

The secrets of a 14th century wall painting in the Western Himalayas: Structural damage sheds light onto the painting technique in the Tsuglag-khang in Kanji in Ladakh

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Fig. 1 Kanji village, with the Tsuglag-khang located to the left of the river, source: Christian Luczanits 2003

The remote village of Kanji is situated on a cross point of three valleys at an altitude of 3,875 meters in the Kargil district of the Ladakh region in Jammu and Kashmir State of India. One of the village's most remarkable structures is the Tsuglag-khang (gTsug-lag-khang), with 700-years old wall paintings and sculptures. Until today, this art-historical treasure is largely unknown in professional circles.

Over the centuries, more and more layers of earthen material have been put onto the temple roof and have

led to major structural problems within the earthen architecture. After the structural conservation works were carried out by the Achi Association, the organisation could address the conservation of the wall paintings and sculptures.

The secco paintings, typical for the region and the period, mainly depict mandalas. Damaged areas caused by infiltrating water allowed for a profound insight into the painting process which an investigation of an undamaged wall painting would not have been able to confer.



Fig. 2 Tsuglag-khang before conservation, source: Christian Luczanits 2000

Other findings were obtained by inspecting the paint layer with different methods of illumination and by microscopic investigations. In addition to the investigation on site, the painting support, the medium and the pigments were analysed in two laboratories in Switzerland, the Expert Center in Zurich and at the Conservation Science Consulting CSC Sàrl in Fribourg.

This paper summarises and assesses the results of our research and aims at providing an insight into the sophisticated artistic working process of 14th century wall paintings in the Western Himalaya.

Introduction

Kanji is a small village in the Kargil district of the Ladakh region which belongs to the Indian State Jammu and Kashmir. It can be accessed through a small river valley from the village Heniskot which is located along the Srinagar-Kargil-Leh highway. The village is situated

on a cross point of three valleys at an altitude of 3.875 m and has about twenty families who farm the immediate area. The historic core of the village is placed on an impressive cliff looking over the valley (Fig. 1).

Approaching from the village and passing the mani walls and stupas the view opens towards the small single room structure of the Tsuglag-khang. Local tradition attributes this temple to the great translator Rinchen Zangpo (Rin-chen-bzang-po: 958–1055). Instead, the temple is approximately 700 years old and presumably dates from the period when Kanji was part of a local kingdom ruled from Wanla.

The temple lies on an eastward slope. This critical position of the gompa, namely on an inclination, in combination with the immense overload onto the roof in the course of several centuries, with additions of earthen material during each of these maintenance measures, have caused severe static problems to the building.

The Tsuglag-khang is a Drikung Kagyü temple and for generations has been used and taken care of by



Fig. 3 The throne platform with clay sculptures, source: Christian Luczanits 2003

one of the village families. 30 to 40 years ago the family addressed the static challenges by building a battered stone facing around the base of the temple. Then, in 1996, two external buttresses were built on the lower side of the slope with the help of Lamayuru monastery. Although these measures stopped further outward movement of the walls, the wall paintings had suffered severe damage as a consequence of the ingress of water resulting from these static problems. The instability of the walls caused cracks, and water seeping through the roof soiled and partly destroyed the paintings. In agreement with the caretaker family and the Drikung Kagyü Order, the Achi Association⁷ began with the conservation on the temple (Fig. 2).

After the structural conservation, the works concentrated on the conservation and cleaning of the wall paintings. Large areas of the paintings could be cleaned from earthen surface deposits and dirt, but in many areas the wall paintings are irreversibly lost due to water ingress and the subsequent washing out of the water

sensitive murals and plaster. The damaged paintings, on the other hand, provided the opportunity to investigate the various stages of the painting process which would have otherwise – with an intact paint layer – not been visible.

Description of the Temple

The temple is a cubic, one-room structure of about five to five metres with a flat roof and an entrance porch on its south side. The porch is formed with the extension of the lateral walls of the temple towards the south, and has a central pillar with a crudely carved capital. The most distinctive elements of the roof structure are the two brick-string courses resting on cantilevered willow sticks, which lie on three sides of the structure at roof-level. This building detail might indicate a former second roof. This presumption was supported by the caretaker of the temple who had told us that during the lifetime of his father, there used to be an additional roof

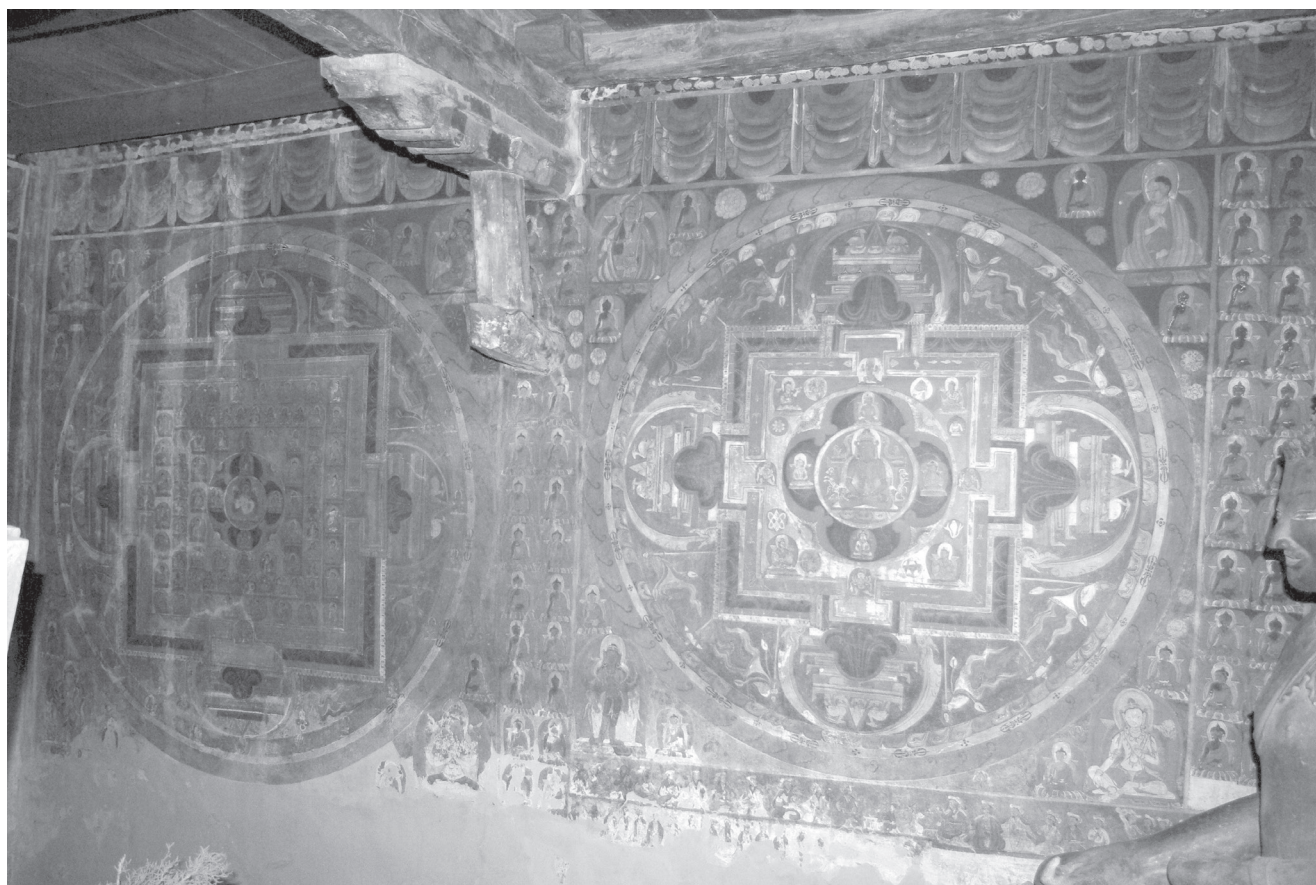


Fig. 4 East wall after conservation and cleaning, source: Martina Oeter 2010

on the temple which had been removed approximately 50 years ago to provide wood for another, more recent temple.²

The supporting structure of the building is made of river stones which serve as foundation. Adobe bricks are laid on top of this foundation covered on the exterior and interior by earthen plaster. The brick walls are 75 cm thick, equalling one and a half bricks. The only opening of the small temple is the doorway in the south, which provides little light for the interior. Opposite the entrance along the back or north wall three larger than life size sculptures are seated on lotus thrones side by side on a common throne platform, while the wall behind them and all the remaining walls are painted.

The three large polychrome clay sculptures depict the four-armed Bodhisattva Six-syllable Avalokiteshvara (Ṣaḍakṣara Lokeśvara; Chenrezik Yigedrugpa/sPyan-ras-gzigs Yi-ge-drug-pa in Tibetan) in the centre, flanked by the Medicine Buddha (Bhaiṣajyaguru; Menla/

sMan-bla) and the goddess Green Tara (Śyamatārā; Dölma Changu/Grol-ma ljang-gu; Fig. 3).

Behind the sculptures, the north wall is covered with the painted throne backs, and on the upper edge of the wall there is a teaching lineage providing the only clue in terms of age and school affiliation. As can be recognised from the figures at the beginning of the row in the upper left corner, this is a lineage of a Kagyü (bKa'-brgyud) branch of Tibetan Buddhism. The lineage starts in the top left corner with the primordial Buddha ('ādibuddha') Vajradhara. Seven figures of this lineage – including the great Indian adepts ('mahāsiddha') Tilopa and Naropa, and the Tibetan teachers Marpa, Milarepa, Gampopa and Phagmodrupa – are represented above the Medicine Buddha and seven more not individualized teachers continue this lineage above a depiction of Green Tara. The lineage does not give a decisive clue to the branch of the Kagyü School referred to here, but the total number of teachers depicted exceeds the most

common depiction in the Wanla Avalokiteshvara temple by one person and suggests an early 14th century date for the Kanji depictions.

The pillar in the centre of the room supports the main east-west beam. This beam visually divides the room into a southern and a northern half. The brackets supporting the beam also divide the side walls into halves, each of them filled with a large mandala. Thus, each side wall has a southern and a northern mandala depiction (Fig. 4). Corresponding with this layout there are also two mandalas to the right and left of the entrance doorway separated by the door, and a central representation above the door frame.

Wall Paintings

The painted surfaces are structured by dark yellow lines, and the top and bottom of the painted surfaces are decorated with common border motifs. At the top a row of geese and a valance motif representing a hanging cloth are used. At the bottom the painted area is demarcated by another common border motive, the so-called lozenge pattern actually representing a row of stylized and differently coloured pearls.

The west or left wall is dominated by two mandalas each covering half of the wall (Fig. 4). The space between them and underneath the main beam features repeated depictions of Buddha Akshobhya (Akṣobhya; Mikyöpa/Mi-bskyod-pa) in rows of two. To the left is a mandala with the Bodhisattva Vajrasattva in the centre of a four-petaled circle surrounded by four squares. As the presence of the Pratyekabuddhas and hearers (monks) within the mandala palace indicates, this is a variant of the main mandala of the ritual cycle 'eliminating all unfavourable rebirths' (Sarvadurgatipariśodhana). The corners outside the mandala are occupied by four central deities. Most significant among them is an unusual form of the goddess Sarasvati (Sarasvatī; Yangchenma/dbYangs-can-ma) in the upper right corner, blue and holding a sword and a book, the only other depiction of which is found at Wanla.³

The right side mandala is dedicated to the Buddha of long life, Amitayus (Amitāyus; Tsepa/kme/Tshe-dpag-med). This 13-deity mandala only consists of the central four-petaled lotus in a circle and the palace. Among the four main figures outside the mandala are the mythical teacher Padmasambhava in the top

left corner (Fig. 12), and a teacher wearing Indian monastic dress under the cape in the upper right corner. Again, it appears that this mandala is unique, but it can be related to the cycle to 'eliminating all unfavourable rebirths', as this also features a mandala of the King of Long Life (his full name being Aparimitāyuhpunya-jñānasambhāratejorāja). In addition, the association of Amitayus with Padmasambhava is known from other sites in the region as well, in particular the main niche of the Avalokiteshvara temple in Wanla.

Below the mandala a part of an extensive donor assembly is preserved. The top row features a drinking feast attended only by the male and a traditional row dance in which four turbaned men lead five women, the last one a girl. Women are seated underneath the men in the second row, and there is also a fragmentary remain of the vessels holding 'chang', the traditional alcoholic beverage.

The composition on the east or right side wall mirrors the one of the left with two mandalas taking most of the space and repeated representations of Buddha Akshobhya between them. Here, the north eastern or left mandala is centred on the teaching Buddha Shakyamuni (Śākyamuni; Shakya Thubpa/Śākya-thub-pa) dressed in monastic robes and bejewelled seated within an eight-petaled lotus. This is the Shakyamuni or Shakyasimha (Śākyasimha; Shakya Senge/Śākya-seng-ge) mandala of the ritual cycle 'eliminating all unfavourable rebirths', and its iconography largely conforms with its most frequent representation.⁴ At earlier sites, such as Nako and Alchi, this has been the only mandala represented from this cycle and thus was considered representative of it. In the corners around the mandala circle are an unusual three-headed and two-armed form of the Bodhisattva Avalokiteshvara,⁵ two red standing Bodhisattvas representing a rare form of the Bodhisattva and future Buddha Maitreya, and an eleven-headed, 22-armed form of Avalokiteshvara.

Underneath the mandala is a long inscription panel that begins in front of the platform for the sculptures and ends to the left of the eleven-headed Avalokiteshvara. On the other side of this Bodhisattva begins a depiction of the life of the Buddha with the first scene showing the Bodhisattva teaching the gods in Tushita (*Tuṣita*) Heaven. This narrative frieze continues along this and the entry walls, and may also have covered the bottom of the left part of the south wall.



Fig. 5 Paleolake 'moonland' near Lamayuru, one of the main areas where 'markalak' can be quarried, source: Verena Knippel 2006

The badly damaged second mandala on this wall is centred on the four-faced meditating Vairocana. Outside the mandala circle, and iconographically part of it are the unfavourable states of rebirth, the hells in the lower left, the hungry ghosts in the upper left, the animals in the upper right and the demi-gods ('asura') fighting the gods ('deva') in the lower right corner. A Bodhisattva sits in the hell, and a female dressed in local West Tibetan style is shown in the realm of the hungry ghosts. This is the main mandala of the 'eliminating all unfavourable rebirths' cycle. Also the entry wall features two main mandalas, here placed to the sides of the door. In general the wall is in fairly poor condition with large sections damaged by water ingress. What has been painted above the door, presumably a seated, four-armed form of the protector Mahakala (*Mahākāla*)

and attendant deities, is practically completely lost with only the row of riders to his right partly preserved. The life of the Buddha scenes once represented at the bottom of this wall are also extremely fragmentary.

Through the cleaning of that wall, the left mandala can now be recognized as a seventeen-deity Vajrapani (*Vajrapāṇi*; *Chakna Dorje/Phyag-na-rdo-rje*) mandala, his entourage consisting of four Bodhisattvas, eight offering goddesses and four gate-keepers. Around the mandala are again repeated representations of Buddha Akshobhya, the Buddha of the eastern direction. Underneath the mandala a larger now lost Buddha occupies the centre of two rows of Buddhas. A strip underneath these Buddhas probably once showed dancing goddesses paralleling the composition on the other side of the entrance.

The mandala to the right of the door is somewhat better preserved and likely dedicated to a wrathful form of Vajrapani. In the circle surrounding him are twelve fierce deities, approximately half of them preserved. In the corners are the four inner offering goddesses, and four gate-keepers occupy the doors. This mandala is surrounded by repeated representations of Buddha Amitabha, the Buddha of the western direction. At the bottom are two rows of the same Buddha flanking a larger central one. The lotus on which the central Buddha is sitting is flanked by six goddesses each playing musical instruments and/or dancing.

The represented mandalas are only in part familiar as several of them have not been identified elsewhere in exactly the same form. Nevertheless, all the mandalas can be associated with those found in commentaries to the 'eliminating all unfavourable rebirths' (Durgatipariśodhana) cycle. The base tantras of this cycle and school and time specific commentaries to it have to be considered the main source of Kanji's iconographic program. Although some iconographic motives are shared with Wanla's Avalokiteshvara temple, the Kanji paintings are surprisingly distinctive from that temple, even though it must be historically rather close. The longer lineage, the simpler representation of Padmasambhava, and the more distinctly commentarial iconography, among others, indicate a later date for the Kanji temple.

The Painting Technology⁶

The supporting structure of the wall paintings is a multilayer earthen plaster. The coarse ground layer of the plaster consists of clay, sand and gravel (grain size between 0.1 and 2.0 cm), straw or other plant fibres and animal hair. The thickness of this plaster varies between three and five centimetres. These materials most probably were collected in the vicinity of the site. The top, fine plaster layer is very thin, measuring approximately only 0.1 cm. It is made of very fine clay known in Ladakh by the name of 'markalak' which translates to butter mud.

Different scientific investigations of 'markalak' samples characterise it as a mixture of abundant quantities of 50–80% clay, the effective binder of the plaster, 7–40% silt that usually contains some calcium carbonate (in the form of calcite sometimes together with aragonite) and no or only a few percent of sand grains (Nicolaescu and

Alexander 2008, p. 62; Alexander and Catanese 2007, p. 35; Jägers and Jägers 2003, p. 3). 'Markalak' can be quarried in various deposits all over Ladakh. Two major sources of clay materials with excellent working properties can be found at 'moonland' near Lamayuru (Fig. 5), and near Spituk, which both formed as paleolake deposits (Phartiyal et al. 2005, p. 254).



Fig. 6 Detail of a wall painting with missing paint layer, the white ground has become visible, source: Alexandra Skedzuhn 2011

The plaster was smoothened with a smooth hard tool, possibly a river stone or a conch shell to obtain an even painting ground.⁷ Then the paintings were applied onto dry walls, using the pigments dispersed in an organic binder, a technique known as *secco* painting. In preparation for the painting the surface was covered with a white prime coating only approx. 0.1 mm thin, made out of a fibrous mineral material (Figs. 6 and 14).

According to our analysis this seems to be the same material which was used for the white washes on the façades, the so called 'karsi'. The analysed white ground layers of the paintings as well as the historic 'karsi' of the façade were exclusively composed of serpentine minerals (probably antigorite) and calcium carbonates.

We believe that these minerals have mainly been selected because of their fibrous structure, which gives the material a wonderful silvery shine.⁸ Until now it was impossible to establish where exactly these materials had been collected, but they can be found in the immediate regional geology, (Steck 2003, compilation of

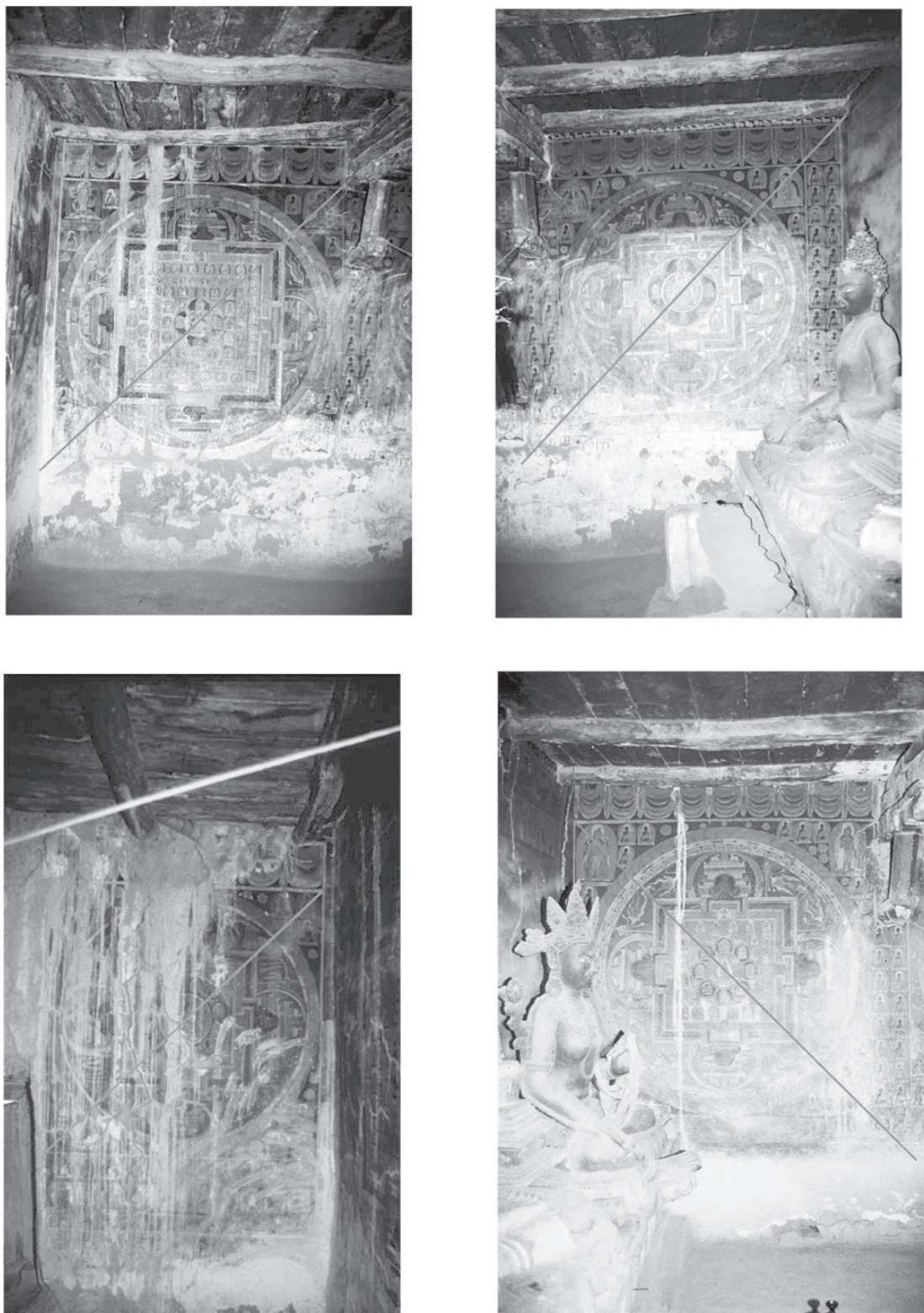


Fig. 7 The mandala on the top right is located in the north section of the west wall, while the mandala on the bottom right lies on the opposite side, on the north section of the east wall. The diagonals show the different geometrical layouts. Source of photo: Christian Luczanits 2000, source of graphics: Steven Post 2003



Fig. 8 Major construction lines can be detected underneath the paint layer, see arrows. Source: Christian Luczanits 2000

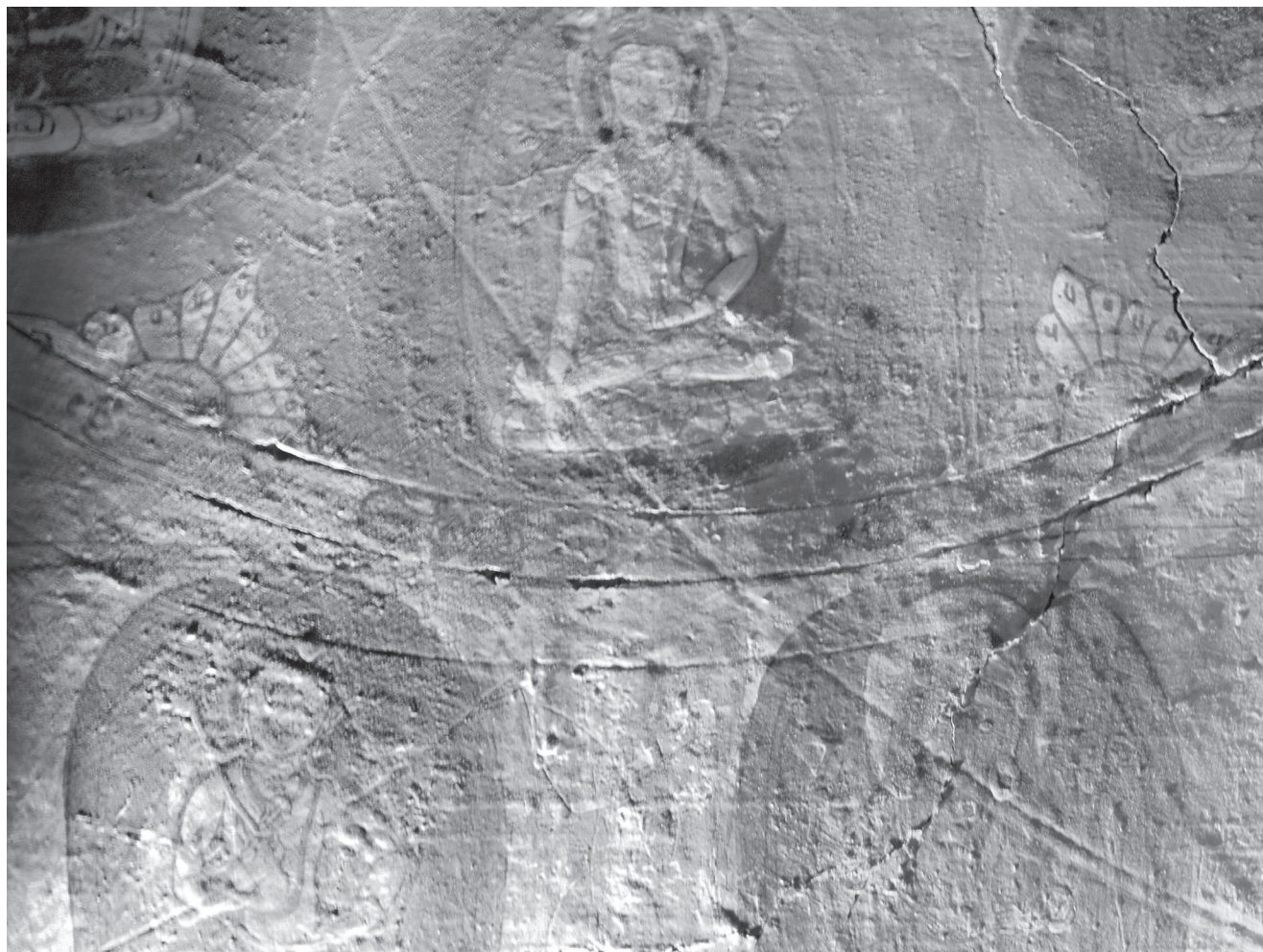


Fig. 9 Mandala incisions, north section of the east wall, source: Alexandra Skedzuhn 2010

the geological map of NW Himalaya, Plate I) and in fact, locals have told us that 'karsi' can be found within a few hours walking distance from Kanji.

So far it is not clear if the prime coating ('karsi') was applied with or without a binder. Generally, it appears that the properties of the specific type of 'karsi' material determine the necessity whether a binder needs to be added: If the 'karsi' adheres well to the support, and if it has a low capillarity and thus does not require a sizing to reduce its absorbency, no binder is necessary.

Only traces of organic material could be analysed in the prime coating in the Tsuglag-khang.⁹ We suppose that they could be the remains of a purification process for the preparation of 'karsi'. Locals have told us that a type of 'karsi' is mixed with milk during the preparation. Alternatively, the presence of the organic material in the primer could indicate the use of a binder. Whether the

binder was mixed into the 'karsi', and/or applied in a second step onto the 'karsi' layer as a sizing, or even penetrated into the 'karsi' layer when the colour was painted onto the surface cannot be determined with certainty.¹⁰

After the white primer had been applied, the walls were geometrically divided into different sections. This was carried out according to the iconometric rules. Here, the layout of the Tsuglag-khang determined a first division of the entrance and the two side walls into six more or less equal rectangles each featuring a mandala.

According to the painting tradition, the artist then laid down the main orientation lines for the mandalas. There are a total of eight major lines for each mandala, starting with the two diagonals, followed by the vertical, the horizontal and the four outer border lines (Jackson and Jackson 2006, p. 45). Presumably this work



Fig. 10 Construction lines in red colour, south section of the east wall, source: Martina Oeter 2011

commenced with the mandala on the northern half of the west wall. Only here the diagonal cutting through the mandala reaches the top right corner of the wall. All diagonals of the other mandalas end below the valance motif. This signifies that with this mandala the width of the upper border zone had been established (Fig. 6). The construction work of the other mandalas was then apparently carried out afterwards (Fig. 8, see arrows).

These major lines presumably were executed as painted lines ('lönthik'/rlon-thig for wet lines) with a marking string (Jackson and Jackson 2006, p. 45), as can be seen in the mandala at the southern half of the west wall; using strong direct light onto the painting, the horizontal line can be detected underneath the paint layer.

To determine these major lines, but also to construct the mandala circles, a compass ('korthik'/skor-thig) was used for small circles and a so-called 'korpang' (skor-pang) for large circles (Jackson and Jackson, 2006, p. 46). Many circle incisions can be detected when observing the mandalas with ranking light. Interestingly, every mandala has

different incisions which might be an indication for more than one painter working in the temple or for different construction methods and iconometric requirements depending on the type of mandala (Fig. 8).

This conforms to the fact that in early mandala depictions each of the mandalas has its distinctive iconometry depending on the mandala elements being represented and the basic geometry of the mandala, in particular the relationship of the outer circles to the palace and its gates and the interior of the palace structure. For example, the two mandalas on the left wall are highly distinctive, as the Vajrapani mandala on the left has essentially four concentric assemblies of deities, and thus a much larger palace than the Amitayus mandala, which only has a single circle of deities.

As the next step the walls were geometrically divided with a grid of exactly positioned lines ('thikhang'/thig-khang; Jackson and Jackson 2006, p. 49). These vertical and horizontal lines are typical for the geometric division of the walls to establish the proportions of all



Fig. 11 Underdrawing visible on the top rider, compared with the bottom figure which has a thinner outline, located in the centre of the south wall, source: Alexandra Skedzuhn 2011

sacred images according to iconometric rules. This is especially visible on the southern mandala on the east wall where a large section of the upper layer of the wall painting is lost due to water infiltration. The visible red lines show the so called finger units, as they correspond to the width of a finger¹¹ (Fig. 9).

Deities were proportionally structured according to strict canonical rules. Historic texts on iconometry say that if an artist did not act in alignment with these rules, this would have a negative impact on himself resulting in illness, or unfavourable rebirth, and on his environment causing suffering or failing harvests (Henss 2006, p. 112). As a next step, precise sketches were made, at least for the detailed figures.

Some of these sketches are visible in heavily damaged areas of the wall paintings. A good example is visible on the south wall above the door, where these under-drawings of horses and riders were carried out in a reddish brown colour with relatively broad outlines (Fig. 10).

The palette of pigments found so far in the paint layers is rich (Küng 2010a, p. 1) and corresponds to the investigations in other temples of that period.

According to the Tibetan-Buddhist painting tradition, the materials were not only employed depending on availability and physical properties, but also on their connection to the religious image. Precious pigments such as azurite are understood as having outstanding merit (Griesser 2008, p. 37). Also the use of different binders according to the religious significance is reported by local thangka painters¹² even though the confirmation of the use of different binders in the Kanji Tsuglag-khang seems to be connected more to technical considerations.

The underdrawings most probably were executed by the master in a freehand manner. His task was also to colour code the images. Two different systems can be used, namely to code an area with corresponding numbers or with the abbreviation of a colour. And again, damaged areas could reveal the coding system in the Tsuglag-khang in Kanji: The Tibetan word for white, *dkar*, can be found in several sections, as well as the abbreviation for yellow, *ser*¹³ (Fig. 11).

Another painting principle was to begin the painting with the distant planes of colour within the composition before painting those in the front, to obtain sharper edges of the more important details (Jackson

and Jackson 2006, p. 96). These distant planes or backgrounds in the Tsuglag-khang are painted in red (cinnabar) directly onto the white primer (Küng 2010a, p. 1) whereas the dark blue areas consist of a bottom black paint layer and top layer of azurite (Küng 2010a, p. 2; Bläuer 2013, p. 2). The images and many important details in the foreground were given various coloured under-paintings. There are several reasons why this may have been done. One reason may be that specific pigments are less opaque than others and require thus a paint basis with a stronger covering power. An example for this would be the costly, usually coarsely ground blue pigment azurite, which is often found to be painted on top of a layer of black paint (Fig. 14).

Another reason is that by applying different colours on top of each other, specific optical effects can be achieved such as a glazing effect, lending the image a translucent appearance. Usually this technique, called shading or tinting, was done by applying darker shading washes over a lighter base colour (Jackson and Jackson 2006, p. 97) (Fig. 13).

According to painting tradition, the main shading colours were organic dyes and lakes (Jackson and Jackson 2006, p. 112). This corresponds to the use of pigments and colours in the Kanji temple.

In accordance, each colour of the wall paintings in the Tsuglag-khang, usually has its own colour of under-painting, with only some exceptions. The analyses made during a field campaign by Andreas Küng revealed the following results: The drab ochre coloured details have a bright yellow under-painting (rather coarsely grained orpiment), the dark blue-green areas (indigo and orpiment) a bright green one (mixture of orpiment and little indigo), and the dusky pink details (red lac) usually an orange one (cinnabar and vegetable black on orpiment). Traditional guidelines also influenced which elements of the painting were to be endowed with contour lines. Specific details could thus be emphasised making them stand out compared to other less important ones. Also minute details for instance necklaces, fabric design or facial details were painted (Jackson and Jackson 2006, p. 129).

The analyses in situ and in laboratory have revealed the use of different materials, as described in the following. The dark blue paint layers are about 0.1 mm thick and formed by very coarse azurite (up to 50 microns in grain size) and coarse red to orange ochre.¹⁴ It sits on



Fig. 12 Colour coding indicating the abbreviation of the colour white, source: Alexandra Skedzuhn 2011



Fig. 13 Detail of painting: washes in blue and pink over a lighter base colour, source: Alexandra Skedzuhn 2011

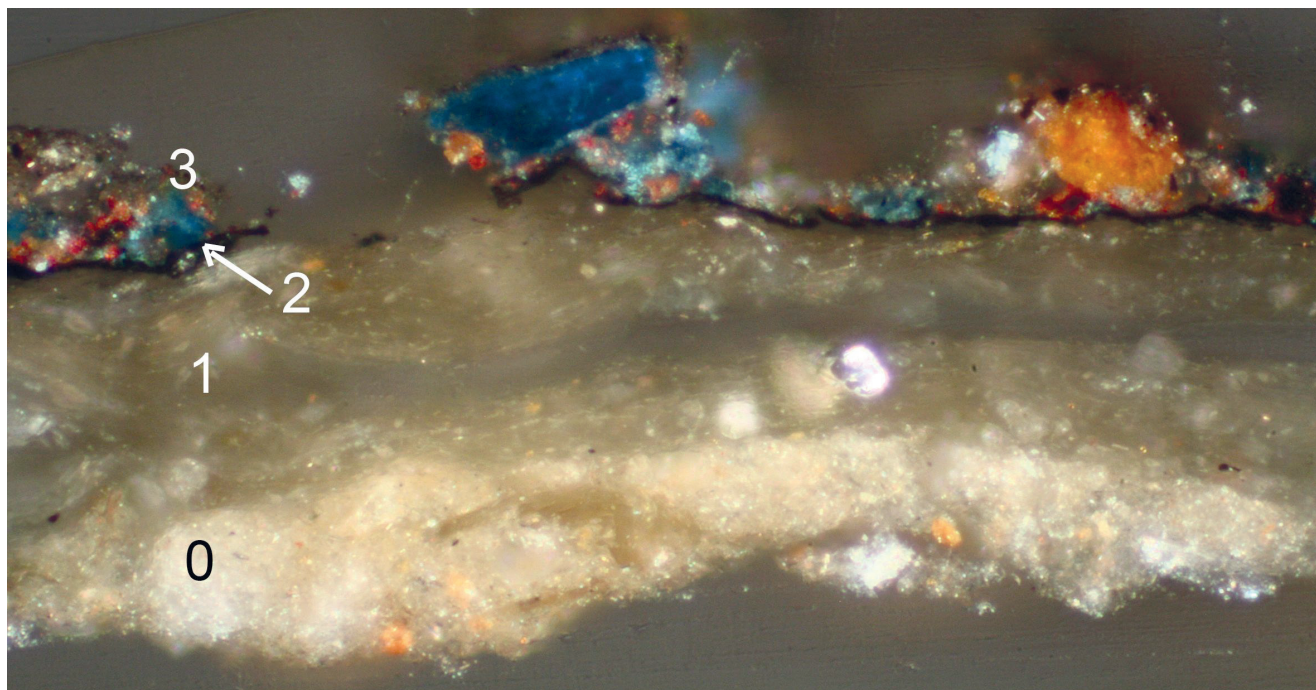


Fig. 14 Cross section through the paint layers in a dark blue area; 0: plaster surface, 1: prime coating (karsi form serpentine minerals), 2: black underpaint, 3: scarce remains of blue paint layer with coarse azurite and red ochre; image width 440 μ m, source: Christine Bläuer 2012

a very thin (about 2 to 10 microns) layer of black that could not be identified with certainty. From microscopic analysis and micro-chemical testing it appears to be a charcoal black (Fig. 14).

That the azurite blue was admixed with red ochre at first appears unusual, but might be explained by considering the principles of chromatics. When the paintings were executed the artists would have worked in a warm open flame light, which renders thus blue colours slightly green. To compensate this effect, its complimentary colour red would have lessened the effect and obtained a somewhat purer blue. The binding media which is soluble in cold water is according to our micro-chemical testing and FTIR measurements most likely a gum.¹⁵

The dark red paint layer which is made of cinnabar with little ochre is only about 20 microns thin (Fig. 15).

The binding medium consists according to micro-chemical testing and FTIR spectroscopy of a distemper. This means that a water based and oil based binder were mixed together. Oils could derive from either walnuts, poppy seeds, linseed or sunflowers, or egg yolk. Water based binder could be either size, or gums

made of fruit trees or roots or egg white. Further analysis however is required to establish more precisely what kind of distemper was used for the paintings in Kanji.

As mentioned above, the reason for different binders could lie in religious motivated effects of specific materials, or apparently, in the case of cinnabar, painting technology.

Cinnabar may become black within water-based binders, for instance gum or size.¹⁶ Applied in a distemper binder and subsequently protected by a varnish such as a madder lake, as literature suggests, this would not happen (Kremer 2013a).

More pink shades of red are painted using red lake which has not yet been fully attributed, sometimes mixes with some charcoal black and little yellow ochre (Küng 2010a, p. 3).¹⁷ The translucent dusky pink which was used for modelling and shading painting details is made of organic red dyes with minor admixtures of charcoal black (Küng 2010a, p. 12).

The yellow colours are obtained with the mineral orpiment, which is often mixed together with some orange red ochre (Küng 2010a, p. 1).

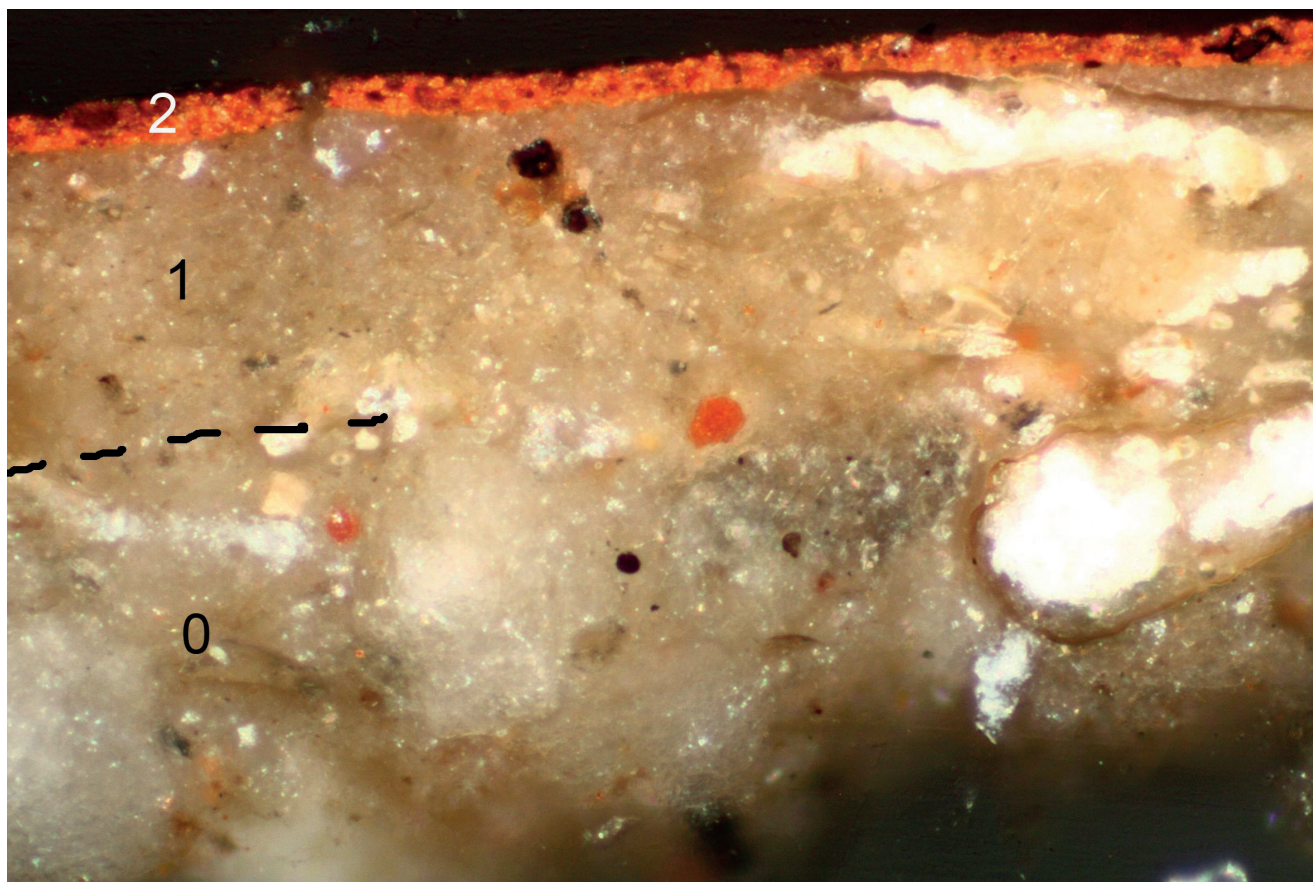


Fig. 15 Cross section through the paint layer in a dark red area; 0: plaster surface, 1: prime coating (serpentine minerals with calcite as well as aragonite), 2: red paint layer made of cinnabar; image width 440 μm , source: Christine Bläuer 2012

The green colour in all of the analysed samples turned out to be a mixture of orpiment and indigo, sometimes mixed with charcoal black, but it never consists of a sole green pigment (Küng 2010a, p. 6). The darker, more olive shade of green is made of charcoal black, very fine yellow and red ochre, and blue dyestuff (Küng 2010a, p. 12).

A mixture of an blue colorant – most likely indigo blue – with orpiment to obtain a green colour has also been found in the analysed samples of green colour taken at the Avalokiteshvara temple in Wanla (Küng 2010b, p. 6) and the Lhakhang Gongma in Nako (Bogin 2005, p. 212). The pigment malachite so far has only been found in later paintings of this region, although it is from its mineralogy very similar to azurite and the two minerals often occur together in nature.

For the black colour, agglomerates of a finely grained black substance can be observed as well as coarser grained charcoal black (Küng 2010a, p. 7).

Traditionally, paintings are concluded with a ceremony, which brings a divinity to life. This is known as the eye-opening act and is inherent part of the consecration of a painting or a temple (Jackson and Jackson 2006, p. 139).

Concluding Remarks

The investigations of the paintings in the Tsuglagkhang reveal how close the painters adhered to the ancient Indian and Tibetan painting technology described in the historic sources.

Additionally, our investigations have brought forth several relevant aspects pertaining to the causes of damages and the conservation of the paintings.

Foremost are the material aspects of the support, primer, and paint layer with its pigments and different binders. According to the type of pigment and binder employed for the painting, the paint layers react very



Fig. 16 Orpiment underpainting visible due to water infiltration which has washed away the overlying ochre, source: Steven Post 2006

differently to the very same external factors, be it damaging forces or a conservation treatment. In areas with an orpiment under-painting for example, the flaky structure of the mineral grains does not allow for a very strong adherence to overlying paint so that the top paint layer easily washed off during rainwater infiltration (Fig. 16).

For conservators working on these paintings it is further important to know that orpiment contains arsenic and thus is highly toxic; extra care and safety is extremely important. Another interesting example is the use of azurite for the light blue painting details. The pigment was admixed with an aqueous binder, which most probably was done to highlight best the beauty of this coarsely grained blue stone mineral, with

its comparatively low reflective indices. Soot adheres more easily to a rough surface than to a smooth one, resulting in heavily blackened paint layer. The details of the blue Bodhisattva faces are often hardly visible, but as the binder is soluble already in cold water, the details painted with azurite need even more care during a cleaning process than other details painted with a distemper.

Apart from these technical considerations, there are more complex questions pertaining the conservation of the paintings.

There might arise the dilemma in the approach of how to conserve wall paintings: either focussing on state-of-the-art conservation products, or according to the religious connotation of the painting materials.

Does the use of 'wrong' products lessen the religious strength and value of an image?

Apart from these technical considerations, there are more complex questions pertaining to the conservation of the paintings. How much needs to be conserved for religious reasons and what is merely an aesthetic choice? What is the religious strength and value of a depiction or an image and how is it affected by conservation?

Does the religious environment require additional ceremonies (pujas) besides the de-consecration and re-consecration of the main image to maintain the integrity of the religious environment?

Opinions diverge greatly on these matters, but the knowledge we have acquired through our on-site investigations, literary research and discussions with Tibetan Buddhist clergy and local thangka painters, have helped us to evaluate the conservation process from very different perspectives making us aware of how necessary it is to integrate the various stakeholders and disciplines into the decision making process and to assess conservation within its different contexts.

Bibliography

- ALEXANDER**, André & Andreas **CATANESE**, 2007: "The Leh Old Town, Conservation Project, Ladakh, Indian Himalayas", *E-conservation* 1:29–50, available at: <http://www.e-conservationline.com/content/view/567/155/> (accessed: 3.4.2010)
- BLÄUER**, Christine, 2013: *Kanji, Tsuglag-khang, Analysis of Samples from the Wall Paintings, Sampling 2010 and 2011*, unpublished report, Zürich: Archive of the Achi Association, 1–9
- BOGIN**, Stephanie, 2005: "A Technical Study of the Early Buddhist Wall Paintings at Nako, Himachal Pradesh, India", *Kunsttechnologie und Konservierung* 19, (2): Worms, 199–229
- CHAKRABARTI**, Jayanta, 1980: *Techniques in Indian Mural Paintings*, Calcutta (K P Bagchi & Company)
- COOMARASWAMY**, Ananda K., 1934: "The Technique and Theory of Indian Painting", *Technical Studies in the Field of Fine Arts* 3, Cambridge, 59–89
- DASSER**, Karl Ludwig, 1996: "Some Observations on the Technology of the Wall Paintings in the Sumtsek", *Alchi, Ladakh's Hidden Buddhist Sanctuary, The Sumtsek*, London (Serindia Publications) 273–276
- GRIESSER**, Ute, 2009: "Presenting, Handling and Treating Sacred Thangkas According to Western Standards and Respecting their Cultural Context—An Achievable Common Purpose?", *Proceedings of the Forum on the Conservation of Thangkas*, special session of the ICOM-CC 15th Triennial Conference, New Delhi, India, September 26, 2008, 30–43
- HENSS**, Michael, 2006: „Vom rechten Maß und richtiger Zahl – Ikonometrie in der buddhistischen Kunst Tibets“, *Tibet, Klöster öffnen ihre Schatzkammern*, Kulturstiftung Ruhr Essen (ed.), exhibition catalogue, München (Hirmer) 105–113
- ISTUDOR**, Ioan & Anca **DINĂ** & Geanina **ROȘU** & Doina **ȘECLĂMAN** & Gheorghe **NICULESCU**, December 2007: "An Alteration Phenomenon of Cinnabar Red Pigment in the Mural Paintings from Sucevita", *E-conservation* 2/2007, available online at: <http://www.e-conservation-line.com/content/view/253/77/> (accessed: 25.3.2013)
- JACKSON**, David P. & Janice A. **JACKSON**, 2006: *Tibetan Thangka Painting, Methods and Materials*, Hong Kong (Serindia Publications)
- JÄGERS**, Elisabeth & Erhard **JÄGERS**, 2003: *Dokumentation der Proben*, unpublished analyses, Zürich, archive of the Achi Association
- KREMER** Pigmente, 2013a: *Zinnober, Cinnabrit, aus der Hunan Provinz, China*, available online at <http://kremer-pigmente.de/10620.htm> (accessed: 11.3.2013)
- KREMER** Pigmente, 2013b: *Azurit, Bergblau, basisches Kupfercarbonat blau, Pigment Blue 30*, available online at <http://kremer-pigmente.de/10200.htm> (accessed: 14.3.2013)
- KÜNG**, Andreas 2010a: *Kanji-Tempel, Proben 2005: Untersuchungsresultate – Dokumentation der Entnahmestellen*, unpublished analyses, Zürich, archive of the Achi Association
- KÜNG**, Andreas, 2010b: *Wanla-Tempel, Proben 2005 und 2006: Untersuchungsresultate – Dokumentation der Entnahmestellen*, unpublished analyses, Zürich, archive of the Achi Association
- LO BUE**, Erberto, 2006: „Tibetische Malerei“, *Tibet, Klöster öffnen ihre Schatzkammern*, Kulturstiftung Ruhr Essen (ed.), exhibition catalogue, München (Hirmer) 90–95
- NICOLAESCU**, Anca & André **ALEXANDER**, 2008: „Red Maitreya Temple–Leh, Ladakh“, *E-conservation* 6, Mural Conservation Project, A Tibet Heritage Fund Program, September 2008:56–77, available at: <http://www.e-conservationline.com/content/view/500/100/> (accessed: 26.8.2011)
- OETER**, Martina, 2003: *Paintings and Sculpture–Work Techniques*, available online at <http://www.achias-sociation.org/activities-sites-kanji-tsuglag-khang-report-paintings-and-sculpture-work-techniques.php> (accessed: 22.3.2013)
- PHARTIYAL**, Binita & Sharma **ANUPAM** & Rajeev **UPADHYAY** & **RAM-AWATAR** & Anshu K. **SINHA**, 2005: "Quaternary Geology, Tectonics and Distribution of Palaeo- and Present Fluvio/Glacio Lacustrine Deposits in Ladakh, NW Indian Himalaya – A Study Based on Field Observations", *Geomorphology* 65, Amsterdam 241–256
- SKORUPSKI**, Tadeusz, 1983: *The Sarvadurgatipariśodhana Tantra, Elimination of all Evil Destinies*, New Delhi-Varanasi-Patna (Motilal Banarsidass)
- STECK**, Albrecht, 2003: "Geology of the NW Indian Himalaya", *Eclogae geol. Helv.* 96, Cham, 147–196

Notes

- 1 The Achi Association (www.achiassociation.org), an NGO based in India and Europe, is working in the Western Himalayas for the preservation of Ladakh's cultural heritage. An interdisciplinary team of specialists from India and Europe, partly linked to academic programs at different universities, combines in-depth research with hands-on preservation.
- 2 A large flat stone which might have functioned as a footing for an upper pillar was found above the central pillar when the roof was renewed. This supports the presumption that there used to be an upper, second roof in former times.
- 3 In Wanla this goddess is represented in the upper section of the left side wall of the Maitreya niche in the Avalokiteshvara Temple.
- 4 For descriptions see Skorupski 1983, pp. 35–42, which in other places also describes the other mandalas referred to later in the text.
- 5 Would it not be for the vase as the second object, this image could easily be recognised as Avalokiteshvara Chintamanichakra (Avalokiteśvara Cintāmaṇicakra; Chenrezi Yizhin-khorlo/sPyan-ras-gzigs yid-bzhin 'khor-lo), who is commonly depicted in exactly the same posture. However, it would be curious if the name giving attribute, the wheel ('cakra'), is replaced by a vase.
- 6 For the identification of the paint layer and the prime coating microscopic and micro-chemical methods were used as well as infrared spectroscopy. For the investigation of the fine layer of earthen plaster, additionally grain size analyses by sedimentation and sieving were employed. Some of the analyses were performed on site by Andreas Küng (Küng 2010a) during the 2005 field work campaign (dispersions analysed using a polarizing field microscope).
- 7 Jackson and Jackson mention thangkas to be smoothed with these tools (Jackson and Jackson 2006, p. 21).
- 8 The primer employed for the Lotsawa Lhakhang in Nako contains some mica, and Bogin presumes the reason lies in the optical effect of it, as it would increase the luminosity of the paint layer (Bogin 2005, p. 207).
- 9 Investigation carried out by FTIR spectroscopy (Bläuer 2013, p. 2).
- 10 In comparison, analyses undertaken for the Sumtsek in Alchi showed that the primer contains a binder of proteins and starch (Dasser 1996, p. 274). Our analysis (FTIR and micro-chemical testing) of the primer on wall paintings in the Avalokiteshvara temple in Wanla showed that both the calcium carbonate (calcite or aragonite) and the gypsum primers contain proteins.
- 11 Names of other measurement units are also derived from the human body, such as the face measure, or the palm measure (Jackson and Jackson 2006, p. 50), see also Lo Bue 2006, p. 94.
- 12 We were informed by thangka painters that the use of animal glue is employed for fierce deities as it lends them more strength, whereas the compassionate deities are painted with a binder deriving from plants, such as gum or sap.
- 13 We are thankful to the thangka painter Tsewang Stanzin who had pointed out the colour codes. This coding system is mentioned in literature on painting technology, such as Jackson and Jackson 2006, p. 91, or Coomaraswamy 1934, p. 74.
- 14 Analyses using polarized light microscopy on cross sections and dispersions.
- 15 Kremer 2013b: Azurite according to Kremer should be used either as an egg distemper or mixed with an abundant quantity of size or gum.
- 16 This could occur with UV radiation, see Istudor et al. 2007, pp. 24–33.
- 17 The black colour is most probably charcoal black, but this still has to be confirmed.