



# Ludwig Boltzmann

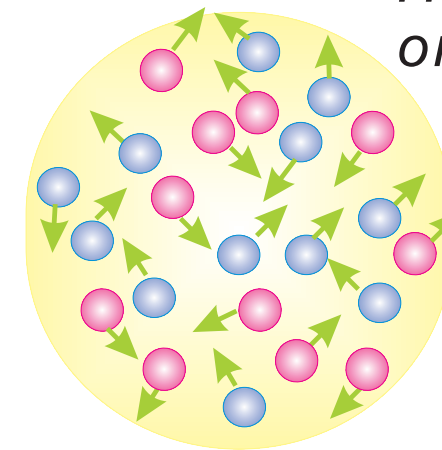
## 1844 - 1906

Ludwig Boltzmann was an outstanding Austrian physicist whose great achievement was in the development of the **atomic theory of matter**. Boltzmann was born in Vienna on 20th February, 1844. His father's income was not very large, but his mother came from quite a rich family. There were three children in the family.

Ludwig obtained an elementary education at home, under private tutors. After he graduated from a local Gymnasium in Linz, he entered the University of Vienna. He received his doctorate in 1866 for work under Stefan on the kinetic theory of gases. He held professorships in mathematics and physics at Vienna, Graz, Munich and Leipzig.

Boltzmann was 25 years old when he became full professor of mathematical physics at the University of Graz. There he spent the happiest time of his life. In 1876 he married a young student, Henriette von Aigentler, 'a girl with long blonde hair and blue eyes'. They had two sons and two daughters. The marriage was a happy one.

In the 1870's Boltzmann published a series of papers in which he developed the idea that heat, entropy (a measure of the disorder of a system), and other thermodynamic properties were the result of the behavior of large numbers of atoms, and could be treated by mechanics and statistics. He introduced the equation (now named as **Boltzmann's equation**), for the relation of entropy ( $S$ ) to probability ( $p$ ):  $S = k \log p + b$ , where  $k$  is known as Boltzmann's constant and has the value  $1.38054 \times 10^{-23}$  joule per kelvin;  $b$  is a constant.



*He was an expert  
on atomic collisions*



*He had an  
Alsatian dog*

Boltzmann made important contributions to the kinetic theory of gases. He developed the **law of equipartition of energy** (the Maxwell-Boltzmann law). This law states that the total energy of an atom or molecule is, on average, equally distributed over the motions.

His atomic theory had many opponents, and he lost much time and energy in his struggle for scientific truth. Boltzmann was an excellent teacher. He had an amazing memory and lectured completely without notes.

A feature of Boltzmann's personality was that he never stayed very long in one place, a fact due to his being somewhat emotionally unstable. Although he had a marvellous sense of humour, he sometimes fell into a deep depression. Nevertheless, he was very kind in his relations with his wife and children and most of his students admired him. He loved nature and used to take long walks. He had an Alsatian dog, who very often waited for him outside the Institute and accompanied his master to a nearby pub for lunch. Boltzmann played the piano and wrote poems and novels.

As his health declined, he became more and more depressed. In the summer of 1906, whilst on holiday in the beautiful Bay of Duino near Trieste, he tragically committed suicide by hanging himself while his family enjoyed a swim.



*His 'kinetic theory  
of gases' explains why  
a hot-air balloon rises*

**" $\pi = 3.141592654.....$ "**

*Boltzmann had an  
amazing memory*