

Color confusion consequences in history

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ABSTRACT

The condition which is now commonly known as *color blindness* and is called *daltonismos* in Latin languages, but which I prefer to call *color vision confusion*, has been known since biblical times. Most often through history it has been seen in a bad light and hushed up. Yet, throughout history tales of a paradox, showing its odd beneficial outcomes have been recorded. It may help explain why the condition has not been given the attention it really deserves. Hopefully, it will also put a spotlight on the need for considering this when designing color communication in this color-driven age.

1. INTRODUCTION

More than 8% of the male population and many females are affected by this inherited condition of color vision confusion. Some have rejected or demoted from jobs. Most have been misunderstood. Yet even today, when so many new discoveries have been made in human biology, and some have made efforts to understand why this condition exists, it is still a mystery.

The problem is that people who have it, have inherited some reason why they do not see colors as we expect them to see. Red and green become a major problem to decipher, but actually, all colors might be at play depending on the severity of the case, the colors adjacent to that color, or even light. But even modern science has not yet pinpointed its cause, nor how to counter-act it. Why has it been ignored? Let us consider that maybe there was value in history for this visual condition to exist, even as it caused those who have it some difficult times, and those who see a full spectrum of colors to misunderstand and belittle them.

2. FROM THE BEGINNING

In the story of Isaac's sons in the Torah, (the Old Testament) we are told that as Isaac was losing his vision, Jacob, the younger of his twins, managed to gain his father's blessing which was reserved for the eldest son. Jacob gained the rights of seniority from his brother Esau in exchange of a bowl of soup. This happened because Jacob was clever enough to keep his mouth shut when his obviously *protanopic* (red-blind) hungry brother referred to a lentil soup that he cooked as a "red, red soup". How do we know he had a color vision condition? Lentil soup is brown or at best, orange (depending on the beans), but Esau called it red. Imagine what a different story we would find in the bible had this not happened. Would there even be a bible? Does this story suggest that we should downgrade those who have the condition?

In any event, it seems that from then on the attitude towards those who have color vision problems has been negative through the ages.

By the end 19th Century, laws were put into place all over Europe as well as in the United States against people who have color vision defects. This was done because of the invention of the steam engine and its use in industry and transportation.- as well as the development of traffic signals for rails and ships. In 1883, President Chester Arthur of the United States pressed the US Congress to put in place laws against hiring people with "abnormal deviation of color sense". Hiring such people for work in the merchant marines, the military or the railroads became illegal. The U. S. was only following a pattern already in place in Europe.

In fact, hysteria was so great that a test to separate these people from the rest of society was eagerly sought. Jakob Stilling (1842-1915), a German ophthalmologist, developed a test in 1878. But this test was ignored. A test by a Swedish doctor named A. F. Holmgren (1831-1897) was developed,

in which wool threads had to be matched. This test took much longer to administer and was not very reliable, but this test became the one used most often. Men were soon barred from good paying jobs in the maritime industry, the military, the railroads, and management of factories because they could not match wool strands.

This led to a desire by women to make sure that they did not marry a man like that. In turn, this led to the great popularity of the book titled *Heads and Faces and How to Study Them*. Published by Phrenologists (the pseudo science that claimed you can judge intelligence by the number of bumps on a person's head and so on), it advised women to look for men with arched eyebrows. It marginalized such men even more. According to this book, color vision capacities lie right above the center of the eye, just below the eyebrow. Heaven help anyone who did not have arched eyebrows! Even Rudolph Valentino, the heartthrob of the silent (black and white) films in the early era of the cinema of the 1920's, made sure he was seen with arched eyebrows.

Some 50 years before that test appeared and the hysteria reached its peak, Charles Meryon (1821-1868) who was color blind became France's "Father of Modern Etching". He actually began his career as a naval officer when ships did not use steam but sails. When France began to turn to steam, he knew he did not belong in the Navy. Indeed, he would have been dismissed as soon as the anti-color blind laws came into effect in France. It is a good thing he turned to etching. France owes him the debt of gratitude for his brilliant and meticulous visual record of what "old" Paris before the full development of the camera, at a time when renovations and expansions of the city took place and many beautiful details disappeared. New Zealand also owes him a debt of gratitude for recording the 1840's views of its shoreline, especially around the area of Akaroa which even today is considered New Zealand's "French" haven much like Montreal in Canada are unique.

Earlier still, John Dalton (1766-1844), another color blind man, was significantly responsible for dramatic changes in history. This unassuming Englishman published a scientific paper in 1794 on what he called his "extraordinary color vision". In his honor, the condition was given the name *Daltonism*, but later it was seen in negative terms and changed in the English language.

Actually, Dalton wanted wished to be a chemist. In fact, he made some significant observations about the metal gold, but dealing in chemistry required reporting exact color changes in chemicals. So he turned to mathematics. He struck on the theory that all matter is composed of atoms, that atoms have a weight, that compounds are atoms of specific combinations of elements, and that you could write down the makeup of these combinations, thus creating chemical equations-information not different from a cake recipe. This led to the development of the atomic chart for chemicals, which hastened the Industrial Revolution.

Chances are that synthetic colors would also not have developed in the mid 1800's, beginning with William Henry Perkins discovery of mauve in 1856. Had synthetic colors not become available, the French Impressionists of the late 1880's would not have been able to take prepared and reasonably priced paints to the outdoors in large quantities, and use them thickly al fresco. Imagine the art world without the French Impressionists!

Considering that the French Impressionists focused on color, one would think that those who have the condition would not be the least interested in their work. That is not the case at all. Most persons with the condition of color vision confusion love this kind of artwork. They may not see the colors that others see, and they do not tend to get the afterimage effect, but they see in those paintings contrasts and variations that others would not see. I have also found that some see in Abstract Impressionist work things that others don't. In fact, one such case was author Jeffrey Porter who had a serious case of the condition. He wrote a biography of the Abstract Impressionist Jackson Pollock. When he heard in 1987 that I aim to produce an educational video on the human factors of color blindness, he offered to be taped describing how Pollock would become furious when he, Porter, would delineate the objects he thought he saw in the abstract paintings- which Pollock never aimed to put there and did not see.

It is curious that the Impressionists benefited from the observations of the French chemist, M. E. Cherveul (1786-1889) who was a pioneer of Organic Chemistry. His fame came from his pioneer discoveries of the makeup of animal fat. He became the Director of Dyes at the Royal Gobelin Tapestry Works because at that time dyes were still of organic sources. There Cherveul produced the most significant study on perception of color interaction which he called "simultaneous contrast". All of that was due to complaints by his confused employees about what they thought was the poor

quality of color dyes. Cherveul's lectures and books were used as guides for handling colors by such artists as George Seurat who developed Pointalism.

Seeing or not seeing colors properly led to baffling surprises at the end of the First World War. It seems that the faulty Holmgren Test they had to pass to enter the military, allowed a good number of men to sneak into the Army. But this turned out to be lucky. Many of the sharp-shooter medals were awarded to these men. The question was why.

It turned out that their success was due in part to the fact that camouflage colors, introduced in that war by the Germans, meant little to them. For them, the German helmets with the pointed spike on top were a perfect cue of an enemy in the bushes. (I have found that persons who have the condition in any inherited form, tend to develop keen motion awareness and often can pick out visual details others ignore as possible cues.

The laws against the color-blind were dropped after the First World War, but there was a new hunt for a better test. The Ishihara test was developed. It was produced 10 years after the death of Stilling whose test had been ignored for over 30 years. The Japanese ophthalmologist S. Ishihara created a test after studies in Germany. His test resembles that of Stilling's.

The Ishihara Test has a strange history. The test was nearly lost to history on September 1, 1923, when the Great Tokyo Earthquake destroyed much of Tokyo, including Ishihara's personal test plate samples. But thankfully, they had already been printed in the United States. However, by 1941 after Japan's military forces attacked American ships in the Pacific, the very mention of Japan, or reference to anyone Japanese, was unpopular in the United States. So, in 1943 a team from Presbyterian Hospital in New York City developed another test that looked much like the Ishihara Test for the US Army. This test was given the name Stilling originally gave it- the Pseudo-Isochromatic Test, but some other initials were added. The director of the research program was named Dr. Hardy, and the two nurses who worked with him were Rand and Ritter. Thus, the test got the name AO (for American Optical) H. R.R Pseudo-Isochromatic Test.

Following the Second World War, in the 1950's, accusing someone that he was *Red* or even *Pink* was terrible in America. Red meant Communist, and Communist meant dangerously evil. At that time of hysteria people lost their livelihood, their professional status, even their sanity because they may be listed as Red-leaning. But an interesting thing happened in the early 1980's. President Ronald Reagan, an arch anti-Communist, said at some point that he liked the color red. (One strongly suspects he liked the color brown like Esau of old, because Reagan often chose to appear in *brown* suits, (and like his astigmatism which he hid, he had hidden his color vision problem.) The result has been that red, the once seen as symbolic of a dangerous element and rejected by Republicans, suddenly became their accepted color. Since then, at election time, you see the Republicans shown as *red* on television charts at election time- all computer generated.

As it happens, one software engineer who created color capacity on the computer had to deal with a boss who could not see why he was so excited. The boss, it turned out, could not see the color green, the first color ever created on computers. I had already heard about computer *nurds* who had this condition from my son when he was a student majoring in computers in the 1970's. But now, in 1988, Gerald Murch, the chair of the Human Factors and Interface session of the NCGA conference at Anaheim Ca. where I was an invited speaker, told me that when he was the one to discover that if you oscillate electrical impulses, light waves will result in green colors. When he excitedly told his boss, his boss responded that he didn't see what was so special. Murch felt crushed because he knew his boss was otherwise brilliant in his field. How could he be color blind?

His reaction reminded me of just how sad it is that so often, many confuse the inherited condition of color vision confusion with lack of intelligence or foolishness.

3. OBSERVATION

The misunderstanding about the condition still exists. Recently I have saved a child from being labeled slow and placed in a Special Education for the slow- minded. The boy had claimed he could not see what the teacher wrote when she used yellow chalk on a green blackboard. But if you have dueteranopia, you may see green and yellow as white, or at least the same light gray. No wonder he saw nothing! Who can see white on white? But school administrators did not at first such a problem can exist. I verified it can happen. I also had to vouch for a student in x-ray radiology. He

could not pass the color vision test. But what does he need to see colors properly when he can detect delicate details needed for medical diagnosis, like small changes in grays and dots and flecks on an ex-ray which might indicate problems? Again, I saved someone from being mislabeled as incompetent.

The paradoxes keep on coming. In 2004 the M&M chocolate company which has prides itself on being a color company, had to reconsider its sales strategy as its market share was shrinking. After doing Market research in the US and Canada they discovered that it would be wise to add 40% more blue and orange colored candies per package, and to take out most of the red, brown and green. (They decided to package red and green coated chocolates for the Christmas holiday market instead). Orange and blue are, of course, the two colors that most people, even those with the condition, can see. The color blind tend to ignore red, brown and even green. In other words, the company many well have, unknowingly, tapped into new customers it had never catered to before- the 8% plus of the male population which is colorblind.

4. CONCLUSIONS

Considering that there is nothing that can be done about it at present, let us at least celebrate its positive aspects, and the paradoxes, which in strange ways, may have benefited us as a result.

References

1. Arthur C, "Message of the President of the United States", Doc 24; US Senate Congressional Record, US Printing Office Washington DC (1883)
 2. Birren F, Introduction notes to "Principles of Harmony and Contrast of Colors" by M.E. Chevreul, Van Nostrand Reinhold Co. (1967)
 3. Collins R, "Charles Meryon; a life", Garton & Co, Devizes, (1999)
 4. Dalton J, "Extraordinary Facts relating to Vision of Colours: with observations", Thomas Clark, Edinburgh UK, 1794 (Reprinted in Edinburgh Journal of Science; 89-99 (1967)
 5. Fama PG, "Charles Meryon: a biographical and psychological assessment", NZ Med J, 78: 448-455 (1973)
 6. Genesis, 25:30-34 (in the Old Testament -Torah)
 7. Lechner A and Harrison L, "Chocolate is Better in Color", presentation at FIT/ ISCC Color and Design Conference, New York City (2004)
 - 8.. Sizer N, Drayton HS, C.F., " Heads and Faces and How to Study Them" , p. 101-102, Fowler & Wells Co, NY (1885)
 9. Rosenthal, O, Color Blindness and the Computer Industry, Proceedings of Compint, Montreal Canada, p. 172-176 (1985)
 10. Rosenthal O, "Coping with Color Blindness". Avery Publishing Group, NY (1997)
 11. Transcript of the Video COLOR VISION CONFUSION, (produced in 1987)
- Also: Private consultation with many persons who have color vision confusion.