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ISN'T COLOUR VISION AN ILLUSION?

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ISN'T COLOUR VISION AN ILLUSION?

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Abstract

Visual perception and colour perception cannot be defined by science. They are both subjective. So they can be only explained to other people by scientific illusions. They are used to show that the colour perception is an illusion. From the colour constancy to colour contrast, from colour metamers to colour temperature, from physical colour properties (red low, blue high temperatures) to perceived colour temperature (blue low, red high temperatures) there are a lot of discrepancies. On the other hand the photoreceptors in the brain are colour blind. Perception of colour is in the brain. The electrical signal which is created by the photon in the photoreceptor is transmitted through three neurons in the eye and two neurons in the brain to the visual cortex, where the transformation to information becomes as a colour perception. Scientists should experience by themselves individually, that human colour vision is an illusion, so that they can differentiate between measurement of colours by instruments and perception of colours by clinically colour vision normal persons.

Keywords: Colour vision, visual perception, illusion.

1 Motivation

Scientists work on colour as a feature, as if it is precise and measurable. Studies in visual perception sciences and neuroscience prove that colour perception in ophthalmologically healthy and "colour vision normal" subjects is an illusion. Colour perception is also -like the visual perception itself- individual. Light and illumination scientists should be aware of this in their scientific and professional life.

2 Methods

Visual perception and colour perception cannot be defined by science. They are both subjective. So they can be only explained to other people by scientific illusions. They are used to show that the colour perception is an illusion. Colour vision deficiencies are not included in this topic.

3 Visual Illusions on Colour

There are many characteristics of colour. To show these characteristics numerous scientific visual illusions have been created, which are mostly named according to the creator of the illusion.

One of the newest colour illusions is #thedress phenomenon. In this illusion from the clinically colour normal subjects about 45 % see the dress in gold-white, another 45 % in a blue-black and the remaining 8-10 % see in other colour combinations. There are many scientific papers about the trial to explain the #thedress phenomenon. None of them can explain it scientifically.



Figure 1b – The dress phenomenon, original photo (#thedress)



Figure 1b – The dress phenomenon, two most common perceptions (#thedress)

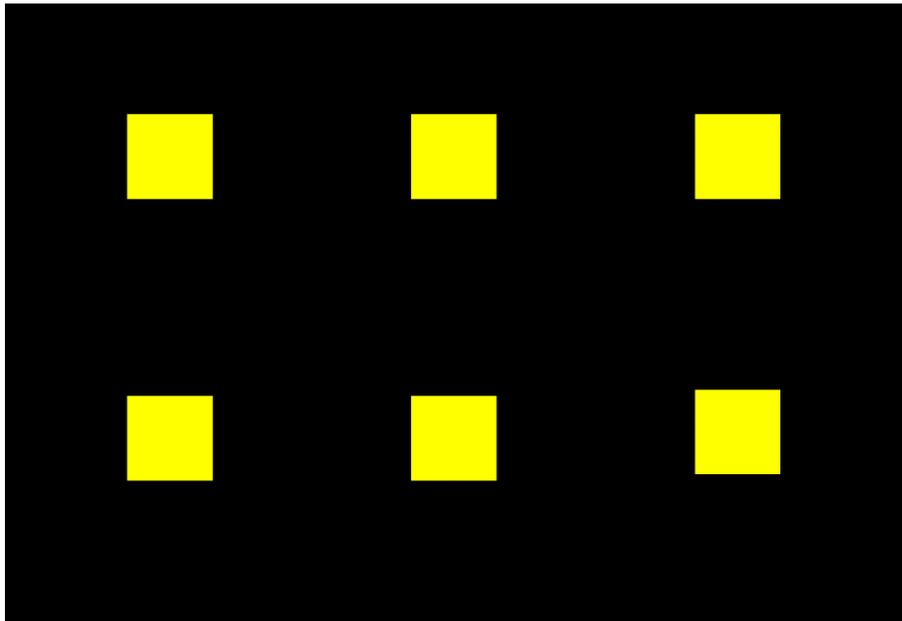


Figure 2a – Colour contrast of a colour with a single colour

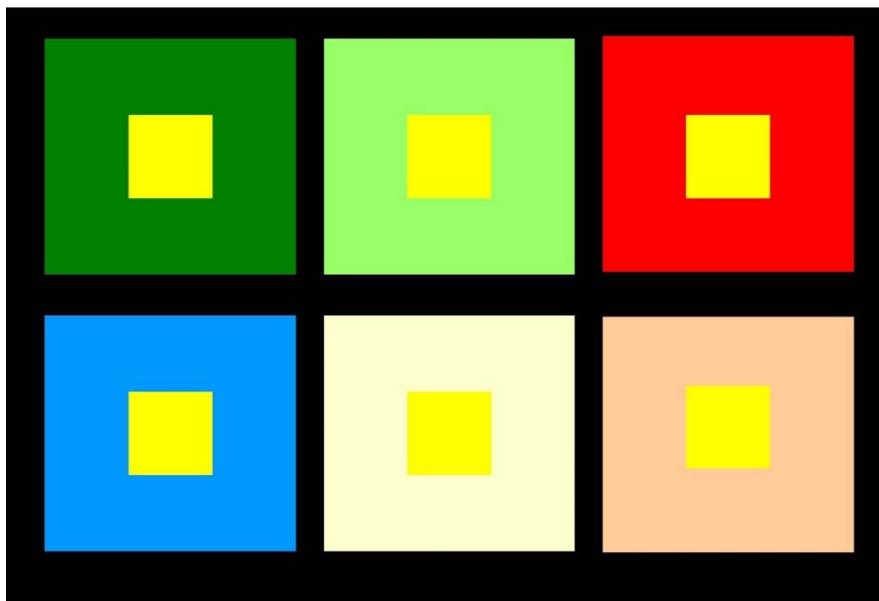


Figure 2b – Colour contrast of a colour with different colours

When the contrasting colour of a colour changes, the perception of the colour itself changes, also.



Figure 2a – Colour constancy (Photo with daylight flash, also the perceived colours)

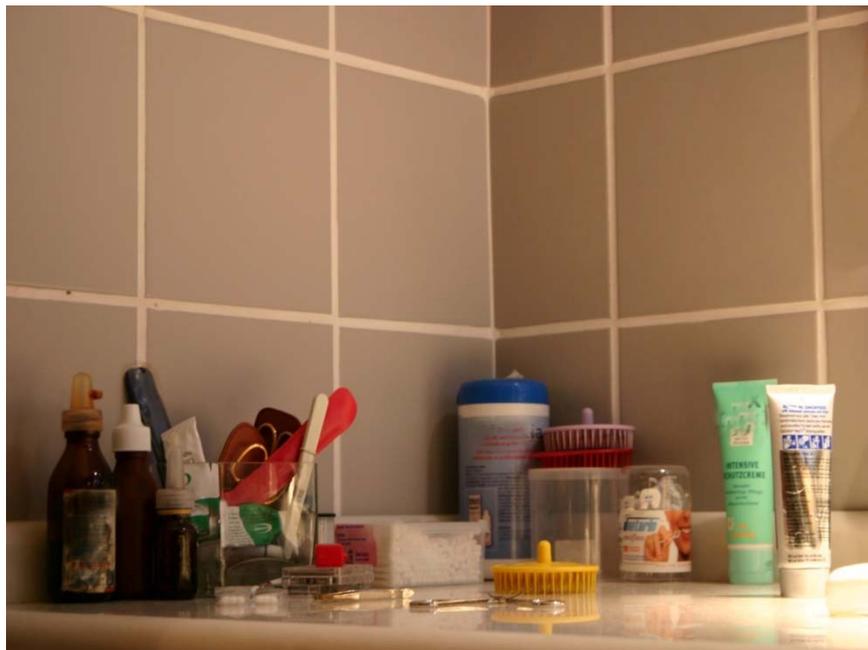


Figure 2b – Colour constancy (Photo with ambient artificial lighting)

Because of colour constancy in the brain, the colours in situation Figure 2b” is perceived like in Figure 2a. So the colours measured with machines don't match the perception of colours in the brain, which resemble the colours of things which have been seen before in daylight by the viewer.

From the colour constancy to colour contrast, from colour metamers to colour temperature, from physical colour properties (red low, blue high temperatures) to perceived colour temperature (blue low, red high temperatures) there are a lot of discrepancies.

On the other hand the photoreceptors in the brain are colour blind. Perception of colour is in the brain. The electrical signal which is created by the photon in the photoreceptor is transmitted through three neurons in the eye and two neurons in the brain to the visual cortex, where the transformation to information becomes as a colour perception.

Perception of colour may be without any eye involvement also. Which is physiologically "seen" in normal dreams.

4 Conclusions

Scientists should experience by themselves individually, that human colour vision is an illusion, so that they can differentiate between measurement of colours by instruments and perception of colours by clinically colour vision normal persons.

References

- BAER , BARFUSS M. and SEIFERT D. 2016. *Beleuchtungstechnik. Grundlagen*. 4. Auflage. Deutsche Lichttechnische Gesellschaft. Berlin. Huss.
- FORRESTER J.V. , DICK A.D. , McMENAMIN P.G. , ROBERTS F and PEARLMAN E. 2016. *The Eye. Basic Sciences in Practice..* Fourth Edition. Edinburgh, London, New York, Oxford, Philadelphia, St.Louis, Sydney, Toronto. Saunders & Elsevier
- LEVIN L.A. , NILSSON F.E. , Ver HOEVE J. , WU S.M. 2011. *Adler's Physiology of the Eye*. St Louis, London, Philadelphia, Sydney, Toronto. Eleventh Edition. Mosby.
- OR, K.H. 2007. "*The Difference of Light Drawing in Vision and Photographic Art*". Master Thesis. Marmara University. Institut of Fine Arts. Istanbul.
- OR, K.H. 2017. "*The Object Colour Perception of Colour Vision Normal Eye Wittnesses under Artificial Light Sources*" PhD Thesis. Forensic Medicine Institute of Istanbul University. Istanbul.
- OR, K.H. 2017. "*The Interaction of Visual Perception with Viewing Photographs*". PhD equivalent Thesis in Arts. Mimar Sinan Fine Arts University. Fine Arts Institute. Istanbul.
- KUEHNI R.G. , SCHWARTZ A. 2008. *Color Ordered: A Survey of Color Order Systems from Antiquity to the Present*. Oxford, New York. Oxford University Press.