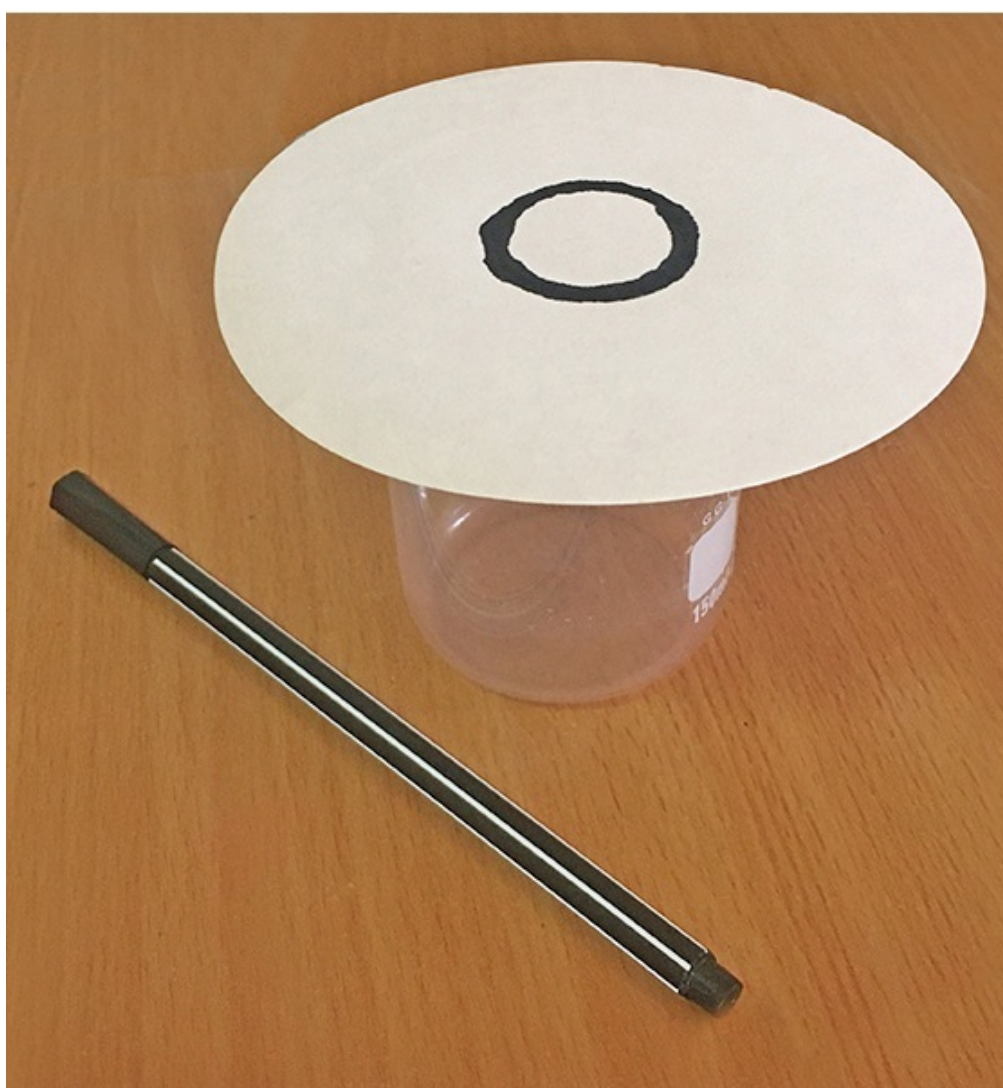


Complimentary colours

Shannon and Ian Jacobs

Radial paper chromatography is a technique that makes attractive separations of soluble dyes. As a solvent is added drop by drop to the centre of the filter paper shown below, it slowly spreads, carrying the dyes outwards at different rates. Smaller molecules normally travel faster.



Water soluble black ink from the pen has been put on the paper. The brand is “*Micky Mouse*”, which probably indicates that it’s made in China, as most of the world’s small consumer goods now are.

The chromatogram

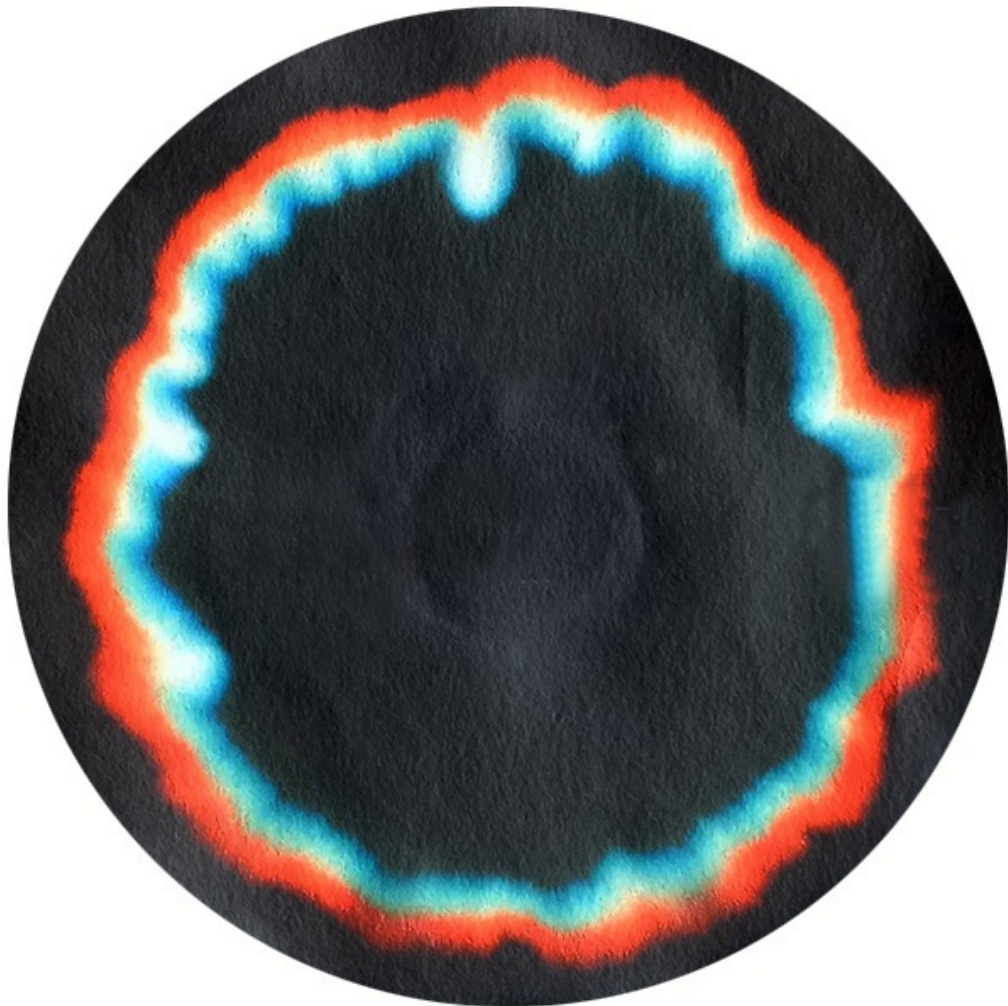
There are three colours on the chromatogram below. An orange like papaya, black, and a blue like the sky. Because our retina has just three colour sensors (cones), ones for red (long wavelengths), ones for green (middle wavelengths) and mostly in the central part ones for blue (shorter wavelengths) two colours can look the same but not be the same in terms of their profile of wavelengths.



All we can say without taking wavelength measurements is that the “papaya” ink absorbs shorter wavelengths towards the blue end of the spectrum and the “sky blue” ink absorbs longer wavelengths towards the red end. In combination they absorb all of the spectrum and look black to us because no light is reflected. We see that on the chromatogram as a dark ring where the separation of the inks is not complete. *Papaya* and *sky-blue* are not defined colours. We use these names *that we made up* so we can talk about them.

Complimentary colours

The image has been *inverted* below. The inversion was done with a computer to swap the parts of the spectrum that were reflected for the parts that were absorbed. White paper reflect all wavelengths. The inverted image of white paper reflects no wavelengths and looks black.



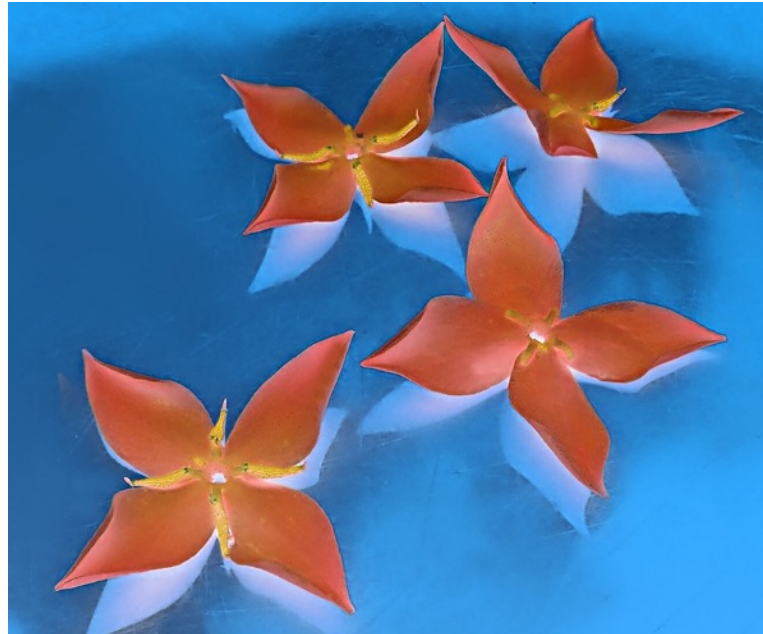
White becomes black. Black becomes white.
Black and white are complimentary.

Papaya becomes *sky-blue*. *Sky-blue* becomes *papaya*.

The colours we call papaya and sky-blue are complimentary.

Near complimentary colours

The flowers and the plastic bowl under them look to us to be the the colours of the inks we call papaya and sky blue.



The colours are almost swapped in the inverted image below but not quite. These colours are close to, but not quite, complimentary.



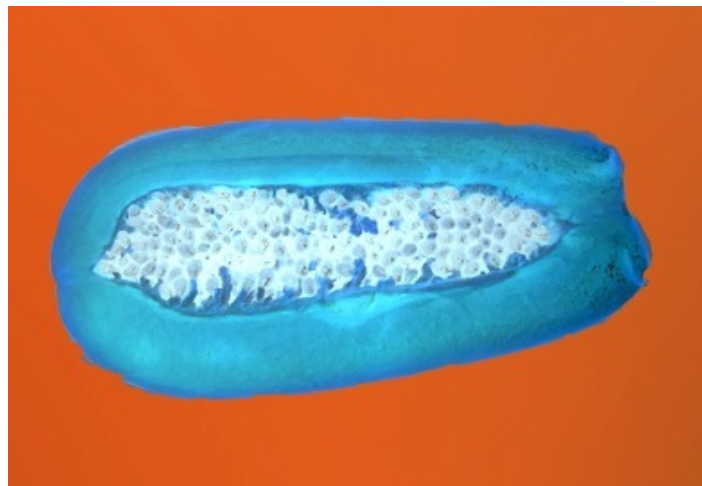
The dyes used to make the black ink above were very carefully selected by the clever people at the Micky Mouse company.

Papaya and sky-blue

We named the ink colours papaya and sky-blue by eye. We made up the names. We thought it might be interesting to photograph the sky and a papaya so we could check to see if in fact the colours of a real papaya and the sky are complimentary.



A papaya against an image of a very blue sky.



The image inverted.

As nearly as we can judge by looking at the images, the dark orange of the papaya is in fact complimentary to a blue sky colour. Intensity measurements at all wavelengths directly from the real objects to give plots of intensity versus wavelength would be required to determine how close these colours are to being exactly complimentary.

A paint job straight out of Noddy in Toyland



The colours of a new paint job (right) and their inversion (left).

What we like to call sky blue more or less goes to papaya as before, yellow swaps with blue and cyan on the square pillar on the right swaps with red on the left. Complimentary colours in combination like this are dramatic but seldom used on houses.