The Colours of Transparencies

Uncommon Colours: things that visually appear transparent (*perceived transparencies*) cannot be perceptually attributed the same colours as things that appear opaque (*perceived opacities*).

Clear Colours: perceived transparencies are attributed colours with an achromatic dimension running from black to clear, rather than black to white.

I. Common Colours

> Byrne & Hilbert (2003: 11): 'Opaque objects, [transparent] objects, and light sources can look the same in respect of colour. Therefore, the natural inference is that there is a single property that vision represents all these objects as having – a conclusion supported by common speech, as well as by what is known about the extraction of colour information by the visual system.'

Similar Language: we describe transparencies and opacities using the same colour terms.

Qualitative Independence: colour qualities are independent of transparency-opacity qualities.

> E.g., Natural Colour System (NCS): Four chromatic primaries – red, green, yellow, and blue – and two achromatic primaries – white and black. *Blackness* dimension defines ratio of black-white. *Chromaticness* dimension defines distance from achromatic axis.

II. Uncommon Colours

1. The perceived greys of opacities can be characterised as mixtures of white and black.
2. Perceived transparencies cannot appear white.
3. If perceived transparencies cannot appear white, they cannot appear colours that can be characterised as mixtures of white.
4. Therefore, perceived transparencies cannot appear the same greys as opacities.
5. If perceived transparencies cannot appear the same greys as opacities, they cannot appear the same chromatic colours as opacities.
6. Therefore, perceived transparencies cannot appear the same chromatic colours as opacities.

Premise 1: Subjects find it natural and easy to apply NCS, characterising perceived achromatic colours of opacities in terms of proportions of white-black. E.g., Hård et al. (1996).

Premise 2: It is hard to conceive of something that appears both transparent and white. Frosted glass and mist don't count: these are translucent, not transparent.

What can defenders of Common Colours say?

> Hardin (1985: 119): white is 'unique among the colours of the surfaces of objects in that it alone involves another surface property, diffuse reflectance.'

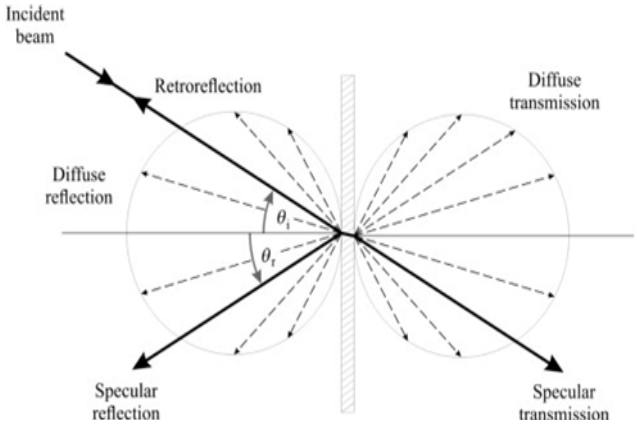

Figure 1. Types of Reflection and Transmission. Source: Höpe (2014)

Premise 3: phenomenological analysis of perceived colours of achromatic filters reveals no presence of white. Optical analysis indicates that NCS greys also associated with significant scattering, which precludes transparency.

Premise 5: NCS characterises chromatic colours as mixtures of hues and greys, hence white. Phenomenological and optical analyses indicate perceived chromatic colours of transparencies contain no white, so are not NCS colours.

III. Clear Colours

Unorthodox Implications: black-clear continuum is an achromatic dimension of perceived colour, and clear is a limit achromatic colour.

> D. K. Buckner (1986: 86-87): 'what characterizes water, window-panes and the air is the complete absence of any identifiable visual quale: they are "colourless" in the sense that they have neither chromatic nor achromatic colour… Achromatic transparency is, if you like, a visual zero: the absence of any visual quale whatsoever.'

Clarity Constancy: there are perceptual constancies with respect to clarity, across variations in illumination and background, and across mechanical deformation.

Transparency-Opacity Manifold: optics measures transparency-opacity by attenuation coefficient, defined as sum of absorption and scattering coefficients. This is schematically represented by 2D space, with attenuation minimum at optical clarity, and maxima at optically pure black and white.

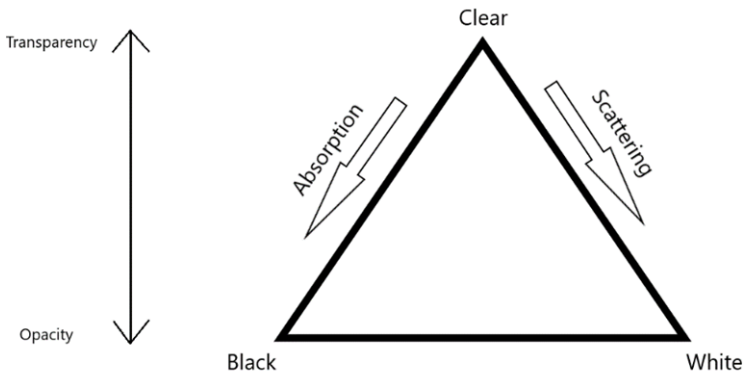

Figure 2. Transparency-Opacity Manifold

Observations: 1. Black and white emerge from this structure, as maximal and simple types of opacity. 2. Black and white are continuous with clarity. 3. Black-white line causally and structurally related to NCS achromatic continuum. 4. Black-clear line causally and structurally related to perceptual black-clear continuum. 5. Mirroring gives reason to think that achromatic colour qualities continuous with transparency-opacity qualities.

Qualitative Dependence: colour and transparency-opacity qualities not independent, in sense of occupying disjoint quality spaces.

Achromatic Parity: black, white, and clear are limit achromatic colours.

References

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