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There's More to Colour than Meets the Eye; Medieval and Early Modern Colour Perception

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Abstract. This paper will review some ways in which colours could have been perceived in the Middle Ages in Western Europe. Central to the paper is an assertion that, historically, colour was perceived as an embodied phenomenon. Whilst colour was in itself immaterial, it was produced as the result of interactions between light and material and was received into the body as a vehicle that carried properties associated with the (earthly) material with which (heavenly) light had interacted. The question of colour is approached from the practical engagements of those who interacted with coloured artefacts – like craftspeople and consumers – and assumes a limited access to contemporary theories of colour.

The article enquires into the historic experience of colour by trying to engage sympathetically with the everyday consequences of living under the conditions formed by the pre-modern Western European worldview. It will suggest that, in comparison with the historic lived experience of colour, the modern appreciation of colour is deeply impoverished.¹ For example, at a merely technical level, modern screen-based colours have a range of hues, saturations and tonalities, but they have no textural properties whatsoever since they necessarily conform to the unifying, and minimised, texture of the screen. The ability of the screen to change colour, displaying one image after another, also has the effect of reducing the significance of any particular colour because the linkage between colours and their particular material causes has been severed. The arbitrary nature of colour production that has been enabled by the digital realm reinforces long-term cultural trends, such as the decline of sumptuary laws and the acceleration of fashions through the nineteenth- and twentieth century with the current availability of multiple colourways in otherwise identical clothes.

Significant aspects of the historic experience of colour can be approached simply by considering the ways in which colours were provided, in particular, by recognising that in the pre-modern world the linkage between a colour and its material substrate was non-

¹ Jenkins 1942.

negotiable. This would have been true for most coloured natural phenomena and for all pre-industrial cultural artefacts, whether coloured with materials that were of natural or synthetic origin. That historic linkage between material and colour endures in current terms like ‘pitch black’, ‘snow white’ and ‘blood red’. Because of such linkages, in the pre- and early-modern worlds, colours were perceived as conveying some of the properties associated with the materials that provided them, as will be outlined below.² This was due to the way colours were produced both in theory, as light’s interaction with matter, and in practice, as emanations from a restricted range of colouring materials. Of course, it was also due to the fact that colours were received by people who were themselves recognised as material beings.

One of the main theoretical frameworks that connected light, materials and people was that of the Aristotelian four elements – fire, air, water and earth. The everyday implications of Aristotelian four element theory were very widely known and endured into the early-modern world. As a quaternary, originating in the ideas of Empedocles, the four elements became associated with the Christian cross in medieval diagrams that were visual forms of logical argument and exegesis, presented with combinations of text and geometry that could both clarify and mystify the elements’ significance.³ One such example, *Byrhtfert’s Diagram*, connects the four elements with the four directions of space (in Greek, spelling Adam’s name), the four seasons, stages of life, and more.⁴ It was a commonplace that all bodies – young and old, male and female, living and dead, polychrome sculptures and pigment particles – were mixed composites of the four elements, with one element dominating the mixture. It was also a commonplace that the earth was created from elements which were ‘bound fast, each in its separate place, forming a harmonious union.’⁵ This cosmogonic aspect of the elements was frequently presented in another diagrammatic pattern – that of nested concentric circles.

An elemental connection between coloured materials in the macrocosm and the experience of colour in the microcosm may have provided a theoretical basis for the ‘four colours’ that Pliny ascribed to Ancient Greek painters.⁶ This theoretical linkage would have re-inforced the non-negotiable connections between colours and their material substrates in the pre-modern world. As an aside, it is worth noting that such theoretical linkages are not available to the modern world – digital ‘true colours’ cannot possibly have 16 million different philosophical correlates – which further downgrades the phenomenon of colour, leading to its status as a subjective epiphenomenon.⁷ And the fact that each of those 16 million colours is merely a combination of three – red, green and blue – has no cultural

² Dinkova-Bruun 2013, 16.

³ Evans 1980, 32-55.

⁴ St John’s College, Oxford, MS 17, fol. 7v.

⁵ Ovid, 29.

⁶ Benson, 2007.

⁷ Digital platforms that operate with 24 bits generate arrays of 2^{24} or 16,777,216 potentially different colours.

significance, so it would be fanciful today to try and assert, for example, a Trinitarian meaning to pixel distributions in screens or cone-cell distributions in retinas. On the other hand, there may have been theoretical implications in Titian's alleged assertion that 'A good painter only needs three colours; black, white and red'.⁸ In this case, Titian's rhetorical justification for a limited palette may not have been inspired by the Trinity but by alchemy, since those three colours, in that sequence, represented the alchemical Great Work – *nigredo*, *albedo* and *rubedo* – and alluded to the transformation of matter and spirit, a transformation that might be effected by paintings.⁹ Given pre-modern assumptions that colour was enmeshed in a web of physical and metaphysical interconnections, colour would have enjoyed rich cultural significance and engaged all the senses.¹⁰ The following briefly considers the appreciation of colour by each of the five senses in turn.

We tend to think of colours as presenting themselves primarily to the eye and to the faculty of sight. Historically these were both rationalised by, amongst other frameworks, the four elements. Diagrams of the eye tended to be concentric circles, like microcosmic echoes of the macrocosmic elemental – as well as planetary, stellar and angelic – nested structures. And the eye's image-generating properties were understood as the interaction of two of the four elements – the eye's 'fiery arrows' and its 'watery' aqueous humour.¹¹ (The other two elements were also implicated in sight. Air was the medium through which species were transmitted and earth provided stability for the endurance of received images.) Coloured lights entering the eye brought with them aspects of the materials from which they were reflected. Red things were seen as 'fiery', green as 'watery', etc. Once internalized, colours could interact with the soul, which could itself be considered as an elemental composite.¹²

Sight is a faculty that operates over a distance. However, whilst an object can be simultaneously seen by several people, the sensations of colour that the object elicits in those people are not necessarily the same. Two people looking at, and moving around, the same polychrome sculpture will see different things depending on their previous experiences and current expectations. (Of course, the same is true of all sensations received through any of the senses but, with sight, the fact that the same stimulus could provoke different experiences in different individuals could have been rationalized in terms of interactions between intramissive and extramissive rays.¹³) And, because of the non-negotiable linkage between colours and their sources, the historic experiences and

⁸ Cited in Osborne 1980, 99.

⁹ Titian was the son of a mine manager and was friends with colourmen, both professions being underpinned by alchemy. See Bucklow, forthcoming.

¹⁰ Is it merely coincidence that Titian's alchemical colours are those that are still strongly linked in the vernacular to materials (pitch, snow and blood)? More generally, see for example, Pulliam 2012, 3–14.

¹¹ Dante, *Vita nuova*, see Akbari 2004, 121–125.

¹² From Aristotle, *On the soul*, (423a), 131, to, for example, Donne, 'Love's growth', in *Complete Poems*, 21.

¹³ For a discussion of intramissive and extramissive vision in the context of scopaesthesia, see Sheldrake 2005, 32–49, plus 'Open Peer Commentary', 40–116 and 'Response to Commentators', 117–126.

expectations of colour that influenced its visual reception would have been determined in part by people's non-visual interactions with the materials that supplied those colours.¹⁴

In contrast to the colour sensations obtained by sight – which were essentially mysterious and only theorized by the few – sources of colour were widely accessible and numerous people were practically involved with them as materials to be mined, cultivated, processed and traded. Coloured materials literally passed through many hands in many contexts and could therefore be perceived through the sense of touch. The primary producers of colour had intimate haptic knowledge of their materials; however, such knowledge could be localised due to the restricted geographic occurrence of some coloured materials. Full knowledge of the lac insect's stickiness might, for example, have been restricted to India. But the end-users of coloured materials, like the Europeans who painted with lac, would have had their own sets of haptic experiences. These too would have been restricted to individuals – unlike vision, the sense of touch does not operate over distance – but those individuals were parts of communities and their haptic knowledge could be recognised, if not directly experienced, within those communities. The haptic knowledge of experts was accepted as part of the embodied skills that were integral parts of craft 'mysteries' and alluded to in popular literature.¹⁵

The fact that haptic knowledge required first-hand experience meant that craft mysteries involved craft 'secrets', the necessary knowledge being essentially un-communicable and embodied, or 'secreted', in muscle memories. The painters who prepared wooden sculptures for polychromy would, for example, have known the correct strength of their animal-glue-in-water by testing its tackiness between finger and thumb. That glue would be mixed with gypsum or chalk and applied to the wood. After applying that first layer, subsequent layers were applied and, if done too soon, the later applications would disturb the earlier ones, but if done too late, the later layers might flake off. The polychrome painter's haptic senses would have helped tell when to apply subsequent layers – the previous layer had to be dry to the touch, but it also had to be cold. (If the first layer contained too much water, it would be liable to being picked up by subsequent layers. This would result in uneven application. If it contained too little water, it would adsorb water from the subsequent layers. This would result in uneven application and maybe also delamination. If the layer was dry but cold to the touch, then evaporation was still taking place, so it was not too dry.) The painter's haptic clues would have been accompanied by visual clues that involved subtle changes in the previous layer's hue and opacity. (When the layer contained water, it was slightly translucent so could convey the warm colour of the underlying wood. As the layer dried, water was replaced by air voids which scattered light within the layer rendering it more opaque and reducing the visual effect of the underlying wood.)

¹⁴ I have approached these linkages and influences elsewhere. See Bucklow 2009 and 2014.

¹⁵ For example, glass making in de Lorris & de Meun, 2008, 249 and Chaucer, 'Squire's Tale' (I) 1975, 414.



Fig. 1 Mixing gypsum and animal glue with water.

Some of the artist's haptic experiences of creating works of art were not available to viewers of the finished objects. However, some devotional and even liturgical practices involved touching. Priests ritually handled objects and kissed manuscripts, especially missals, and the pax or osculatory. Owners of prayer books and books of hours could also interact with their private manuscripts in a tactile manner, leaving evidence of their acts of affection.¹⁶ Altarpieces were not intended to be treated in such an intimate manner, but the Thornham Parva Retable shows signs of having been repeatedly touched and kissed after having been rescued from a Priory in the mid-sixteenth century and housed in a private attic chapel.¹⁷

¹⁶ Rudy 2011.

¹⁷ Bucklow 2003, 209–217.



Fig. 2 Applying multiple gesso layers.

Lips and fingertips are the most sensitive areas of skin – the organ of touch – so those who kissed and touched works of art would have had keen perceptions of the different textures associated with different colours. And the evidence offered by surviving medieval polychromy indicates that variations in surface texture were just as important as variations in colour. Very rough deep blues were created by strewing coarsely ground crystals of azurite onto a thin layer of oil and very smooth rich red were created by embedding lac within thick layers of oil. (Although museums discourage touching objects, the evidence of abrasion indicated that touching was a common historic response to objects. Differences in paint surface texture can be felt when handling reconstructions of historic objects.) Gold could be applied as a powder or as a leaf that could be burnished, left matt, or covered with glazes thus varying colour by varying texture.¹⁸ Optical cues about texture – such as specular or diffuse reflections – could correlate with haptic experiences to create an almost synesthetic experience of visual textures.

¹⁸ The word ‘matt’ derives from the Arabic for ‘dead’ (as in the chess term, ‘check mate’, or ‘the Shah is dead’). This implies that non-matte coloured surfaces were perceived as ‘alive’.



Fig. 3 Punching decoration in burnished gold.

Connections between colour and the sense of hearing were available to artists but not directly to those who appreciated finished works of art.¹⁹ For the artist, sound provided a key indicator in some hidden colour-generating processes. For example, vermillion was made by mixing mercury with sulphur to make black metacinnabar which was then sublimed to make the red pigment. The transformation took place out of sight in a sealed jar. In the early twelfth century, Theophilus described the process saying ‘bury [the jar] in blazing coals and as soon as it begins to get hot, you will hear a crashing inside, as the mercury unites with the blazing sulphur. When the noise stops, immediately remove the jar, open it and take out the pigment.’²⁰ The colour red has long been associated with conflict and passion so the crashing sound that announced vermillion’s birth was incomplete accord with the colour’s symbolism.²¹

¹⁹ On the other hand, in the assessment, as opposed to appreciation, of works of art, sound did contribute to understanding crafted artefacts – the heard response to tapping, for example, could help to determine materials and degrees of solidity.

²⁰ Theophilus, 40.

²¹ Bucklow, 2016.



Fig. 4 Juxtaposed gloss gilding and matt (egg tempera) paint.

Painters used many different coloured materials, each with its own origins and its own requirements for preparation in the workshop. They were aware, for example, that the same coloured pigment could create different coloured effects when mixed with (relatively) colourless media like glue, egg, gum, oil or resin. They also knew that the same coloured pigment could create different coloured effects when ground into coarse or fine powders and the evidence offered by medieval polychromy indicates that painters could sort the size of their pigment particles with a surprising degree of control.²² Since the colour of a pigment could change with its enveloping medium as well as its particle size, the person grinding the pigment could not usually judge the correct degree of grinding by colour.²³ The sense that guided them was hearing – when grinding an earth pigment, for example, the initial noise was like scratching on blackboard then, as the particles got smaller, the unpleasant scratching turned into a continuous shriek, then a hiss and finally a mellow hum or rhythmic song. The sound of pigment between muller and slab told you the particle size and helped you decide when to stop grinding.

²² van Asperen de Boer 1974. See also Theiss 2015, 24–25.

²³ There were some exceptions, like azurite and malachite.

Smell was also mainly confined to the production of raw colour rather than the appreciation of finished coloured products. However, whilst most sounds associated with the production of colour were only perceptible in the workshop, some of the smells associated with colour production could be perceived from afar. The smelliest colour making processes were those that used stale urine, which included most dyeing operations. For example, the Imperial Byzantine purple came from Tyre, a town that was famous for its stench of stale urine.²⁴ Spectacularly coloured high status textiles and clothes were indelibly linked in the popular imagination with foul water and sewers because all dyed cloth involved treatment with urine. Such textiles and clothes were recycled by artists to make (usually transparent red) paints.

Towards the end of the sixteenth century, Nicholas Hilliard counselled the miniature painter, or 'limner', to use sweet-smelling ingredients. This was probably to enhance the status of the limner – usually a male who he thought should be considered a gentleman – and to make the experience of sitting for the portrait more pleasurable for the high-status client. Hilliard particularly warned the painter off the use of orpiment, verdigris, verditer, pinke, lap green and litmus as 'ill-smelling colours'. It is perhaps relevant that he also considered these ill-smelling colours to be 'ill-tasting colours'.²⁵ Smell and taste are intimately connected senses. And Aristotle connected them both with sight as he said there were 'seven savours' as there are seven colours.²⁶ (The number seven was of course also associated with planets and their earthly counterparts, metals, and through them, also the colours. Following Albertus Magnus, Cennino Cennini said there were 'seven natural colours', four mineral pigments and three helped artificially.²⁷ Traditionally, the head also had seven orifices – two eyes, two ears, two nostrils and a mouth – through which colours could interact with the soul, in addition to the skin.)

Tasting the materials that provided colour involved taking them in by mouth. This allowed them to interact with the body, just as taking them in by eye allowed them to interact with the soul, and for this reason, artists' colours were often obtained from the apothecary. Some colours, such as vermilion, were known to have harmful effects on the body whilst others were considered to have beneficial effects on body and soul. For example, according to Albertus Magnus, lapis lazuli was taken by mouth to lower fevers and dispel melancholy.²⁸ The presence of lapis adhered to teeth in the skeletal remains of a twelfth-century woman were interpreted as evidence that the woman was a painter who was in the unfortunate habit of licking her brush.²⁹ This is unlikely, given a contemporary understanding of the potentially dangerous nature of many pigments and given the fact

²⁴ Strabo 1960–69, vol. 7: 269.

²⁵ Kinney 1983, 29–30.

²⁶ Aristotle, *On the senses*, (442a), 245.

²⁷ Cennino Cennini, 20–21.

²⁸ Albertus Magnus, *Book of Minerals*, 115, 125.

²⁹ Radini et al. 2019.



Fig. 5 Reconstruction of a Cimabue crucifix by Lara Broeke and Kristin Kausland.

that lapis lazuli was the only pigment found in her teeth. A simpler alternative explanation might be that the woman suffered from fever or melancholia and took the lapis as a medicine.

Every one of a person's senses could be engaged with the colours that resided in medieval works of art. Indeed, the boundaries we perceive between the senses are historical constructs, and it has been suggested that medieval and early modern concept-

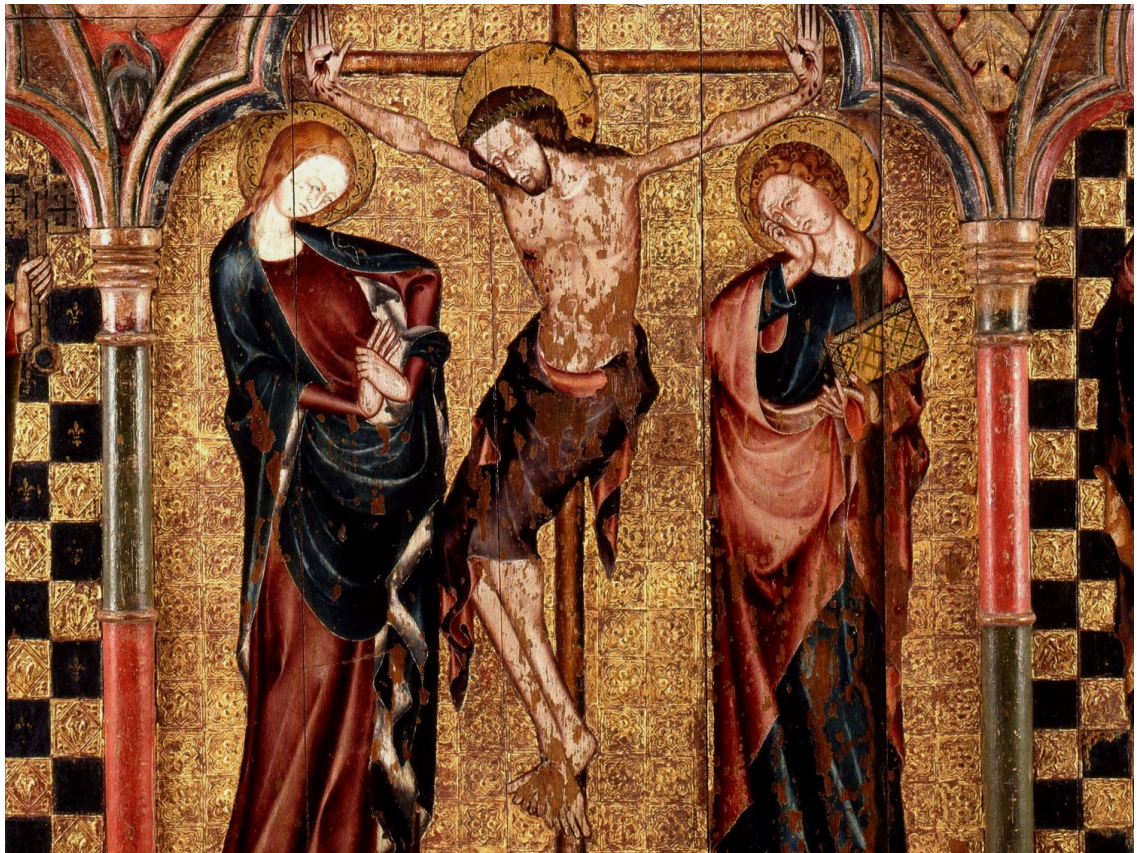


Fig. 6 Paint loss due to kissing Christ on Thornham Parva Retable, (detail) c.1330.

tions of the senses were relatively blurred. To see the Eucharist was to consume it and to see the Passion was to be consumed by it.³⁰ And the attributes associated with each pigment – their colour, feel, sound, smell and taste – were not connected arbitrarily since they were foundational to the Doctrine of Signatures. This doctrine was evident (if not formally explicated) in the classical and medieval post-rationalisations of the natural world and it even underpinned early modern understanding of how humans interacted with their environs, both natural and artificial.³¹

Concluding remarks

Due to surface abrasion, fading and the degradation of materials – not to mention human interventions such as iconoclasm and restoration – the colour of a historic polychrome object today has a very complex relationship with its original colour scheme. The

³⁰ Sadler 2018.

³¹ Preston 1993, 263–70.

manufacture of historically informed reconstructions of museum objects by conservators goes some way to recreating the sensual impression of pristine polychromy. However, the physical context in which the polychrome object is encountered has a significant effect on its sensual impact, so the placement of historically informed reconstructions in churches, rather than museums for example, is therefore instructive. Yet, even when placed in a sympathetic environment, a historically informed reconstruction of a polychrome object is still liable to be primarily processed by sight – over and above feel, sound, smell or taste – and with an assumption that the senses are separate. This paper has tried to suggest that the people for whom the polychrome objects were originally made would have had radically different assumptions about their sensual relationships with works of art. We may not be able to reconstruct those sensual relationships, but we can at least try to acknowledge them in our imaginations.

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