JOHN TYNDALL
By
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John Tyndall (1820-1893) was one of the greatest scientists of the 19th century. He made important contributions in physics, atmospheric science and geology. Tyndall was also a gifted public lecturer, an avid promoter of the public understanding of science, and a noted mountaineer. He is best remembered popularly as the man who first explained why the sky is blue.

John Tyndall was born in Leighlinbridge, Co. Carlow, into a Protestant family of small landowners. His father, a man of some intellect, ensured that John received a good elementary education. He left school at 17 well grounded in mathematics, surveying and English.

John joined the Irish Ordnance Survey in 1839 as a surveyor/draughtsman and was transferred to the English Survey in 1842. He was sacked from this post in 1843, partly because he protested at its treatment of the Irish. After 3 years working on the construction of the UK rail network he secured employment teaching mathematics at Queenswood College Hampshire.

In 1848, Tyndall went to Marburg, Germany to do a Ph.D. on magnetism in the laboratory of Robert Bunsen (1811-1899). He worked intensely hard and completed his Ph.D. in less than 2 years (such work normally takes 3-4 years).

Tyndall returned to England and spent 2 years at Queenswood College. In 1853 he was invited to lecture at the Royal Institution (RI) and was so successful he was invited to give a course of lectures.

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In 1853 he was appointed Professor of Natural Philosophy at the RI and began to work beside the great Michael Faraday (1791-1867), Superintendent of the RI. He succeeded Faraday as Superintendent in 1862. Tyndall became renowned as a public lecturer, making difficult scientific concepts understandable and entertaining to the layperson.

In 1859 Tyndall began to study the capacities of various gases to absorb or transmit radiant heat. He showed that the main atmospheric gases, nitrogen and oxygen, are almost transparent to radiant heat, whereas water vapour, carbon dioxide and ozone are such good absorbers that, even in small quantities, these gases absorb heat radiation much more strongly than the rest of the atmosphere.

Tyndall concluded that water vapour is the strongest absorber of heat in the atmosphere and is the principal gas controlling surface air temperature by inhibiting leakage of the Earth's heat back into outer space. He declared that, without water vapour, the Earth's surface would be 'held fast in the iron grip of frost' – the greenhouse effect.

The greenhouse effect works as follows. Most of the Sun's energy is radiated as visible light. This is not absorbed by the atmosphere and passes through to warm the Earth. The warm Earth radiates heat back into the atmosphere as infrared radiation. This is avidly absorbed by atmospheric water vapour and carbon dioxide, trapping the heat and preventing the Earth from freezing.

In 1869 Tyndall discovered the scattering of light by dust and large molecules, now known as the Tyndall Effect. He noticed that a beam of light, visible as it passed through ordinary laboratory air, disappeared when it entered a flask of pure filtered water. He now passed a light beam through filtered air and got the same result – no beam. He deduced that light bounces off little particles and into our eyes, allowing us to see the beam. He found that different sized particles scattered light in different ways. Visible light contains 7 different coloured lights, ranging from red to violet, but is colourless when the 7 lights are jumbled together. Tyndall suggested that the sky is blue because molecules in the atmosphere preferentially scatter the sun's blue rays.

Tyndall later showed that 'optically pure' (i.e. extremely filtered) air contains no micro-organisms. He compared what happened when he left fish or meat sit in such pure air or in ordinary air. The preparations in ordinary air gradually went putrid and maggoty, but the preparations left in pure air did not deteriorate. These studies extended Pasteur's demonstrations that life can only arise from pre-existing life and ruled out any spontaneous generation of life.

Tyndall also studied glaciers and became a skilled mountaineer. In 1860 he made the first ascent of the Weisshorn, and he climbed Mount Blanc, the highest alpine peak, several times. In 1863 he would have been the first to climb the Matterhorn but his guides wouldn't attempt the last peak.

Tyndall was best known as an advocate and interpreter of science and he constantly urged greater recognition of its intellectual and practical benefits. He was an early defender of the new theory of evolution. He was denounced by the Churches as a materialist and atheist, despite his acknowledgement of the limitations of science and his allusions to mysteries beyond human understanding.

Tyndall made many other contributions to science. For example he invented the fireman's respirator and his invention of the light pipe led to the development of fibre optics.

Tyndall married Louisa Hamilton at the age of 56. Their marriage was childless but very happy. Insomnia plagued Tyndall, and this, combined with general ill-health, led to his resignation from the RI in 1887. As his insomnia got worse he experimented with a variety of drugs. He died in 1893 from an accidental overdose of chloral administered by Louisa. I like to think that, on sleepless nights, Tyndall comforted himself by thinking of childhood walks in Leighlinbridge with teacher Master Conwill, when they would often figure out geometrical problems on the dusty ground or in the snow.

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