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Investigation into the colours of the DunHuang murals from the Tang Dynasty

Zhaohua Lei [1], Elza Tantcheva-Burdge [2] and Vien Cheung [3,*]

[1] Poli.Design, Italy; lzhdesign2018@gmail.com
[2] Independent Art Historian, UK; etan711@talktalk.net
[3] School of Design, University of Leeds, UK; t.l.v.cheung@leeds.ac.uk
* Corresponding author: t.l.v.cheung@leeds.ac.uk

Abstract

In 1961 the site of the MoGao cave temples was recognised as one of the State Priority Protected Sites by the State Council of the People's Republic of China and was put under the protection of the national laws including the Law on the Protection of Cultural Relics. In 1987 UNESCO added the MoGao Caves to its protected World Heritage Sites as one of intrinsic unmatched historic value to humanity. The present paper assesses the appearance of colours in the representational system of the murals from the Tang period (618-907 AD) with a view to gaining a deeper understanding of the DunHuang murals as emblematic of Chinese civilisation. Thus the use of colour will be discussed in the context of the traditional 'five colour system'.

Keywords: *DunHuang murals, Ancient Chinese art, Colour appearance, Chinese culture, Wuxing*

INTRODUCTION

DunHuang is a Buddhist centre on the ancient Silk Road, in the Gansu province of China, known as the Caves of the Thousand Buddhas, consisting of 735 cells and temples, constructed over 1,000 years (366-1386 AD). The centre is famous for its MoGao cave temples of which 495 survive in a relatively well-preserved condition. It is accepted that the first caves were carved into the rocks in the fourth century AD and the most recent are from the fourteenth century AD.

The DunHuang centre was modelled on the existing Kizil caves Buddhist centre and the influence of the Kizil style was at its strongest in the earlier periods of the development of the MoGao temple caves. Scholars consider Kizil to be the earliest major Buddhist cave complex in China, with development occurring between the third and eighth centuries AD. It comprises a set of 236 cave temples excavated into the rocks and extending for some two kilometres in a general east-west direction. As in the case of DunHuang it is situated on the Silk Road. At the time of their creation the Kizil Cave temples were part of another Buddhist Kingdom, that of Kucha (or Kuche), though its territories are now part of the Aksu Prefecture, Xinjiang, China. However, the Tang Dynasty ruled Kucha after 658 AD and this caused a reversal, with its Central Plains culture increasingly influencing the paintings in the Kizil cave temples, evidenced by the adoption of styles and colours found in the seventh and eighth century decoration of the MoGao temple caves (Li 1994: 83-85).

All the Kizil caves are elaborately decorated with murals and it is considered that the influences shaping the art of the Kizil caves came from the cultures of South Asia, India, Iran, and the coastal areas of China. This was aided by the fact that Kucha was an important commercial centre on the Silk Road. This enabled Kucha, and in particular the Kizil Buddhist centre, to play a major role in the dissemination along the Silk Road of Buddhism and its art.

As in Kizil all the MoGao caves are elaborately decorated with murals, the total area being about 45,000 square metres, and over 2,000 coloured sculptures. In some of the temples the decoration covers not just the walls but also the ceilings. Because of the wide time span through which the complex was developed and its good level of preservation, the MoGao caves are considered, both nationally and internationally, to provide a compendium of Chinese art, particularly evidencing the evolution of Buddhist art in the north-west region of China.

The aim of this paper is to make an initial assessment of the appearance of the colours in order to evaluate the relative constancy in the use of colour in these caves throughout the Tang Dynasty period. Our hypothesis is that the number of colour hues used will be relatively constant. This is not just because of the limited number of pigments available, but also because of the influence of Taoist cosmology within the Chan (Zen) School of Buddhism. This School is directly associated with the Tang period.

COLOUR OF THE MURALS FROM THE TANG DYNASTY

The methodology used for this investigation was designed to overcome the constraints imposed by the Covid-19 pandemic by conducting the study using images created for the virtual museum of the MoGao caves (Dunhuang Academy, 2020). Generally, historians recognise four major stages in the development of the Tang Dynasty: (1) the Early Tang period (618-712 AD); (2) the High Tang period (713-766 AD); (3) the Middle Tang period (762-827 AD) and (4) the Late Tang period (828-907 AD). To carry out our investigation, those murals considered by scholarship to be particularly significant examples of Buddhist art from each period will be selected. Each colour in the selected digital images is then identified as the nearest match within the Pantone Colour System using its digitalised version. The use of colour will be discussed in the context of the traditional 'five colour system'.

Wuxing and the Chinese Traditional Five-Colour System

The Chinese term *Wuxing* (usually translated as 'five processes', 'five phases' or 'five elements') is used for a conceptual theory that has been a constant feature of traditional Chinese thought and culture. The five elements were considered to be independent, but at the same time interlinked. Before the Han Dynasty, when the initial idea was formed, the elements were associated with natural phenomena and seasonal changes, bringing an understanding of the workings and development of the Universe. These five elements were: Wood, Fire, Earth, Metal, and Water (see Figure 1a and Table 1).

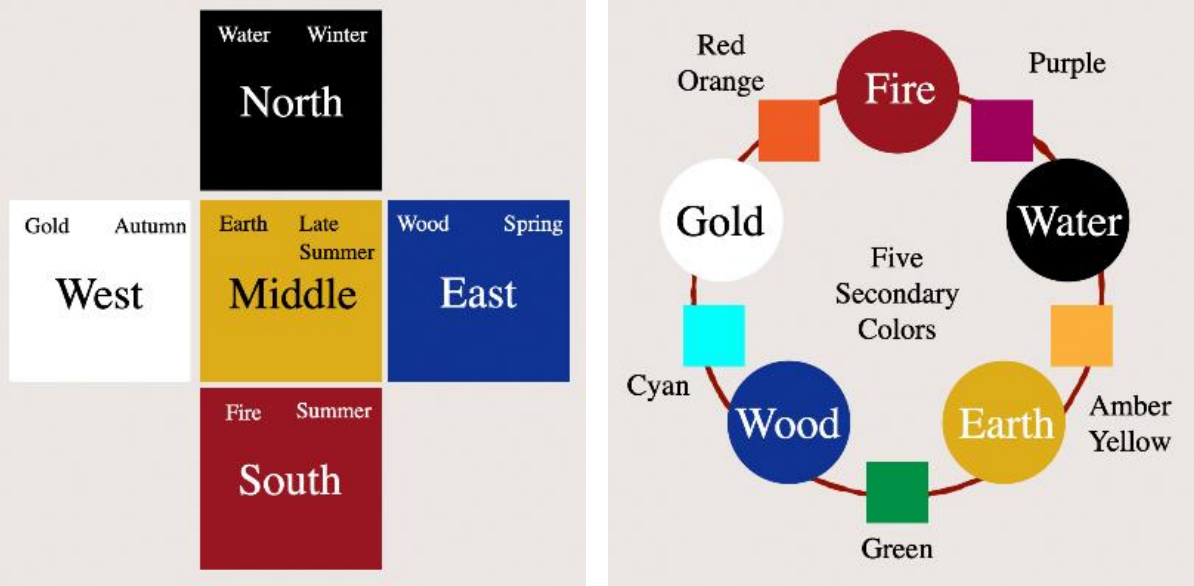

Figure 1: Relationship between the "five-colour system" and (a) direction; (b) secondary colours.

Element	Fire	Wood	Earth	Metal	Water
Colour	Red	Blue	Yellow	White	Black
Direction	South	East	Centre/middle	West	North
Season	Summer	Spring	Change of season	Autumn	Winter

Table 1: Relationship between the "five-colour system" and colour, direction and season.

The first proposed universal use of the 'five elements' conceptual system is found in "Book of Documents", one of the "*Five Classics*" written during the Zhou dynasty (1046-256 BC). In those texts were associations with directions, colours, spirits, and proper rituals that were later enshrined in the Confucian classics, in particular the books *Shijing* (Classic of Poetry*)* and *Rites of Zhou* (2nd century BC), dating respectively from the 11th to 7th centuries BC and the 2nd century BC. Those were used initially to regulate early Chinese dyeing techniques for the production of maps and paintings during this period thus leading to the development of the traditional Chinese 'five-colour' system (Tseng 2003: 192-197). Moreover, *Wuxing* assisted in describing, analysing or regulating the relationship of the elements within different spheres of human life - political, social and cultural. For example it assisted in complying with rituals and numerous hierarchical regulations such as those relating to the use of colour in people's clothing or the colours of their ornaments. Thus colours began to occupy an important place in all aspects of Chinese culture (Chen 2015: 369).

In brief, the five colour system includes three chromatic colours and two achromatic ones: red, blue, red, yellow, white, and black. In a broad sense they are independent sets of colours. There does not seem to be a suggestion of their optical qualities and thus no interest in the visual interrelationship between them. Moreover, the three colours occupy only part of any western colour system, but instead mirror the *Wuxing* conceptual system (Xiao 2013: 185-187).

A relationship between the five colours and the five phases or elements in *Wuxing* was developed gradually. By its overarching nature *Wuxing* established a defining association between the five colours and natural phenomena and also concepts of space and time amongst others (Xiao 2013: 191-195).

In painting, the mixing of pigments or the presence of natural impurities could result in 'secondary' colours, which are employed and are also considered within the 'five-colour system'. For example, green (blue + yellow), cyan (blue + white), red orange (red + white), amber yellow (black + yellow), purple (black + red) as shown in Figure 1b. In the case of the mixing of chromatic and achromatic colour usually the chromatic one is the defining 'element'; in case of the colour green it is associated in tandem with the blues and cyans with Wood (Chen 2015: 368-369).

Research shows that a number of mainly inorganic but also some organic pigments were used in creation of the DunHuang murals from the Tang Dynasty period (Xu 2007). For greater clarity the list of the pigments so far identified is presented here in tabular form (see Table 2).

Colour	Red	Blue	Green	Yellow	White	Black
Pigment	Haematite, Cinnabar, Red lead	Lapis lazuli, Azurite	Malachite, Verdigris	Ochre, Orpiment, Gold leaf, Organic pigments	Calcite, Kaolin, Basic Lead, Oyster shell, Gypsum	Vegetable black, Black lead

Table 2: List of pigments identified for the creation of the DunHuang murals from the Tang Dynasty period.

This would have allowed the creation and use of the above mentioned 'secondary' colours. However, in at least one such case, green, it appears that green-coloured pigments were used. This leaves open the question about the use of any other secondary colour(s), which will be determined in the next part of this investigation.

Appearance of the colours in the main palette of the DunHuang Tang murals

The construction of the DunHuang Buddhist centre began in the Early Tang Dynasty (618-712 AD). Over its 94 years 46 caves were dug. The walls were then plastered using local iron-rich clay and the mural colours were applied over that, thus helping to create compositions with a warmer tone overall compared to those from the later periods. Nevertheless, because of natural variations in the chemical composition of the plaster base and perhaps because of the interplay between adjacent colours the final appearance of the various murals from the early Tang Dynasty also varies, but only to a limited extent.

The image that was analysed for the purposes of this paper is the central composition on the south wall of Cave 322 (Figure 2a). Initial examination indicated that all the general hues in the traditional Chinese 'five colour system' were used in this mural, together with one of the 'secondary' colours, green. Moreover, a new combination of gold and earth yellow had been added. However, because of the specific optical properties of gold, for the purposes of this investigation only the appearance of the colour yellow was considered. Despite the already mentioned foreign influences on the DunHuang style, especially in the Early Tang period, it has to be stressed that the choice of colours is considered to have been primarily influenced by the local Chinese colour preferences (Zhou 2000).

Over the High Tang period (713-766 AD) the DunHuang style was established. It is considered that 97 caves were excavated and decorated during this period. The mural on the north side of Cave 217 (Figure 2b) is well preserved and is one of the outstanding masterpieces of the murals executed at the most prosperous time of the Tang Dynasty. The overall tone of the whole painting is again warm, but more intense than that of the murals from the early Tang period as the colours were made with less mixing of pigments, thus appearing more saturated and vibrant (Zhou 2000). Moreover there could be noted an even wider use of gold, compared to the previous period. Research considers that to be a result of the increase in the influence of Buddhism as a defining force in the structuring and maintenance of Chinese Imperial power. As a result gold leaf and vibrant, 'secular' colours perceived as 'colours of wealth' began to be widely used in paintings (Meng, 2008).

During the Middle Tang period (762-827 AD) 55 new cave temples were created. This was a period of continuous internal and external struggles as there were countless wars, battles and skirmishes with the Tibetan Empire (618-842 AD) resulting in considerable territorial losses. The political and economic instability in the period impacted on the production of art and the opulence and refinement of the murals made in the Early and especially in the prosperous High Tang Period was lost. The early golden and vibrant tones were replaced by a mainly lighter, paler palette. These light paints appear to have been thinly applied, with a dominance of flat green and yellow, and outlined with ink (Meng, 2008).

An example of the Middle Tang period mural art is the image of the central mural on the south wall of Cave 159 (Figure 2c), where more obvious changes in the use and the appearance of colour can be noted. Green was used on a much larger scale either as a single colour or in a number of very similar adjacent tones, though red and other warmer tones could also be found in the compositions. The base undercoat of the murals was now white earth and the intensity of the colours of the murals appeared to be greater. It could be argued that those changes are to some extent a consequence of periodic changes in the *Wuxing* rules in general and those relating to art and its production in particular. At the

same time there were still some murals from the Middle Tang period that were painted over an iron-rich undercoat, as in the previous two periods (Meng 2008).

In the Late Tang period (828-907 AD) DunHuang saw the excavation of 71 caves. This period saw a continuation of the style of the Mid-Tang Dynasty that was dominated by light blue and green tones, as is illustrated in a mural from the decoration of Cave 12 (Figure 2d). The influence of Tibetan religious art is still noticeable but there are stylistic changes. They have been attributed to the growing cross-fertilisation between the previously separate aesthetics of secular art found in the Western Regions of the Late Tang Empire and that of the existing style of religious paintings. Scholars concluded that this, on the one hand, revitalised the paintings from the period, compared to the Mid-Tang period and, on the other hand, prepared the foundation for the emergence of the style of the Western Xia Dynasty (1038-1227 AD) and its significantly different use of colour (Meng 2008).

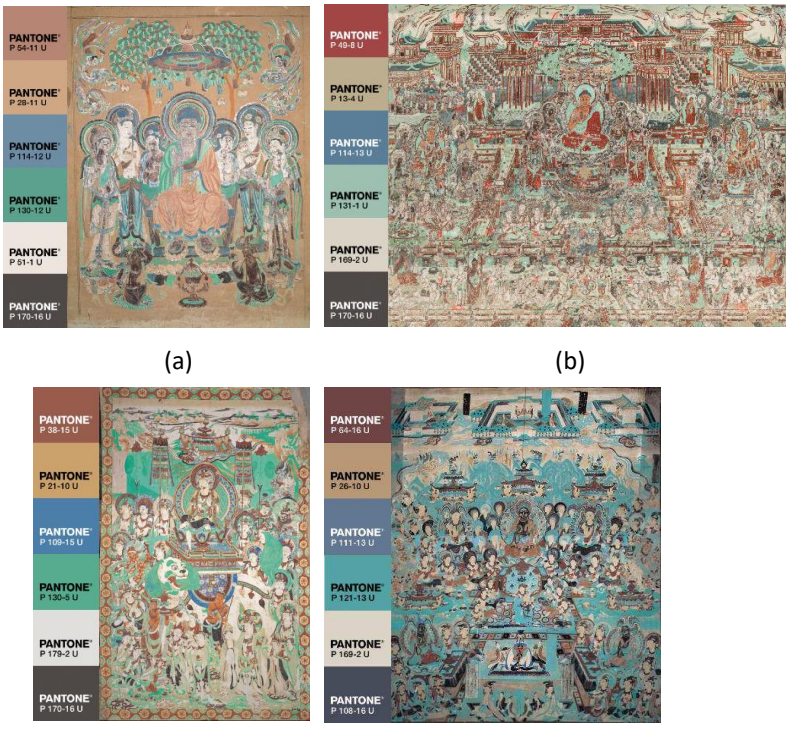

Figure 2: Colour palettes used in (a) Cave 322 in the Early Tang Period (618-712 AD), (b) Cave 217 in the High Tang Period (713-766 AD), (c) Cave 159 in the Middle Tang Period (762-827 AD) and (d) Cave 12 in the Late Tang Period (828-907 AD).

Our findings are summarised in Table 3.

Colour	Red	Yellow	Blue	Green	White	Black
Cave 322	P 54 - 11 U	P 28 - 11 U	P 114 - 12 U	P 130 - 12 U	P 51 - 1 U	P 170 - 16 U
Cave 217	P 49 - 8 U	P 13 - 4 U	P 114 - 13 U	P 131 - 1 U	P 169 - 2 U	P 170 - 16 U
Cave 159	P 38 - 15 U	P 21 - 10 U	P 109 - 15 U	P 130 - 05 U	P 179 - 2 U	P 170 - 16 U
Cave 12	P 64 - 16 U	P 26 - 10 U	P 111 - 13 U	P 121 - 13 U	P 169 - 2 U	P 108 - 16 U

Table 3: Colour palettes, presenting in the closest match of the PANTONE® CMYK Uncoated guide set, of the DunHuang murals from the Tang Period.

DISCUSSION

From an examination of the existing scholarship on the use of colour in Chinese art and, in particular, the DunHuang murals from the Tang period it became apparent that thematically and stylistically the compositions of the MoGao caves absorbed many influences from Buddhist art mainly of Central Asia, India, Iran and Tibet. Moreover, throughout the Tang period the use of colour changed. Whereas in the Early and High Tang period the palettes were dominated by reds and yellows, with the added use of physical gold, by contrast in the Middle and Late Tang periods the palettes became dominated by light blues and greens.

Nevertheless, research indicated that the palettes were always constructed according to the *Wuxing* conceptual system that ruled every part of the human life. Therefore, in every period of the Tang Dynasty, the palette followed the traditional Chinese 'five colour system' without deviation. Furthermore, despite the considerable number of pigments found to have been used in the DunHuang cave temples, there is only one 'secondary' colour which, it must be stressed, does appear to be part of the extended 'five colour system'. Even for that a separate pigment was used, rather than creating the colour by mixing two other pigments. This leads to the conclusion that the intensity and vibrancy of colours was of a special significance at that period.

To conclude, the present work is yet another step towards building an understanding and appreciation of the significance of the DunHuang complex as emblematic of Chinese civilisation and the Tang Dynasty Buddhist art in particular. Moreover, the results of this work prepare the ground for further investigation into the aesthetics of the representational system of these murals, as part of the national and world cultural heritage.

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