

Dressgate – which colour is the dress?

Blue/black or white/gold? – this is here the question. A heated debate has recently ignited in the social media and showed a split in society: people who see the foto of the dress (pictured below) as blue/black and those who perceive it undoubtedly as white/gold. In fact, it turns out that it is a 50:50 divide (for the „real colours“ of the dress see the end of this column).

How can we explain this ?



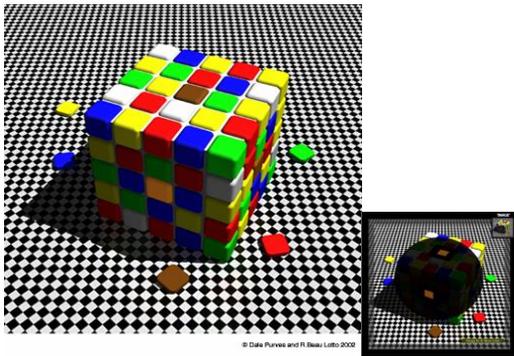
<http://swiked.tumblr.com/image/112174461490>

In brief: (1) Colour is an illusion which is constructed in the brain (as already emphasized by Goethe, Helmholtz, Koffka, and others; 2) there are large interindividual differences in colour perception. Or in yet other words: Colour is in the eye of the beholder.

An attempt for explanation:

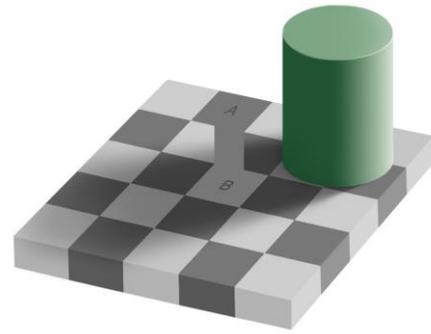
The recognition of object colour under changing illumination is not a trivial problem, since the light reaching our eyes is ambiguous with respect to its origin, i.e. the spectral properties of an object (its characteristic reflectance) and the properties of its illumination (which is variable). Our visual system, however, separates both effects, or as it is sometimes expressed, „discount“ the illumination. It does so most successfully, since we perceive the colour of objects as their inherent property, not as a variable. The corresponding perceptual phenomenon is called colour constancy. We know that colour constancy is carried by a number of sensory processes, such as adaptation (corresponding to the camera's white balance) and the encoding of contrast. The latter correspond to ratios and as such are independent of uniform changes in the illumination.

In addition, cognition comes into play: colour memory is responsible for our tendency to see a banana more yellow than it „really“ is (photometrically speaking); also, we make assumptions about the illumination: for example, we infer, based on the context, properties of the illumination, as in the illusions pictured below (Purves' & Lotto's colour-cube; Adelson's checkerboard-shadow). Illusions like these demonstrate how strong these sub-conscious inferences, as Helmholtz called them, can be. So, in fact, we can never know for sure how exactly other people see the world (the philosophical „qualia“ problem). But why do we normally all agree roughly on these perceptions, but not in the case of the dress?



Purves-Lotto Farbwürfel

<http://www.lottolab.org/downloads/illusion/cube1.mov>



Adelson, Edward H. (2005). "Checkershadow Illusion"

The most favored hypothesis it as follows: in the case of the dress-foto, the information of the image (little background visible, foto is hopelessly overexposed), seems to be too ambiguous, to be interpreted by everybody in one way or the other. As a result, different people make different assumptions about the illumination (see picture below): around 50% of observers assume that the dress is in the shadow and therefore they discount a shadow (i.e. shift it along a perceptual axis away from blue and towards yellow, and therefore see it as white and gold); the other 50% of observers assume bright sunshine on the dress and shift it perceptually towards more blue and therefore see it as blue and black.



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As said before, the basic effects are known from other illusions; but none of the previous colour illusions has been as ambiguous and has evoked such a controversy. The reason why the dress illusion is interesting scientifically is (1) because it demonstrates that there inter-individual differences in colour perception are larger than previously thought; and (2) because it shows that we have not yet fully understood the properties and role of cognitive influences on perception (including semantic and cultural factors). We are investigating in the Tübinger ColourLab sensory and cognitive factors of colour constancy and find – in particular with respect to real objects – large individual differences. (Werner, Vision Research 104, 2014; Werner et al., J VIS 13, 2013; amongst others). But never have we seen such an extreme perceptual divide as in the case of the *dress-illusion*. The particular

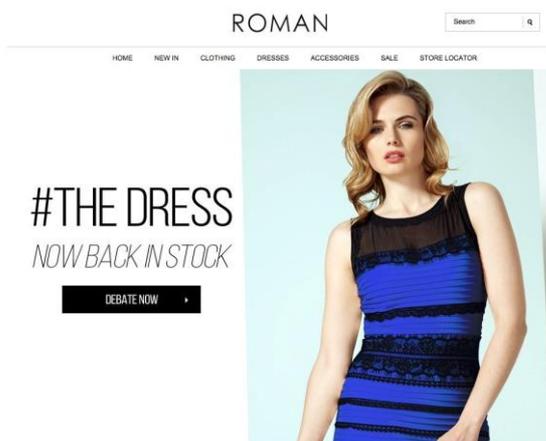
conditions that lead to this phenomenon rise interesting questions about the nature of colour perception that need further investigation.

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Here the foto from the catalog:



Some more stories and views about the dress:

<http://www.michaelbach.de/ot/col-dress/index.html>

<http://swiked.tumblr.com/post/112174461490/officialunitedstates-unclefather>

http://www.nytimes.com/interactive/2015/02/28/science/white-or-blue-dress.html?_r=0

<http://www.iflscience.com/brain/explaining-perceptions-dress> (IFLScience)

<http://blogs.scientificamerican.com/illusion-chasers/2015/02/27/thattdress/>
(Scientific American)