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COMMENTARY

Confessions of a colour blind optometrist

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As a child I could not understand what people meant when they said someone was blushing and it took the ruining of a day's work at the laboratory at which I worked as a trainee industrial chemist to find the reason—not for the blushing but for my inability to correctly identify the end-point of a chemical analysis titration based on a colour change in the solution. There was an Ishihara colour test in the laboratory library, which soon dispelled any lingering doubts about my colour vision. We overcame the problem in the laboratory by having one reading of the standard solutions for me and another for the remainder of the laboratory staff. I have severe deuteranomly thanks to a rather careless choice of parents.

This disability consists of extreme deuteranomaly. I have a matching range at the Nagel anomaloscope from two to 45 units. I comprehensively failed the Farnsworth D15 test at my first attempt but I have learned how to do better, although I still sometimes make errors. For example, on the last occasion I did the test, I made no errors on the first trial but made four diametrical crossing errors on retest. I have a poor record with the Farnsworth-Munsell 100 Hue test, on the last occasion my score was 194, which compares unfavourably with the average score for my age group of 11.46 ± 2.01 (SD).[1]

During the Second World War, I was planning to join the Royal Australian Navy on turning 17 years of age. I set about learning the correct answers for the Ishihara test plates in order to pass the Navy's medical test. I must have been shown some plates out of sequence because I was stood aside to undergo the Lantern test. If the Lantern test had not consisted (in my view) of only amber lights, I might have stumbled through but I was comprehensively undone. As a result, I was declared unfit for deckwatch duty and suitable only for less glamorous shipboard duties. This proved to be a good outcome, as I never had to stand for four hours in the cold and wet in the middle watch from 12 midnight to 4 am. I had difficulty understanding this restriction because what lookouts had to look for were invariably painted grey or black and of course at night normal colour vision would be no help even if submarines been painted bright red. I must admit that the signal department would have stretched my ability because of the need to identify coloured flags, often barely glimpsed end-on. Perhaps more importantly, as will be revealed later, I would have had difficulty recognising the side lights of ships at night.

On discharge from the RAN, I needed a job to tide me over until the commencement of the university year. There was an acute shortage of skilled labour in those days with exservicemen re-entering the work force but mostly not having the skills needed for the majority of occupations. I applied for a position as a trainee industrial chemist and was accepted immediately and without any discussion of the job specifications. I had not admitted that I only intended to stay with this position for the three months before commencing university but as it transpired, it was far shorter than that, because the work entailed mixing dyes for a fabric manufacturer. I started and finished on the same day and we parted with goodwill intact. I thought it preferable to sever the relationship before my colour defect wrecked their business

There is no question that a colour vision defect can be a hazard in some circumstances. My obsession with sailing has shown me that people with defective colour vision are a risk at sea, particularly when navigating at night. On one occasion, I failed to recognise the change of the light colour when entering the red sector of the Cape Byron lighthouse and nearly went aground. I thought that the change in the appearance of the light was due only to it losing some illuminance due to mist or perhaps my being more distant from it, rather than its change from white to red marking the danger area.

There was a problem presented by a colour-coded pile in Tasmania's Bateman's Bay. We were committed by wind and tide to pass it on one side or the other with a choice between a safe passage and a three-hour wait for the tide to get off a mudbank. There are no brakes on a sailing yacht. We

passed on the correct side purely by good fortune rather than by correctly distinguishing the red from the green paint that was heavily camouflaged by bird droppings.

Fortunately, awareness of the disability usually allowed consultation with a crewmember having normal colour vision. In later years, the port authorities have added topmarks to all piles and buoys, which provide a shape cue. Buoys that should be left to starboard (right) when entering port are green and have cone-shaped topmarks, whereas those to be left to port (left) are red and have can-shaped topmarks. Piles are similarly coloured and also have top marks in can or cone shapes in addition to their paint colour. Sea birds conspire to paint all such structures white and I find that I rely very heavily on the shape of the buoy or topmark rather than its colour. More recently introduced navigation aids in the form of Cardinal Marks are not colour-coded but depend on shape alone. As an afterthought, perhaps I should check to ensure that they are not colour-coded and that I had simply not noticed.

I find the most dangerous aspect of my deuteranomaly is in recognising the colour of navigation lights at sea. The 'rules of the road' at sea require that at night all vessels identify their type by the display of combinations of white, red and green lights set in specified positions on the vessel. There are also red and green sidelights by which the relative orientation of an approaching vessel can be determined and the safe passing side defined. In poor visibility or at a distance, I am unable to make the necessary identification when others having normal colour vision have no such difficulty. To some extent, I can overcome this by the use of binoculars but time does not always allow this luxury in close encounters. Perhaps the Navy was wise to keep me below decks.

In some 60 years of driving, the only red lights that I have run through have been due to poor judgement rather than a lack of good colour sense. Even at a safe braking distance or in poor visibility conditions, I have no trouble recognising coloured traffic signals. At long distances, there may be uncertainty but not to the extent that a judgement in relation to speed and position is compromised. I am aware of the relative position of the coloured traffic signals at intersections but do not consciously rely on this redundant information. Certainly, the newer green colour that is now used in traffic signals is rich in blue and gives me greater confidence. It has been my experience that even a moderately severe colour vision defect is at worst only a minor risk when driving. This may be due partly to my recognition of the defect and the use of strategies to compensate.

As an optometrist for 50 years, I found having a colour defect caused some difficulties. There was the occasional embarrassment when a patient complained of a red eye but the offending side, not obvious to a colour vision deficient clinician, was not specified. The most severe problem was in differentiating between blood and pigment in the retina; particularly beneath the retinal pigment epithelium. I found that this could largely be overcome by using an ophthalmoscope fitted with coloured lenses. The contrast between melanin and blood is enhanced by quickly shifting from an orange to a green (red-free) lens in the viewing system. Under orange light, melanin appears much darker in contrast to blood in the retinal vessels. When using green illumination, a haemorrhage has the same contrast as the vessels and greater contrast than melanin. Skin and ocular adnexal erythema can be a problem and I developed a high index of suspicion for skin changes such as the butterfly rash of systemic lupus, corneal new vessels, conjunctival hyperaemia and other erythematous changes in and near the eye. I had an aversion to assisting with spectacle frame selection and a plea of inadequacy based on a colour vision problem allowed me some reprieve from this task.

In more recent times, I have developed an interest in oil painting. I have ceased to debate with family critics who ask why I use so much purple (that I believe is really grey) and why I choose to paint things green when they should be (and to my eye are) grey. My claims of 'artistic licence' and 'bold use of colour' are rudely brushed aside by these critics. In response, I tend to paint using a very restricted pallet. If I am painting a blue sky, I keep yellow well clear of the pallet to avoid accidentally producing a replica of the sunset phenomenon of the ' green flash'. I keep separate piles of white paint for mixing with each colour on the pallet to avoid accidental and unnoticed mixing of colours. I also enjoy painting in monochrome such as sepia or grey where mistakes are impossible—well, for colour, that is. Sea and ships are another favourite, both because of my life-long association with the sea and the fact that I am comfortable with the blue of the sea and sky. Moreover, naval ships are always grey and a proper yacht is always painted white. These strategies are discussed and illustrated in a study, which includes a copy I made of the work of another painter. I am told that there are major differences between the original and my copy although I am satisfied with my effort.[1]

On the domestic scene, I have difficulty matching socks when the light is poor and I have noticed that, if I am wearing a missmatch today, then I will very likely do so again on the following day even though the socks have been changed. Unless the light is good, I sometimes have difficulty in separating Australian currency notes because the $20 note is red and the $50 a yellowish colour, which until writing this piece, I believed was green. I occasionally overlook a home-grown ripe tomato on the bush because it has the same contrast as the surrounding green leaves and when viewing a landscape having deep flowering eucalypt trees, I find difficulty in detecting the flowers. It is necessary for me to scan the scene using the very central foveal vision to find the deep reds. The outer foveal and more peripheral vision appear unable to detect the red areas. These and other minor problems due to colour vision anomalies are similar to those of colour defective individuals reported by Steward and Cole.[2]

Perhaps the most challenging aspect of being colour defective is trying to explain the problem to those lesser creatures that have what they chose to define as normal

colour vision. My unscientific explanation as told to similarly affected patients is along the following lines.

A person having normal colour vision and one having a deutranomalous defect view a fish-bowl filled with clear water. They are then masked and either red or green dye is added to the water a drop at a time and well mixed into the water. The two subjects look at the fish-bowl after each drop is added and indicate when they are able to identify the added colour. The subject with normal colour vision might correctly report the colour change after, say, 10 drops but the colour defective subject might require a further 40 to 50 drops before being able to make this decision. If the colour is saturated or nearly so, as in a bright red rose, we probably both see it in a similar way.

Occasionally, I add that to survive the process of natural selection, we colour defective people must have some associated compensatory genetic advantage that keeps the gene alive. I am still searching for this illusive feature.

In conclusion, if given the choice between having normal colour vision and, say, the ability to competently play a musical instrument, I would certainly choose the later. As it stands, I have to accept that I have no chance of having either and I have very likely inflicted future generations with the problem through my daughter.

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