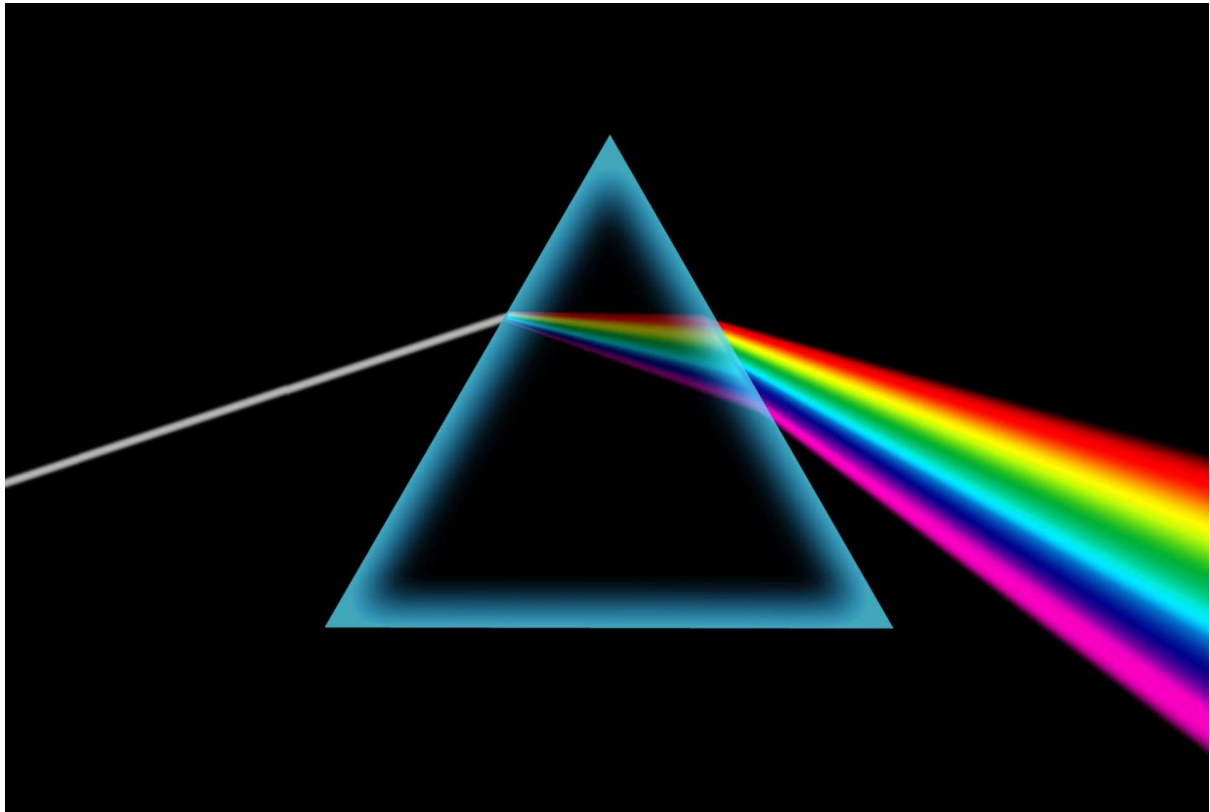


Mysteries of Photography #2: Your Brain, Rainbows and RGB

We have all seen a rainbow. The “white” light we see is really a mixture of “All the Colours of the Rainbow”. The classic way to illustrate this is to pass a beam of white light through a prism.



The different colours in what we see as white light are bent by different amounts and we see the rainbow from red through yellow, green, blues through to purple.

Ever since the Stone Age, artists have been grappling with ways to represent the colours of nature using artificial pigments. Before colour photography was feasible, The CIE (Confederation Internationale de l'Eclairage) was working on practical ways to put colour on a page to represent accurately what we see with our eyes. Their key findings were published in 1931 from experiments with human colour vision using a group of *only* men from the Yorkshire region of England. (Teaser: Some women have superior vision in blue to *any* man.)

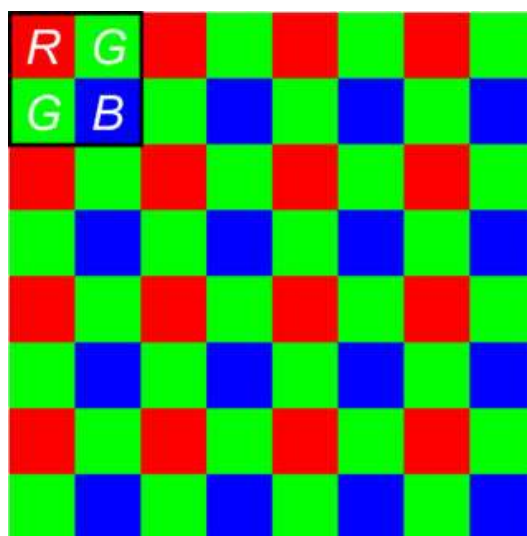
I don't think it an exaggeration to say that the whole of the world's current printing and photography industries are based on this work.

Now our primary interest in all this is for photography. Let's get practical. If you want to capture an image via photography, you break the image down to as small and as many bits as you can. Each tiny bit used to be silver halide crystals on a film and are now pixels on your camera sensor. Depending on the image in front of you, every pixel can potentially be exposed to any combination of colours. How do you capture this so you can reproduce them later as a recognisable image?

The short answer we don't try to. We do something that gives our brains the impression that we have. This is called RGB colour model (red, blue, green again).

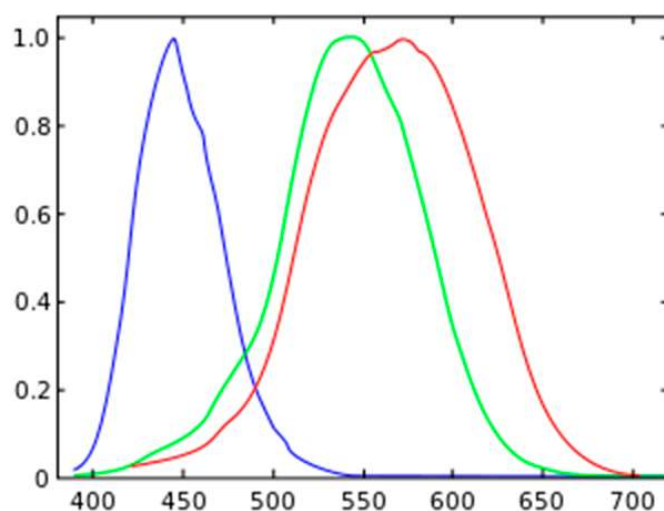
In front of every pixel on your camera sensor is what is called a Beyer Filter with either a red, a blue or a green filter in front of each tiny light sensitive element. So every pixel in your digital image comes from a mix of four adjacent sub-pixels (Some say that there are twice as many green pixels

since our brains have evolved to be more efficient in noticing predators hiding in the undergrowth! However, in my humble opinion it is simply due to both the red and blue receptors being partially activated by green light.).



How does this work in producing a colour image that our brains tell us looks like what we see directly with our eyes?

Well it all comes back to the 1930s and the good old CIE. With their group of hardy Yorkshiremen, they found that human colour vision uses three colour receptors with peak sensitivities at red green and blue.



Take your colour TV as an example. Every picture element emits only red, green and blue light. Yet it seems to show any and every colour in the rainbow.

This trick works for everything to do with colour reproduction from screens to colour printing. Put together any combination of red, blue and green and you can trick our brains into thinking we are seeing any natural combination of colours in the visual spectrum.

It's all a big con job really. As I have written before, we see with our brains, not with our eyes.

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5/2/2023