had a key role in the successful laying of the first transatlantic communications cable, he established the absolute (Kelvin) temperature scale, and he contributed significantly to the understanding of thermodynamics. Many things that we take for granted, today in university Physics were begun by Kelvin.

William's family was prone to illness and, tragically, his mother died when he was only six. William's grieving father became especially attached to the young boy and the two became very close. The father home schooled William and his older brother James. When William was nine, his father was offered a job as professor of mathematics at Glasgow University, Scotland and the family dug up its roots and moved in 1883. At that time, William became very ill with a heart ailment, and almost died. Almost miraculously, he recovered and remained relatively healthy for the rest of his life.

While it was traditional at that time to enter university at age 16 – 17, William enrolled at the early age of ten. Inspired by his father, he had very high expectations for himself and for what opportunities a good education could provide him in life. Being highly motivated, William pushed himself to excel above his classmates, winning a medal for his paper, "An Essay on the Figure of the Earth" and began to publish papers at the age of fifteen. However, despite being academically inclined, William was still a regular teenage boy known for his good sense of humor and infectious laughter.

After seven years studying at the University of Glasgow, William Thomson's father encouraged him to continue his education and to get a degree at Cambridge University, where his passion for science, mathematics, and electricity grew. By his father's suggestion, William went to work with a French Physicist and Chemist named Henri Victor Regnault in order to improve his skills in performing experiments. During this time, with Regnault as his mentor, William managed to solve some fundamental problems in electricity, which later led other scientists to important discoveries. It was in Regnault's laboratory that he began to study the science behind the steam engine, which remained an interest to him when he returned to Cambridge after four and a half months in Paris. At the young age of 22, William was elected as Chair of Natural Philosophy at Glasgow University, making his father very proud. His father died of cholera two years after he was elected. In turn, Thomson devoted his life to working at Glasgow, continuing to work there for 53 years.

Another great scientific interest of Thomson's came about after listening to James Prescott Joule read a paper during a meeting of the British Association in 1847. In this paper, Joule discussed the experiments he had performed in his brewery, which dealt with temperature and mechanical work. His work impressed and intrigued Thomson so much that he stood and praised the author, and even joined Joule in his brewery to watch a demonstration of his experiments. This led to a long friendship and collaboration between the two scientists. Despite their admiration of each other's work, the two men often disagreed, especially over the Carnot's theory of heat engines, which was the accepted theory at the time. While Thomson based many of his own papers on the assumption that the Carnot theory was correct, Joule had founded his own conflicting theory. Through letters, Thomson and Joule discussed their experiments and argued about their findings. Over a few years, and many letters, Thomson became more convinced of Joule's theory of heat, and suggested that the true theory might be a combination of Carnot's and Joule's. Despite their disagreements, they corresponded for many years, and together discovered what is known as the Joule-Thomson effect, which describes the change in temperature that accompanies expansion of a gas when there is no work done, or heat transferred. Their findings led to a greater acceptance of Joule's work in the scientific community.

One of the more popular topics in science at the time was studying the relationship between pressure and temperature in a certain volume of gas. Scientists at the time knew that as the temperature of a gas decreases, so does its volume. Since gas, as with any object, must have volume, they knew there must be a point where temperature cannot fall any further. Many scientists made estimations as to what that temperature might be. Thomson made his mark by defining temperature in a way that was independent of whether the item was a gas or liquid, and defined the concept of absolute zero—the temperature at which no heat can be removed from a system.

Thomson's work also played a large part in formalizing the second law of thermodynamics, where he formulated the familiar version:

> *It is impossible to devise an engine which, working in a cycle, shall produce no effect other than the extraction of heat from a reservoir and the performance of an equal amount of mechanical work.*

While similar statements had been made by other scientists, Thomson's explanation would go down in history as a significant stepping stone in what can be considered one of the most significant advancements of that century.

In 1852, Thomson married Margaret Crum, the daughter of a cotton merchant and someone he had known since childhood. Shortly after their wedding, Margaret became very sick and was unable to walk or move from her bed without help. Thomson cared diligently for his wife for the next many years.

Taking a break from the world of academics to care for his sick wife, William Thomson began to work on the Atlantic Cable project. The transatlantic telegraph cable was the first cable used for telegraph communications, and was laid across the floor of the Atlantic Ocean. The cable connected North America and Europe, and expedited communication between the two. Whereas it would normally take at least ten days to deliver a message by ship, it now became a matter of minutes.

Thomson and Dr. Edward Whitehouse both worked on the cable project. The cable was destroyed when Dr. Whitehouse applied too high a voltage through it, and he was later removed from the project. In 1866, Thomson was the scientific director of an expedition to complete the first successful cable, and for this he was knighted. Thomson gained a personal fortune through patents and consulting surrounding the Atlantic Cable.

Unfortunately, his wife Margaret died a few years later after her long illness. Perhaps as a need for distraction, he bought a yacht and took up sailing.

In 1892, Sir William Thomson was given the title of Baron Kelvin of Largs, named after the river Kelvin, which ran by his laboratory at the University of Glasgow.

Kelvin was known through his life as someone modest and well-liked. With no heirs to carry on his name, Lord Kelvin died on December 17, 1907. He was buried in Westminster Abbey, nearby Isaac Newton. In 1968, units of temperature on the absolute degree scale were given the official name of kelvin, and the symbol K.

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Biography: Sir William Thompson, Baron Kelvin of Largs was written by Stephen Klassen, Sarah Dietrich, and Cathrine Froese Klassen, with the support of the European Commission (project 518094-LLP-1-2011-1-GR-COMENIUS-CMP) and the University of Winnipeg, Canada. This publication reflects only the views of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.