

**Black plus white equals
colour**

More Details

Colourless becomes colourful

Although the disc is only black and white, you can see bright colours during the rotation! To this day, we do not know exactly why this is so. Most probably, the reason is the different reaction time of the colour receptors in the eye. The so-called cones are responsible for colour vision. There are three different types of cones: one for red, one for green and one for blue. Each type of cone transmits the incoming light stimuli to our brain at a different speed. For example, the cones that "see" blue light react rather slowly compared with the "red" cones. White light stimulates all three types of cone simultaneously. So if the blue component of white light has not yet been passed on to the brain, the red component has already arrived. The rotating Benham disc irritates the eye because there is not enough time to clearly distinguish the white shapes from the black areas. As a result, the different cones in the eye transmit colour information to the brain at different speeds – the viewer thus has a subjective perception of colour. Depending on the pattern, direction and speed of rotation, the colour effect is different. And because it is not a real colour stimulus but only a colour illusion, the effect is perceived with different intensity by different people.

Inventor and name giver

The British physicist Charles E. Benham and the German physicist Gustav Theodor Fechner developed the disc in the 19th century. From 1895, Benham sold various types of such discs as games under the

name "Artificial Spectrum Top". Today these discs bear his name: "Benham Disc".

What exactly is colour?

The world is not really colourful, it only appears to be so! Colour is a psychological phenomenon, because there is no such thing as coloured light. There is only light of different wavelengths and we perceive this light as coloured.

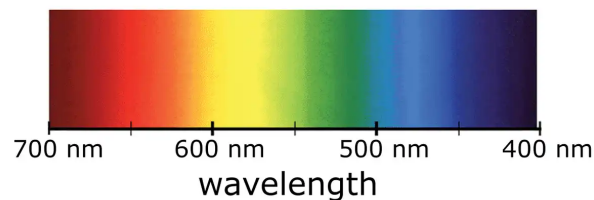


Fig. 1: Light spectrum.

In addition to the individual wavelengths, i.e. the individual colours, we perceive combinations of wavelengths as further colours (e.g. we see red and green light together as yellow). Just as there are immeasurably many wavelengths and combinations, so the colour spectrum is inexhaustible.

Do-it-yourself

A white beer mat, a short pencil and some black paint are enough to create the amazing optical effect of the Benham disc.



Fig. 2: Self-made Benham disc.

The logo of the "Fachhochschule Schwäbisch Hall" is a design of the Benham disc. As the logo rotates, an additional optical illusion is created. It seems that different circles are formed within the disc, which turn in different directions depending on the speed of rotation.