

The Newton Window Prism

**Triangular prism, 3 x 3 x 3 x 20 cm, with hanger,
made from precision polished crystal glass (K9, crown glass).**

Produces spectral colours when exposed to sunlight.

Hang the prism in a south-west or south-east facing window that is not shaded by trees or other obstructions. When the sun shines through the prism, it produces large patches of spectral colours that stand out best in shaded areas of the room. A slight spin of the prism makes them dance around beautifully.

The English mathematician, physicist, and philosopher Isaac Newton (1643 - 1727) was one of the founding fathers of the modern theory of colours. Prisms, like this one, were commonly known as a toy in Newton's time, but he was the first one who used them for scientific experiments, which led him to his famous Theory of Colours.

One of his main experiments consisted of a thin ray of light which was directed through a prism inside a darkened room. This ray spread into a rainbow of colours on the other side of the prism (Newton counted 7 colours). He noted that the deflection through the prism depended on the colour (it was strongest at the purple end of the spectrum). Then he blocked all colours but one and aimed this monochromatic ray of light into another prism. The deflection angle was the same as with the first prism, so deflection depended only on the colour of the light.

In a second experiment he again spread a ray of white sunlight into a spectrum with one prism. He then aimed this spectrum at a second prism. The resulting single ray of light was again white and was indistinguishable from the first one. From this he deduced that white light is the result of the interaction of coloured fundamental components. These fundamental colours become visible when white light is broken down through a prism.

About a hundred years later, the German poet Johann Wolfgang von Goethe (1749 - 1832) tried to reproduce Newton's experiments and came to different conclusions. He thought that colours are the result of the interaction between light and shadow and not the origin of light. In modern science Newton's point of view has prevailed, but especially in Germany there are artists and philosophers who discuss Goethe's results as a valid point of view.

Recent research, however, has shown that the two supposedly contradictory views on the spectra of colours actually complement each other (Matthias Rang, *Phänomenologie komplementärer Spektren*, Doctoral Thesis, Berlin 2015). See also Wikipedia's article about Goethe's Theory of Colours: http://en.wikipedia.org/wiki/Theory_of_Colours.

©Klaus Hünig, Andreas Schröer (translation)