



# Examination of 14–15th century Buddhist wall paintings from a cave complex in Saspol, Ladakh

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## ABSTRACT

Buddhist wall paintings from a cave complex in Saspol, Ladakh, India, dating to the 14–15th century, were taken up for a study of their painting technology. Paint micro-samples were investigated by scanning electron and optical microscopy, and multi-spectral imaging of the paintings conducted at site. Azurite, vermilion, orpiment, indigo, and madder are the main inorganic and organic pigments identified. Pigments were typically applied in one or more layers on the wall surfaces, depending on the painting scheme and on the colour finish desired. The materials and techniques employed for the Saspol paintings are consistent with those known to exist in the region up to that time, with no indications of any new external influences as made out for their artistic style or iconographic content.

## 1. Introduction

Located in the Ladakh region in northern India, the small village of Saspol hosts a cultural site that incorporates several components: a castle from the 8–9th century, a group of chortens, and a series of historically significant caves (Fig. 1). Five of these caves contain an impressive group of Buddhist wall paintings, executed in an Indo-Tibetan style. They have been ascribed to the 14th or 15th century, although their dating is still under some debate. Detailed studies of the iconographic program present in these paintings have been published (Snellgrove and Skorupski, 1977, 79–81; Singh, 1985, 143–146; Bellini, 2014). The paintings are significant for a study of painting techniques in the region. They represent an important stage in the development of an indigenous artistic style following new influences from Central Tibet from the 13th century onwards, supplanting an earlier Kashmir-influenced style that prevailed up to that time (Vitali, 1996, 96; Luczanits, 2004, 7).

The Saspol caves and the paintings they contain are an invaluable part of the cultural heritage of Ladakh. However, their current conservation state is highly delicate. The main concern is the gradual erosion and subsidence of the hillside on which the caves are located, leading to the collapse of the front portions of two of the painted caves at some time in the past. The direct exposure of some of the paintings to the elements of nature, detachment of the render, and rampant flaking of the paint layer are other threats posed. The treatment of the site as a

whole, and paintings in particular, is being carried out after an exhaustive condition assessment (INTACH, 2015). Characterization of the painting materials is much needed to help in the decision-making process for their best possible conservation treatment.

Available published studies provide an insight into the technologies employed for the execution of Buddhist wall paintings elsewhere in Ladakh and its immediate surroundings (summarized in Table 1). The early paintings in the Kashmir-influenced artistic style at Alchi, Sumda Chun and Nako, ascribed to between the 12th and early 13th centuries, have been studied *in situ*, and laboratory analyses performed on paint samples for their characterization (Goepper et al., 1996, 273–276; Bogin, 2005; Gill et al., 2014; Bayerová, 2017). Relatively later paintings, from the 14th to 16th centuries, at Kanji, Wanla, Leh, and Basgo, have likewise been subject to scientific studies for a better elucidation of their original materials and techniques (Nicolaeescu and Alexander, 2008; Dhar, 2010; Skedzuhn et al., 2013; Oeter and Skedzuhn-Safir, 2015). Such studies, however, are overall very few and do not yet present a complete picture of the development of painting technologies in the region. An examination of the Saspol paintings presents an opportunity to better understand the transitions that may have taken place in local painting technologies with the passage of time. The results of this study would therefore not only provide valuable information on the material character of the Saspol paintings to help in their conservation, but would also generate much needed data to place them in the context of Buddhist wall paintings in the wider region around.

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Fig. 1. General view of the hillside with the caves. The location of the main or central cave is shown with a white arrow.

## 2. The site

The village of Saspol is about 35 km away from the district centre Leh, located on the highway that connects Leh with the town of Kargil to its west, and to Srinagar in Kashmir beyond. The caves themselves are situated on a low hill behind the settlement, about a kilometre away from the highway. From the base of the hill, a relatively wide path leads up to the most frequently visited central or ‘main’ painted cave (numbered Cave 3 by Snellgrove and Skorupski, 1977, 79), distinguished from the others in the ensemble by its whitewashed and red-painted exteriors (see Fig. 1). Two other painted caves flank the main cave, while two more are located further uphill, closer to a ruinous fort that is prominently perched on the hilltop. The interiors of these caves have been artificially shaped to create formalised chambers, the ceilings being left unaltered. All the painted caves are believed to have functioned as temples in the past (Sonam, 2013, 9).

The paintings in the main cave, the most elaborately decorated of the lot, were taken up for the study. All the walls within this cave are painted with figurative and decorative schemes in a rich colour palette. Significant compositions include a finely rendered principal Buddha figure seated on a lotus throne in the centre of the wall (oriented north) opposite to the entrance, with other important deities painted around (Fig. 2). The top register of the same wall has a series of *Mahasiddhas*, each involved in a different activity. On the other walls, a band painted all around at the bottom depicts the life story of Lord Buddha through a series of painted scenes. It begins with his birth on the east wall, continues on to the south wall with various scenes from his childhood to adulthood, and ends with his demise on the west wall. The west wall also contains a particularly fine representation of *Sukhavati* paradise, the abode of the celestial Buddha Amitabha. In general, all the figures on all the walls are finished in great detail with respect to their features and iconographic attributes. Varying tones of the primary colours along with green, black and white are found employed in their execution.

## 3. Materials and methods

The paintings were visually examined in detail at site, prior to their sampling. This was followed by context and detailed imaging of the areas to be sampled. Micro samples through the paint layer (as cross-sections), representative of the entire painting scheme, were then taken from inconspicuous areas of the paintings for analysis. A total of 15 samples taken in this manner were investigated at the Archaeological

Materials Science Laboratories of UCL Qatar.

The samples were first observed and documented using a Leica M205A stereomicroscope, and preliminary analyses conducted using a Fischerscope XUV 773 bench-top X-ray Fluorescence (bXRF) instrument. Small amounts of the pigment were extracted from three of the samples (S-01, 05 and 07), and dispersed in Cargille Meltmount (Refractive Index: 1.662) for examination by Polarized Light Microscopy (PLM: Leica DM2500P) under transmitted plane polarized light (PPL) and polarized light with crossed polars (XPL). All 15 samples were then mounted as cross-sections in light-curing acrylic resin Technovit 2000 LC. The resin was set with the Technotray light curing device and the blocks were dry ground and polished with sandpaper and Micro-Mesh soft touch pads from 400 to 12,000 grits. The cross-sections were observed and documented under external incident light, using a Leica DM2500P microscope. All sections were further examined using an Olympus Vanox-T microscope fitted with an external ultra-violet (UV) light source.

Analysis was conducted with a Scanning Electron Microscope (SEM: JEOL JSM-6610LV) having an attached Energy Dispersive X-ray Spectrometer (EDS: Oxford Instrument X-Max<sup>N</sup>50), the latter operated with Aztec software. Imaging was carried out both with secondary (SE) and backscatter (BSE) electrons. The SEM was operated under high vacuum, working distance 10 mm, accelerating voltage 20 kV, process time 5, and acquisition time 60 sec live-time. The energy of the beam was calibrated periodically using a cobalt metal standard and setting the dead time at around 40% by adjusting the spot size from 58 to 61. All samples were carbon coated to improve conductivity.

In addition, some results from a separate study involving Multi-Spectral Imaging (MSI), notably the analysis of infrared false-colour (IRFC) images generated during *in situ* documentation (Menon and Gill, 2015), were incorporated to better elucidate the technology of the paintings. This relatively new technique is proving to be increasingly useful for the identification of pigments by non-destructive methods. Pigments are typically identified by their characteristic ‘false’ colours generated on combining selective components of image data sets taken under infrared (IR) and visible illumination (Dyer et al., 2013). Imaging was carried out using a Nikon D7000 camera, modified by removing the inbuilt UV-IR block filter, and a pair of Wistro AD360 external flashes. Various filters and their combinations were used on the flashes and camera lens for excitation and image capture respectively. IRFC images were generated using *bm-workspace.ws* – software and *nip2-7.34.0* software.

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