

BETTER VIEWING

London-based optician **John Dollond** announced to the Royal Society in 1758 a discovery that would transform the working lives of astronomers. By that time telescopes and microscopes had been aiding researchers for a century and half, vastly expanding our knowledge of the Universe beyond the Earth, as well as revealing an unsuspected "microcosm" of living things too small to be seen with the unaided eye.

But apart from the problems of making glass pure enough for high-quality lenses for such instruments, the images obtained were always surrounded by coloured fringes. Such "**chromatic aberration**" made details hard to discern. The solution that Dollond offered, based on the experiments he reported to the Royal Society, involved a doublet; two lenses of different shapes and made of different types of glass cemented together. A convex lens of "crown glass" united with a lens of "flint glass", concave on one side, flat on the other, suppressed the chromatic aberration, leaving the images free of unwanted colour.

As is commonly the case in science and technology, that is not the whole story. The story begins with **Isaac Newton** more than fifty years before. Newton had discovered that white light was a mixture of colours, and these colours are separated ("dispersed") when a ray of light is bent ("refracted") by passing through a lens or prism. As a result, each colour of light is brought to a slightly different focus, producing a number of superimposed images in different colours. These "fringes", Newton thought, were inherent in lenses and could not be fixed. That led him to pioneer the "reflecting telescope" using a mirror rather than a lens to collect and concentrate the light. But people kept looking for a solution. After all, the human eye produces images free of such aberration. Perhaps combining lenses made

from different materials might do the same.

These would disperse light by different amounts and if properly arranged could cancel out the effect. Such lenses would be "achromatic" ("without colour"). One who

thought so was **Chester Moor Hall**, a lawyer

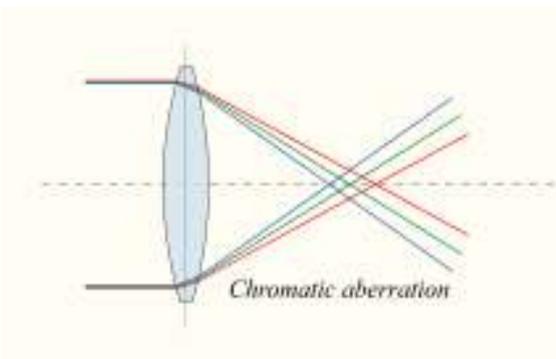
and amateur optician living in Essex. His first experiments combined solid glass lens with lenses filled with water. He soon moved onto a more practical arrangement

combining lenses of crown glass and flint glass, the latter containing lead oxide. By 1730 he had built a refracting telescope free of chromatic aberration, something Newton had thought impossible. The discovery remained little known for another quarter of a century, until **George Bass** (the optician who made the glass for the lenses) passed it on to Dollond. Sceptical, since the idea seemed to conflict with the mighty Newton, experiments soon convinced Dollond. The announcement to the Royal Society and the patent application quickly followed, and Dollond went into production. Dollond was well aware of the previous work done by others on the subject and even though he had been granted a patent he chose not to enforce it. Others also began to make the achromatic doublets.

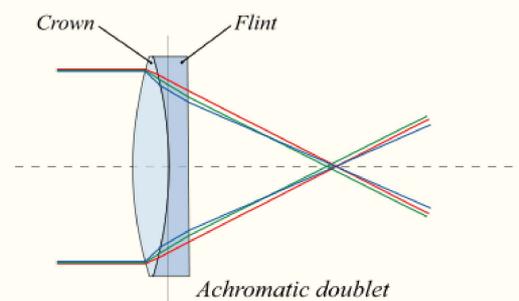
When John Dollond died in 1761 his son Peter took action against those who had infringed on the patent. The matter went to court and the Dollond patent was upheld on the grounds that he had made "productive use" of the discovery whereas those prior to him had not.



John Dollond, (1706 - 1761) was an English optician, known for his successful optics business and the patenting and commercialization of achromatic doublets. He was the son of a Huguenot silk weaver from East London and did well from his invention. He was awarded the Copley Medal from the Royal Society, made a Fellow two years later and became Optician to the King.



Chromatic aberration of a single lens causes different wavelengths of light to have differing focal lengths



Dollond patented the achromatic doublet, which combines crown glass and flint glass

