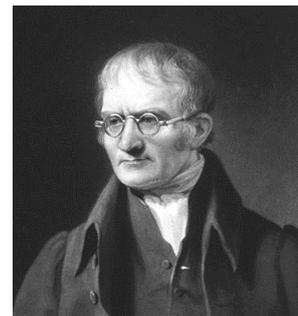


Biography: John Dalton

John Dalton (1766 – 1844) was an English physicist and chemist, a teacher in Manchester and a professor at Oxford University. Dalton was a man of diverse interests, although his greatest achievements were in the field of chemistry. Dalton introduced atomic theory by explaining the law of constancy of chemical composition, and formulating the laws of partial pressures and multiple proportions. He also carried out numerous tests on gas absorption in liquids and thermal expansion of gases, and described the condition known as daltonism. He regularly observed the weather, studied the phenomenon of aurora Polaris and explained what causes the trade winds.



John Dalton was born on September 6, 1766 in Eaglesfield, Cumberland, England. He was born to an impoverished family. His father was a weaver and owned a small piece of land. Despite their poor financial situation, John received a good general education. However, he soon left school and started helping his father.

When John was 12, he started working as a teacher in a local school. He earned his living and provided himself with a quiet, untroubled life. Meteorology was his passion. He constructed barometers and other scientific instruments used in this field. He began to keep a diary where he entered his weather observations. During his life he made more than 200,000 observations and published them as a book in 1793.

Young Dalton was busy teaching at school, helping his father, and studying Latin, Greek, and natural sciences. After two years he moved to Kendal where he began teaching at the school run by his older brother, Jonathan. After twelve years, he travelled to Manchester, where he was appointed as professor at the Warrington Academy. During this time, he devoted every spare moment to conducting physics experiments.

In 1781, he began teaching high school mathematics and in 1793 he became a teacher of mathematics and natural philosophy at the New College in Manchester. There he met Robert Owen, who introduced him to the Manchester Literary and Philosophical Society. Soon Dalton became a secretary and since 1817 was the President of the Society. Over a period of 50 years, Dalton presented 116 of his scientific works. In addition, Dalton created his private laboratory in the building be-

longing to the Manchester Literary and Philosophical Society, where he conducted most of his chemical experiments and weather observations. In 1799, the Society moved out of Manchester, but Dalton remained in the city giving private lessons for two shillings per hour.

Dalton was a Quaker. He wore a traditional grey coat, a white scarf on his neck, knee-breeches, grey hose and boots with buckles. In the company of other people he was tense and often felt uncomfortable. He never succeeded as a lecturer because he lacked charisma. He also never married, claiming that he could not afford to have a wife.

Dalton had a great interest in weather observations and he began doing research on atmospheric composition. He collected air samples from different places on Earth and observed that atmospheric composition is the same regardless of the location. Dalton also proved that the atmosphere is not a chemical compound, but instead is a composition of various gases. He stated that the total pressure exerted by the mixture of gases is equal to the sum of the partial pressures of individual gases. This observation later became known as Dalton's law of partial pressures, or simply Dalton's law.

This prominent scholar was very curious about one particular aspect of gases. John knew that carbon dioxide is quite heavy, oxygen is lighter, nitrogen is even lighter and water vapor is the lightest of the four, being two times lighter than carbon dioxide. Knowing this, Dalton wondered why there was a layer of water vapor above the ground, instead of the layer of carbon dioxide. Dalton tried to imagine the structure of the above mentioned compounds to explain the concept of diffusion.

This was the beginning of his detailed studies, which resulted in the creation of a highly controversial theory. In this theory, Dalton stated that *everything is made of atoms*.

Dalton's atomic theory can be described in four main points:

- 1) All substances are made of atoms.
- 2) Atoms of the same substance are the same and have the same mass; atoms of different substances differ from each other and have different masses.
- 3) A chemical reaction involves connection, dividing and exchanging atoms. In other words, the atom is a basic unit involved in a chemical reaction and cannot be subdivided.
- 4) If two or more compounds made of the same elements exist, the simplest compound of all will contain one atom of every element present there.

Dalton presented this theory to the Royal Institution in 1803. More precise details were included in the general "System of Chemistry," which was later written by the chemist Thomas Thomson.

Dalton conducted an analysis of two molecules of carbon monoxide and found that in one of them the mass of oxygen is two times bigger than the mass of carbon. He suspected that a rule must exist to explain this phenomenon and conducted an analysis using nitrous oxide. This time, he carefully examined three gases, and found that the ratio of the mass of nitrogen in relation to the mass of oxygen was 7:8, in a second compound 7:16, and in a third, 7:4. Based on his analyses he formulated the law of multiple proportions. This law says that if two elements (A and B) form more than one compound, then the ratios of the masses of element B which combine with a fixed mass of A, are small integers.

In 1822, Dalton was elected as a member of the Royal Society and eight years later he was appointed as one of the foreign associates of the French Académie des Sciences. He was highly respected by many scientists in Europe and the King of England granted him a pension which enabled him to retire from delivering lectures at the Academy.

One event in Dalton's life is especially worth mentioning: One day Dalton decided to visit his

mother and gave her a colorful piece of fabric as a gift. He was surprised when his mother said that the fabric was red, because he thought that it was as grey as his coat. He was very concerned about not being able to tell the difference between grey, green, and red. Later, this inability was called daltonism after him, or as we now know it, color blindness.

John Dalton died in Manchester on July 27, 1844. In his memory, Owens College created a scholarship fund. One of the first students who received it was J. J. Thompson. The atomic mass unit (Da) was named in Dalton's honor.

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