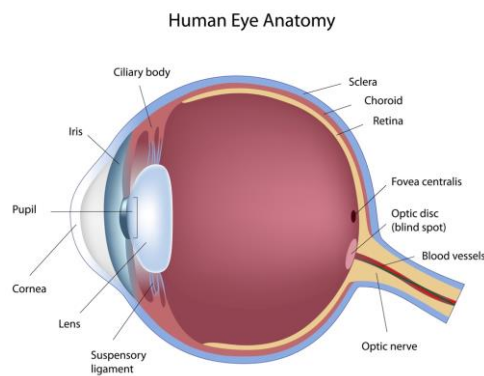




Introduction to Colour – VLE course Script

5. The Eye



So here we have the eye. Light enters through the front of the eye and is focused by the lens and an image is projected on to the back of the eye. This is shown in the smaller image on the right.

From this you can see that the image is upside down but that is not how we see things. What happens is that this image stimulates cells in the back of the eye and electrical pulses are sent down the optic nerve to the brain where the image is reassembled to be the right way up.

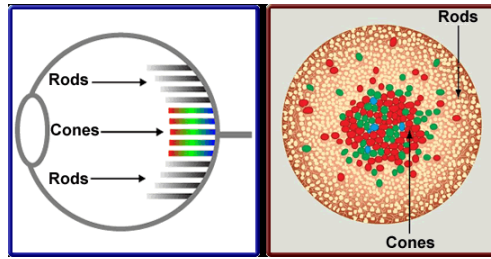
A few other things to point out.

The fovea centralis is the point at which the image is focused and so whatever lands on this spot is most in focus. Of course not all the image is just on this one spot and so there is an optimum size to look at to see a whole object in focus as best as possible and this is important later on.

The point at which the **optic nerve** leaves the eye to go to the brain is actually a blind spot as none of the cells needed for vision and colour vision can be in this place.

This though does not explain how we see colour.

To do this we need to look at the retina and there we see 2 types of cells.



Rods which **react to light and dark** and

Cones which react to different wavelength of light so **react to coloured light**.

As you can see in the image they react to Blue, Red and Green light.

They produce electrical impulses that are sent to the brain through the optic nerve. When lights are turned off and there is some ambient light the rods allow us to see. You will know that in subdued lighting there is less colour and we actually do not see things as clearly as before.

The rods and cones are not evenly spread across the whole of the back of the eye. Around the fovea there are more cones and as we move out from here there are less cones and more rods.

So the point at which you have most clarity of vision is also the point at which you have best colour discrimination. So when looking at colours from a QC or approval point of view it makes sense to have the right size of sample to be able to see the colour and the colour difference between two samples as clearly as possible.

This makes for another interesting bit of information.

If we see objects and colours because of electrical impulses going to the brain then we know that it is our brain that is analysing the information and colour is just a sensation. It isn't something that is tangible. So can the human be fooled by seeing colours in different circumstance?

It can and here is an examples – Green elephant.

I hope that you can all see the pink elephant now.

Pink is the complimentary colour of the green shade and there is an image left in the brain for a few seconds, showing that colour is a sensation which exists and interpreted in the brain. The green cones have become 'bleached' by looking at the green elephant for too long, and so the complimentary colour is seen.

This is also a good way to show you that you do need to rest between looking at colours and not look at colours for too long. There will be a few more examples at the end to make you question what you see.

A while ago we mentioned defective colour vision – colour blindness.

Approximately 8% of males & 0.05% of females are classified as having defective colour vision and should not work in jobs where good colour vision is required.

Several defective colour vision tests can be used.

Ishihara is one of the most famous. Ishihara tests may be used to screen for colour defectives, these tests work by asking the subject to identify numbers composed of coloured dots against a background of colours that are likely to be confused by people suffering from the most common types of colour deficiencies.

The Farnsworth–Munsell Hundred Hue test gives a diagnostic evaluation of colour discrimination, the subject has to arrange a series of chips in the correct colour order and the results are plotted on a polar graph highlighting areas of colour weakness or expertise.

Ideally all people working closely with colour and involved in decisions about colour should have both these test done.

It is important to know that we can improve our colour discrimination by looking at colour more and being subjective about colour and colour difference so it is an important skill to develop as part of the work being done.