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Technique of Modelling the Buddha Statues

Introduction

The Giant Buddha statues have mostly been regarded as stone sculptures. Indeed, they were cut out of the rock of the cliff and the great bulk of them consists of stone. The visible surface, however, was made of clay. The clay layers were more than a thick 'priming layer', applied to obtain a smooth surface for the paint layers. They also served the purpose of perfecting the shape: The sculpting process reached its finish by a modelling with clay.

As there never had been a detailed investigation of the manufacturing technique of the two statues, nor analyses of the material before the statues were destroyed, the fragments rescued from the rubble provide a chance to understand how the Buddha statues had been made.

Moreover, the examination of the fragments offers a possibility to clear up a question discussed since the 19th century: whether the clay layers were part of the original design of the statues or a later addition in order to repair damaged stone parts. Therefore, the analyses were also aimed at the question if it is possible to date the clay layers or to distinguish between original and later phases.

Sculpting in stone and perfection with clay layers

The Buddha statues were cut out of the cliff face in the Bāmiyān valley. Inside deep niches they protruded as a high relief, their entire neck being attached to the back of the niche. The cliff in Bāmiyān consists of rocks with an uneven stratification containing horizontal layers of sand, pebbles, boulders, and fragments of materials, such as quartz, schist, sandstone, or limestone. In between there are more compact layers of clay and sandstone.[1] This porous and inhomogeneous material is not suited to sculpt fine shapes. Furthermore, it cannot be painted directly.

The technique of modelling in clay, which can be traced back in China to the Neolithic Age, is wide-spread in Central and East Asia. The combination of sculpting in stone and clay modelling is also frequent in Central and East Asian art. Buddhist cave sanctuaries which contain large sculptures often show transitional decoration ranging between small sculptures modelled in clay over a wooden support and wall decorations painted on thin clay plasters smoothening the walls. The large statues were often sculpted from the stone, but finished in clay, especially when the rock material was too inhomogeneous or coarse to cut out fine shapes. If thick layers of clay or protruding parts were applied, a substructure was required as a core of the shape and an anchorage to the support below.

Historical descriptions

Certain observations on the technique used for the production of the Buddha statues of Bāmiyān were already made between the 1830s and 1930s. Although the texts did not focus on the manufacturing technique, they nonetheless contain valuable information. They also include different considerations concerning the question if the clay layers were part of the original design or later additions.

Alexander Burnes who visited Bāmiyān and the two statues seems to have been the first to describe some technical aspects in his record on the Western Buddha of 1834:

> *The figure is covered by a mantle, which hangs over it in all parts, and has been formed of a kind of plaster; the image having been studded with wooden pins in various places, to assist in fixing it.*[2]

With reference to Burnes, Carl Ritter who had not seen the statues himself wrote in 1838:

> *The body is not naked, but vested with a kind of cloak which covers all parts, but is made of an applied gypsum stucco. Numerous inserted pegs can still be noticed which incontestably served to reinforce this stucco.* [3]

In 1843, Vincent Eyre gave a more detailed description and also touched on the question if the clay layers were part of the original design or the result of later repairs:

> *One circumstance struck me as remarkable, – which was, that in all those parts where the limbs are deficient, there are regular rows of small holes in which pieces of wood have been stuck, for the evident purpose of making the plaster adhere. From this it would appear either that an attempt had been made to restore the mutilated parts of these means, or that the figure was originally only partially sculptured on the rock, and the deficiencies made up with plaster in the way I have mentioned. From the apparent facility with which from the softness of the rock, the image might have been chiselled perfect at the first, I incline to the belief that an attempt has been since made to repair the work of destruction, during some temporary success of the heathen inhabitants against the Mahomedan invaders. The cliff is composed of that species of conglomerate known by the name of pudding-stone, consisting of very hard clay, thickly studded with various kinds of rounded pebbles.*[4]

△ Fig. 1

△ Fig. 2

Fig. 1. Jean Carl standing on the right forearm of the Western Buddha [Hackin/Carl 1933, detail from fig. 23]. The wooden substructure of the forearm is lost, but Carl is standing on the upper coating of the arm which Hackin described as made of bricks. In the *sangati* the holes for the pegs and the partly damaged fold ridges can be recognised.

Fig. 2. Western Buddha, holes of different sizes to insert wooden substructures. At the left arm, the part sculpted from the rock ends at the elbow. Forearm and hanging folds were modelled in clay over massive substructures. All fold ridges were applied in clay except for the deep ones between the legs. [ASI]

Fig. 3. Modelling system of the Eastern Buddha. Left: Right arm and right leg with holes in the stone visible in the lower part of the *sangati*. [Namikawa 1999]
Right: Detail under the right arm with preserved blue paint layer. In the holes the pebbles for anchoring the clay are visible. [Praxenthaler]

▽ Fig. 4

▽ Fig. 5

Fig. 4. Left arm of Eastern Buddha in 1965: U-shaped part cut from the stone with holes visible at the hem of the sleeve cuff. The wooden support and clay cover of the top are already lost. [ASI]

Fig. 5. Below the right arm of the Western Buddha: The fold ridges are modelled in clay on the smooth stone surface. [Keith Worsley-Brown, June 1972]

The work published by Maitland, Talbot, and Simpson in 1886 presents the Buddha statues from a scientific point of view. Maitland, who made drawings of the statues, describes the clay layers and also discusses the question of their origination, coming to a result different from Eyre:

> *The idols themselves are rather clumsy figures, roughly hewn in the tough conglomerate of the rock, and afterwards thickly overlaid with stucco, in which all the details are executed. The whole arrangement shows that this was not done in later period, but is part of the original design of the figures.*[5]

During the comprehensive expedition to the Bamiyan Buddha statues of the Délégation Archéologique Française en Afghanistan (DAFA) in the late 1920s, Joseph Hackin and Jean Carl explored the Western Buddha. Starting from the top of the head, Carl climbed down to the shoulders and went through a narrow corridor built with mud bricks connecting the shoulders. He used a rope to climb down from the right shoulder between the upper arm and the niche wall:

> […] *and thus he arrived at the first section of the revetment made of bricks covering the piece of wood which formed the skeleton of the forearm and supported the hand raised in* abhaya-mudra (*gesture of reassurance*). *On his climbing tour Mr. Carl discovered fragments of the surface* '*skin*' *which was composed of a mixture of clay and chaff, covered with a very thin film of lime mortar. [This* '*skin*'*] covered the rough modelling of the statue. We have collected fragments which imitated the drapery of the monk's robe. They still possessed their armature made of ropes and pegs, and coated with the red paint layer which originally had covered the entire robe* (fig. 24).[6]

The modelling of the surface – Eastern Buddha

All the cited descriptions concern the Western Buddha. The Eastern Buddha is only mentioned incidentally as being similar and – by Burnes – as being more perfect [in style], without indicating any technical details.[7]

Historical photographs allow drawing some conclusions about the stone sculpture. However, the stone was only visible in the damaged parts where the clay layers were already lost and assessment thus remains restricted to these areas.

Apparently, the statue was sculpted almost completely out of the stone. Details of the garment were elaborated or at least indicated. Fold ridges visible in the lower parts were distinctively sculpted. Here, the clay layers seem to repeat only what was laid out in the stone and to refine it slightly.

To reach a better adhesion between the stone and the clay, a multitude of conical holes was gouged into the stone. They seem to have been extended over the whole surface: They can be seen on the garment, the legs, in the face, and on the neck. The fold ridges were spared from holes which were concentrated in the recesses between the ridges.

Observations on the technique 2005–2008

The examination within our project showed that the holes are about 7 cm wide and of the same depth. They are positioned with a distance of 10 to 12 cm between each other. When the clay was applied, pebbles were pressed into the holes together with the clay, thus serving as mechanical interlocking between the stone and the clay layers. Some of the pebbles, together with remnants of the clay layer, have been found in-situ below the right arm (fig. 3).

The holes can also be seen on the edge of the sleeve cuff of the left arm, indicating that the whole forearm was worked in stone. The hands were already lost in the 19th century. In the historical photographs the forearms seem to be open on the upper side: It seems that the forearms were sculpted from the stone in a U-shaped form (fig. 4). At the end (i.e. the elbow) a deeper square hole was driven into the stone which can still be seen today. An anchoring construction was inserted into the U-shaped channel in the arm and pushed into the hole at its end where the stone stabilised it against tilting forward due to the weight of hand. The upper side of the arm was then closed, probably either with bricks or with clay. The anchoring construction was probably made of wood, either of a thick beam or of several beams put together.

Larger square holes in the small gap between the statue and the side walls could come from a scaffold which was necessary after the sculpting had been finished.

The modelling of the surface – Western Buddha

The technique of the Western Buddha differs from the one of the Eastern Buddha. While the Eastern Buddha is mainly worked out of the stone and the clay layers repeat the shape in the way of a thick priming layer, the clay layers of the Western Buddha have a more important part in the design of the statue.

At the Western Buddha, the fine details are not created in stone: The *sangati* is smooth except for the large and deep folds between the legs. The forearms seem to stick out of the rock as well as the hem of the *sangati* hanging down over the forearms in thin, far-protruding ridges (fig. 2).

Large square holes cut into the stone served to insert massive construction supports. The biggest were the ones in the forearms. In this connection it is interesting that in 1933 Hackin and Carl described the upper side of the forearm – on which Carl was standing during his climbing tour – as being made of *bricks* covering the lost timber which served as anchorage of the forearm (*revêtement de briques recouvrant la pièce de bois qui formait l'ossature de l'avant-bras*). Although a photograph gives the impression of solid clay rather than bricks, this description must have been based on close observation.

Rows of smaller square holes can be found along the protruding ridges of the *sangati* hanging down over the forearms and in the right lower leg. As the stone has broken away irregularly in these areas, the insertion of anchoring supports and the completion of the shape with other means than stone clearly appear as a method of repair. This repair

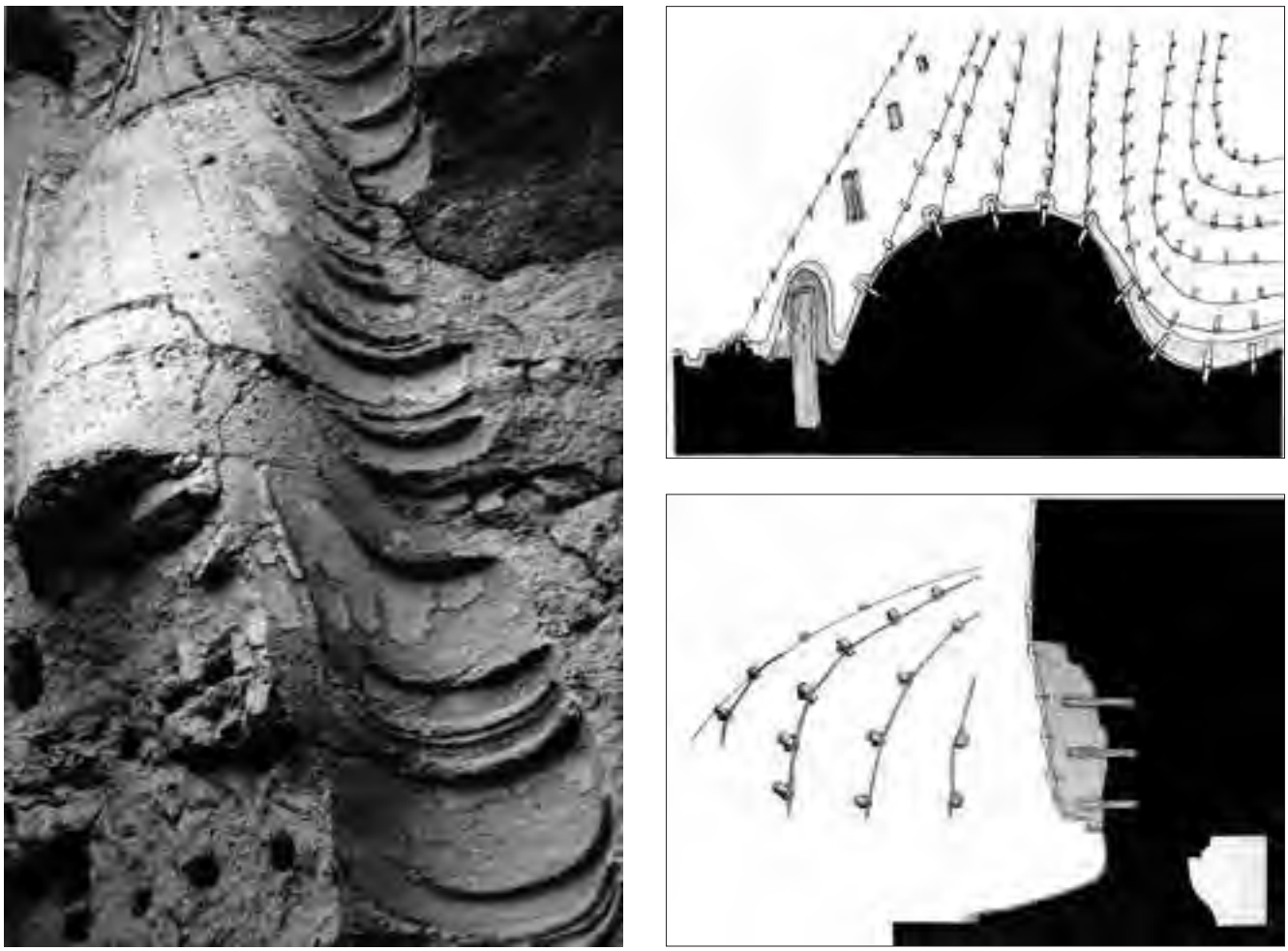


Fig. 6. Western Buddha, detail of right leg in 1965 [ASI] and sketch demonstrating the system with wooden pegs and ropes [Tarzi 1977, vol. 2. p. 117]

Fig. 7. Demonstration of system with fragments found in the rubble [Melzl]: Peg inserted into a hole in the stone (left) and peg inserted into a preserved eye in a rope (right).

can be the consequence of an early damage, as Vincent Eyre suggested, but it may also date back to the creation of the statue: Due to the soft rock with low stability, parts may have broken off during the sculpting, requiring a repair during the work process. In the case of the protruding ridges of the *sangati* hanging down over the forearms, the sculptors may even have considered from the beginning to add the most protruding part rather than attempting to cut these thin parts from the rock.

Fold ridges

The fold ridges are not indicated in the stone. This shows that at least for these parts the sculptors took the modelling with clay into consideration from the beginning.

The fold ridges possess a substructure of ropes affixed to wooden pegs. Square holes were driven into the stone to insert the pegs. The holes can only be found along the fold ridges, while the interspaces and recesses were spared. The holes are conical, with an edge length of 3.0 cm to 4.5 cm and a depth of about 7 cm. They were made using a pointed chisel. The distance between the holes measures 30.0 to 40.0 cm.

The ropes served as a mechanical stabilisation and core of the fold ridges. The pegs also increased the adhesion to the stone.

The system of ropes and pegs was a phenomenon that the authors of the 19th and early 20th centuries described as peculiar and amazing. In 1977, Z. Tarzi published sketches demonstrating the anchoring system of the fold ridges and of the larger broken-off parts part of the right leg (fig. 6).[8]

Observations on the technique 2005-08

Numerous fragments from the fold ridges have been found in the rubble, consisting of clay fragments with embedded ropes, hundreds of pegs and many pieces of ropes. Some clay fragments also show the imprint of a rope and a peg on the back[9]. The examination of these fragments revealed more details of this technique.

Pegs

The pegs are usually square or trapezoid in diameter and pointed. They measure between 12 and 20 cm in length, with an average of 16 cm (fig. 8). Many show traces of a saw at the cross section (fig. 9). The sides were hewn with an axe or a knife. Smaller pegs, sometimes wedge-shaped, of 8 to 12 cm length, apparently served to stabilise the peg inside the hole.

Very few wooden pieces found so far are round in cross section. It is not clear if they were really part of the Buddha or not.

Many pegs and also the reverse sides of some fragments show black dots, sometimes covering large parts of the wood (figs. 10–12). These black dots are of microbiological origin. Normally humidity is extremely low in Bāmiyān. Thus, this microbiological growth may date back to the creation of the statues when thick layers of clay provided enough moisture to allow microbiological growth.

Some pegs show traces of weathering at the end. This means that that they must have been exposed to the environment for a long time. It can be assumed that such traces come from weathered or damaged parts where the

Fig. 8. Selection of pegs, GBL 1371-75. Peg GBL 1375 shows weathering at the end [Melzl]

Fig. 9. Peg GBL 810 with cut of a saw (arrow) [Melzl]

Fig. 10. Peg no. ‘a’. Black dots on the wood. Traces of pink slurry on the tip of the peg [Blänsdorf]

Fig. 11. Peg no. ‘a’. Detail of black dots [Blänsdorf]

clay was reduced or lost (fig. 8, right).[10] Very few pegs show signs of wood pest or fungi attack.

Today many pegs are broken. Often the tip is broken off, others are reduced to splinters. This damage was caused by the destruction of the statues.

On a larger number of pegs soot or traces of fire have been found, but it is not clear if this dates back to the origination or to the destruction. Sengupta mentioned in 1984 that he found traces of charcoal in the large holes within the elbows of the Western Buddha. He assumed that the wooden anchoring system of the statues had been burnt at an earlier time.[11]

Fig. 12. Peg no. ‘a’. Shell of dot opened to reveal white round material, indicating the microbiological origin of the dot [Blänsdorf]

Ropes

The ropes are rather thin, but show a durable quality. They vary in thickness, colour and manufacture technique.[12] The ropes were attached to the pegs in different ways (fig. 13). The simplest way was to take one rope and wind it around the peg once before continuing to the next peg (fig. 13, 1). Mostly two ropes had been plied together to form a double rope. To insert a peg, the twist was opened to form an eye (fig. 13, 2, 2a). Four ropes were plied together as well and used the same way (fig. 13, 2b; 14). Often one of the ropes or both (fig. 13, 3a and 3b; 15) are wound around the peg once, thus allowing to regulate the tension of the rope. In a rare case, a rope was split and the peg inserted between the strings (fig. 13, 4 and 16).

Generally pegs and ropes were separated during the destruction of the statue. Only very few pegs have been found that are still connected to pieces of the rope.[13] In one case two ropes were affixed to a round wooden armature with two knots (GBL 1773, fig. 17).

Large wooden anchoring beams

Several large beams were found in the rubble. They are square in diameter[14] and the end is blunt, not pointed. They were probably inserted in the large holes mentioned above. The holes seem to be driven up to 1 m deep into the stone.[15] The parts of beams found in the rubble are between 20 and 81 cm long. They were clearly broken off during the destruction of the statues. They were probably clamped in the holes using wedge-shaped planks which were about 7–8 cm shorter than the depth of the holes.

A large timber found at the Eastern Buddha proved to date from the same time as the clay layers (see: *Dating of the Buddha statues – AMS ^{14}C dating of organic materials*, in this publication). It was probably used as anchorage for larger protruding parts.

Fig. 13. Different ways of inserting pegs into the rope [Blaensdorf, Melzl]:

1 S-plied rope with simple loop

2 double rope with simple eye

2a Z-plied double rope with simple eye

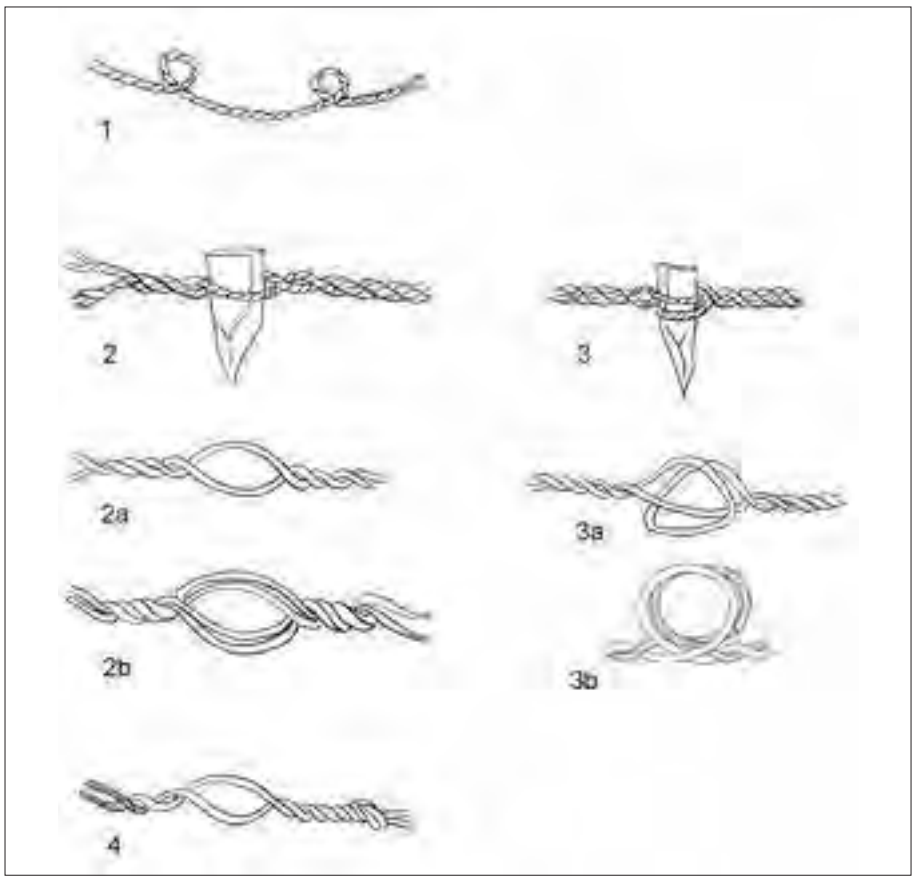
2b two Z-plied double ropes with simple loop

3 double rope with loop

3a Z-plied double rope with loop in one rope

3b Z-plied double rope with loop in both ropes

4 Z-plied rope split to insert rope



△ Fig. 14. GBL 1447: Double ply of four ropes with simple eye [Melzl]

△ Fig. 16. GBL 662: Rope split to insert peg [Melzl]

▽ Fig. 15. GBL 1386: Plied double rope with loop in one rope [Melzl]

▽ Fig. 17. Round peg GBL 1773 with two ropes [Melzl]

Clay layers

Before the destruction of the two Buddha statues, there was never a thorough examination of the clay layers covering both statues. The fragments examined in Munich are mostly too small or too damaged to allocate their original position. Our investigations therefore aimed at the question if it is possible to distingish between parts of the statues and the niches or cave murals, and between original parts and possible later completions.

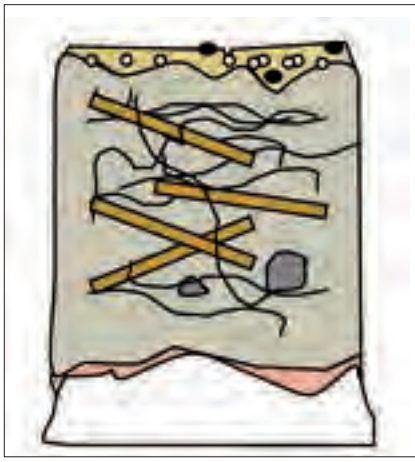
The descriptions of the 19th and 20th centuries do not contain more than brief remarks concerning the clay layers. They all agree that these top layers served to model the details of the shape. Burnes 1834 even says that the folds hanging over the arms of the Western Buddha were modelled in *some kind of plaster*.[16] Burnes and Eyre called the layers *plaster*, Maitland used the term *stucco*. Both reports do not seem to refer to a specific material.[17]

In 1933, Hackin and Carl gave the first detailed description of the clay layers as '[…] *composed of a mixture of clay and chaff, covered with a very thin film of lime mortar.*'[18] We find a similar description in a report of 1934, written by Joseph and Ria Hackin, concerning the Western Buddha: '*The whole* [surface] *was then covered with a coarse mixture of earth and chaff and covered with a layer of lime mortar*.'[19]

The photographs taken at that time show that the clay layers did not only cover the statues, but continued on the sides of the niches. It is remarkable that these descriptions mention a lime mortar as top layer. No analyses were done, but it can be assumed that a lime mortar should be white or whitish.

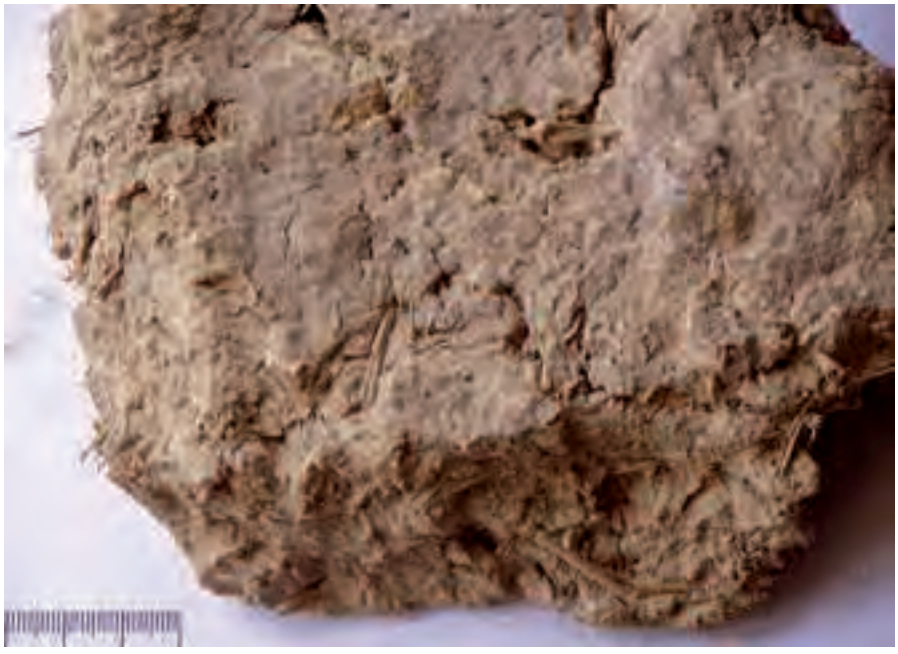
The first scientific analyses were made by Gettens in 1937 on samples from murals of different caves. He describes that the support as clay reinforced with vegetable fibre, chiefly straw or grass, which is spread in a thickness of about 1 to 2.5 cm (half an inch to one inch) on the stone surface. On top a white ground was applied, which he identified as burnt gypsum (not calcite).[20]

The description of lime mortars might be inspired by the white ground layers visible on the murals, but it nevertheless appears strange as Carl and Hackin collected fragments from the hair and the fold ridges of the Western Buddha. None of the fragments from the statues collected in Bāmiyān since 2004 possesses a white plaster layer and most of them do not have any white layers at all.



type of layer	colour/properties	additive	thickness
finish coat ('intonacco')	more yellowish, hard, compact	sand, hair, charcoal	0.05–0.5 cm (often 0.2 to 0.3 cm)
under coat ('arriccio')	more greyish, less comapct, rather inhomogenous, inclusions of lime	threshing, residues, hair, pebbles	max. 15–19 cm (depending on shape)
clay-lime slurry	reddish pink, rarely grey or yellow		< 0.2 cm

△ Fig. 18. Schematic structure of clay layers



◁ Fig. 19. Traces of pink slurry on the back of a clay fragment. Plant material is visible in the undercoat. [Melzl]

From 1969 to 1978, the restorers of the Indo-Afghan co-operation repaired damaged parts of the two Buddha statues in Bamiyan. In the report on the restoration of the Eastern Buddha Sengupta describes the layers as being made of clay and adds an interesting detail concerning the Eastern Buddha, saying that it was '*... covered with plaster in three layers and painted*.'[21]

Observations on the technique 2005–08

Observations have been made during the collection of the fragments and on the sample material sent to Munich. On most of the fragments two layers can be distinguished, consisting of a thick undercoat ('arriccio') and a thin finish coat ('intonaco'). Underneath traces of a slurry have been found (fig. 19).

The combination of a coarse clay layer, usually straw mud, and a finer clay plaster, usually containing vegetable fibres or hair and sand, is a wide-spread procedure in Central Asia and China. Moistening and applications of clay suspensions improve the adhesion.

The back of the fragments prove that the stone surface showed traces of aging and fibrous dirt when the slurry was applied.[22] This seems to indicate that at least some months, perhaps a winter season, passed between sculpting and clay modelling. The clay layers of the Eastern and Western Buddha are very similar. The coarse layers, however, can be distinguished by their visual appearance:

The clay layers of the caves are thinner than those of the Buddha statues. They look different as the clay does not contain hair and the surfaces are mostly blackened by soot. So, the differentiation of the fragments between caves and statues was quite reliable.

It has to be kept in mind, however, that at the outline of the statues there has been a transition between sculpture and painted niche walls, so there might be some fragments belonging to both. As fragments of the niche's wall plaster could not be retrieved – or identified so far – a technical comparison was not possible yet.

Slurry

As many fragments of the Eastern Buddha are broken apart within the clay layers, the preparation of the stone support can only be reconstructed partially. Traces of reddish or grey slurry were found underneath the coarse clay layer of a certain number of fragments.

Many fragments of the Western Buddha show traces of a slurry. It has been observed on the stone surface, the back of clay fragments and on many of the pegs. As to the pegs, the slurry is often found only on the tip. This seems to indicate that the slurry was applied before the pegs were inserted. If it was intended to apply the clay as long as the slurry was still moist, this would mean an extremely expeditious procedure requiring a team working with divided tasks at high speed. Generally, the slurry is pink, but on some fragments yellow or grey slurry was found as well. Other fragments show a coating of a material that the Afghans identified as donkey dung. The preparation with animal dung can partly be attributed to the restoration of 1969–78,[23] but on some fragments it seems to be part of the original structure, for example on the wooden pegs GBL 1171–1180. The grey slurry definitely dates from antique times.

So far, only the pink slurry from the Western Buddha has been analysed. It is a mixture of clay, coloured reddish by hematite, and of ground limestone. Some samples contain a rather high amount of gypsum in different quantities. So it has to be assumed that gypsum was added deliberately.[24]

Undercoat

The layer is 15 to 19 cm thick. On the Eastern Buddha it is slightly thicker than that on the Western Buddha. The undercoat was often applied in several layers, which today partly detach from each other. The execution in several applications seems reasonable regarding the considerable thickness of the layer. In the surface often traces of fingers have been preserved (fig. 20), showing that the clay was applied with bare hands.[25] This technique is still practised in Asia today.[26]

As additives chaff, threshing residues and hair have been observed. On the Eastern Buddha the additives appear coarser and also contain straw. The material used here could be analysed. On the Western Buddha the plant parts are finer, but some fragments of stones and pebbles of about 1–3 cm length were imbedded, either as deliberate addition or by accident. Inside one fragment a small piece of leather was found, in another one a small piece of textile.[27] As leather and textile pieces obviously got into the clay accidentally, the stones, too, were probably not mixed in on purpose.

The added animal hair is white, brown, and black. At the Western Buddha it sometimes occurs in surprisingly big tufts (fig. 21). The addition of animal hair is an important peculiarity of the clay from the statues. Animal hair is not found in the plasters of the cave murals. In fragments from caves next to both statues, the coarse clay plaster contains straw and chaff and very few, very fine bast fibres (maybe jute). The fine clay layer does not contain any organic additives. Using these criteria, clay fragments from the statues can be distinguished from the ones of the caves. An additional criterion is that on fragments from the caves the surface usually is rather blackened by soot.

There is a number of fragments catalogued as parts of the Western Buddha which do not contain hair and also show a paint layer sequence quite unlike most of the other fragments, but their colours are bright, not darkened by soot. It is not clear yet if they belong to the Buddha statue or where they could come from.

One fragment from the Western Buddha shows a completely smooth and flat reverse side. It seems not to have been attached to the rock surface, but to another kind of support. So far, there is no hint what this could have been.[28]

Finish coat

On both statues, the finish coat is only 0.5 to 5 mm thick. Only in rare cases, the layer is thicker (up to 1 cm), obviously in connection with corrections in the modelling. It contains additions of sand, a very small amount of fine animal hair, and a considerable amount of charcoal. The surfaces are very smooth and obviously treated in order to perfect the shape and to compact the layer. Straight edges of c. 0.5 to

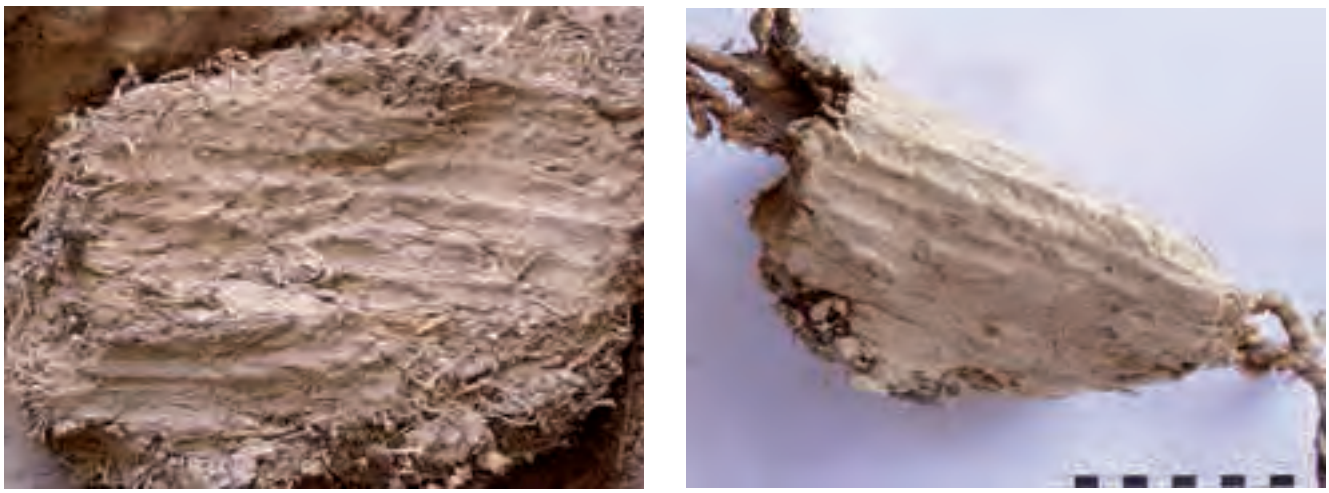
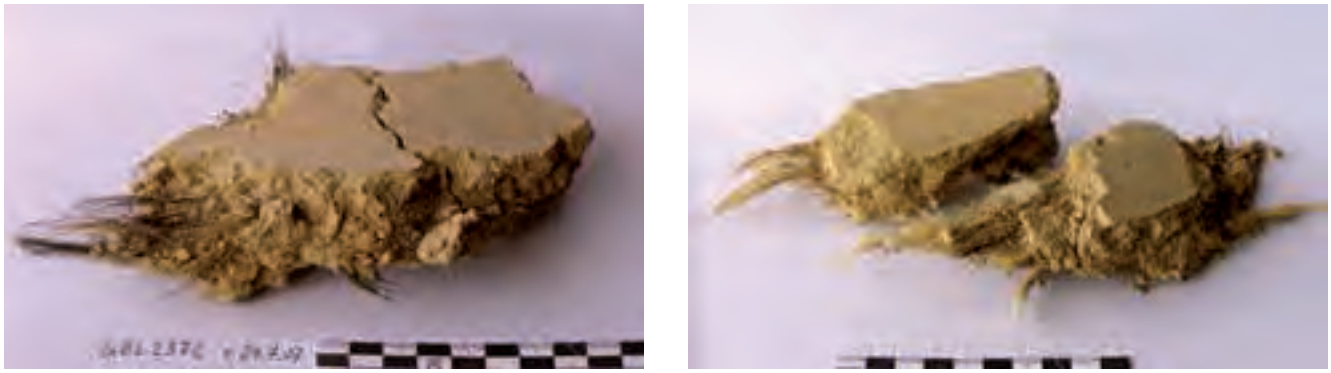


Fig. 20. Traces of fingers in the undercoat layers: Left: Fragment on-site. Right: Fold ridge of Western Buddha, fragment GBL 1088: Undercoat of a fold ridge of the Western Buddha [Melzl]

Fig. 21. Hair, sometimes in tufts, in the undercoat of the Western Buddha [Melzl]



◁ Fig. 22b. Fragments photographed in raking light showing 1 cm wide traces of modelling tools, ID 282 of GBL 775, size of sample 4 x 5 cm [Thiemann]

▽ Fig. 22a. Fragments photographed in raking light showing 2.5 cm wide traces of modelling tools, GBL 2425, length of fragment 7 cm [Melzl]

1 cm width indicate that flat modelling tools were used (fig. 22)[29]. Two pieces of leather detected in the rubble[30] can be interpreted as polishing tools.

Three-layer clay structures

In few areas of both statues, three instead of two clay layers have been observed.[31] A three-layered structure was already observed by the Indo-Afghan restoration team on the Eastern Buddha. In contrast to earlier assumptions, these parts do not seem to be a repair, but the result of changes for artistic or technical reasons during the modelling.[32]

Possible early repairs

Some fragments of the Eastern Buddha show the same type of yellowish coarse layer with finer additives, as they are characteristic for the Western Buddha. Assuming that the Western Buddha was made several decades later than the Eastern Buddha, this might be the result of an early repair or an added enrichment during the time when the Western Buddha was created.[33] ^{14}C-AMS dating proved that the work on the murals of the caves in the cliff continued until the late 9th century.[34] This means that craftsmen were around who could have repaired damages or changed some details.

Materials used in the Indo-Afghan restoration 1969–78

Several fragments clearly show traces of filling materials, plasters and overpaintings, which can be attributed to restoration interventions of the 20th century. Sengupta mentions that plaster of Paris was used for fillings in the murals in 1922-1923[35], but the French archaeologists probably did not carry out measurements on the statues themselves.[36] Thus the added materials found on fragments were brought in by the restoration of 1969–78:

Fragments of the repaired or reconstructed parts show that the restorers at that time partly worked with traditional techniques, but also used modern materials.

The clay plasters show very little additives; no hair was used. Animal dung was found as pre-treatment of the stone. Original pegs were re-used, visible on damages which occurred when they were driven into the wall again. Some missing pegs and larger anchoring beams were replaced by new ones.

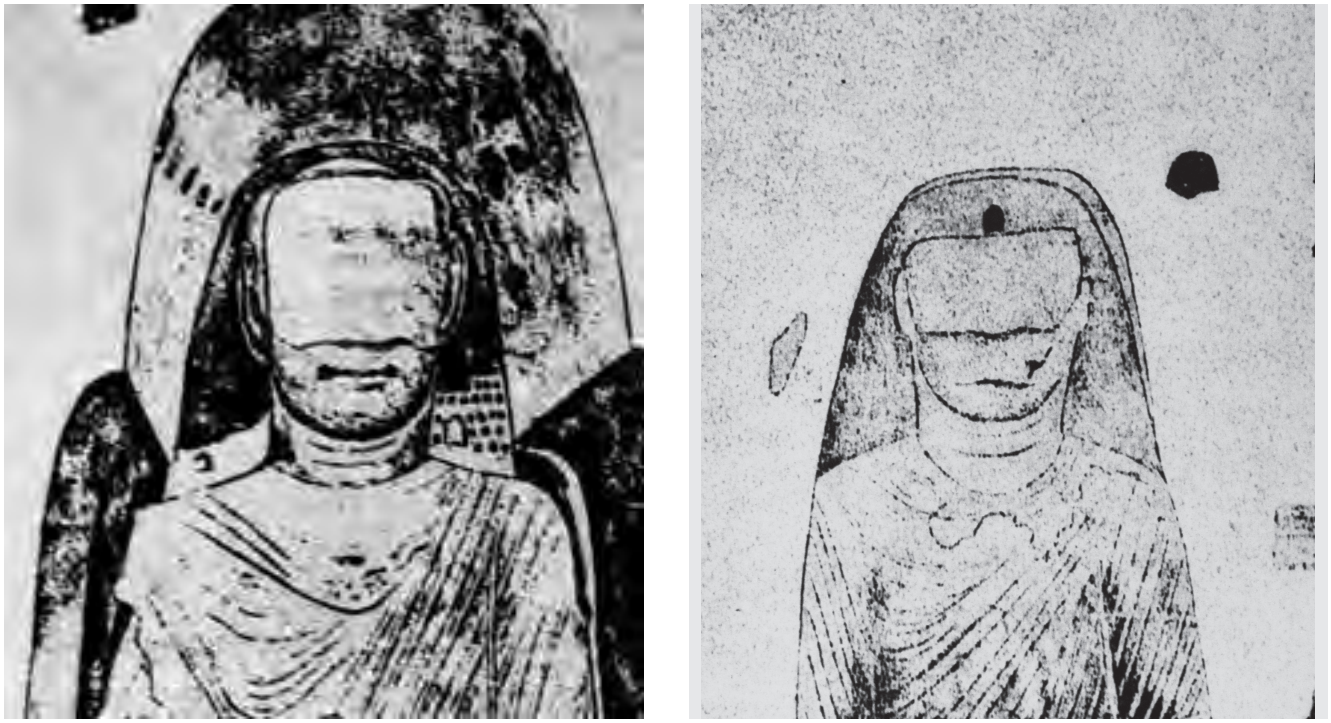
For fillings sometimes on top of damaged original clay layers with 'gypsum' (dihydrate, semi-hydrate and anhydrite)[37] and cement[38] could be proved by analysis. A thin reddish clay plaster on top of a probably cement-containing plaster contained vegetable fibres.[39] According to oral information the Indian restorers added shredded strings as fibrous material to the gypsum.[40]

Most of the fragments show a thin light ochre layer or traces of it on top of the paint layer. The covering of still visible remnants of paint with this 'clay-wash' can be attributed to the Indo-Afghan restoration. It was identified as a clay suspension[41], sometimes containing larger quantities of gypsum and calcite.[42]

Faces

In the faces of the statues, the parts above the mouth were missing, in the case of Western Buddha even above the lower lip. The authors of the 19th century attributed this phenomenon to damage. Listing other damages including

Fig. 23. Earliest correct drawing by Maitland 1885 showing that the faces were cut-out and not weathered or mutilated [Talbot/Simpson 1886, p. 348]



△ (a)

▽ (b)

(c) ▷

Fig. 24. Faces: Photographs and drawings showing the cut-out faces and the trench at the bottom to insert a wooden substructure

(a) Head of Western Buddha [Namikawa 1999, Abb. 97]

(b) Head of Eastern Buddha, 1956 [ASI]

(c) Schematic drawing of the faces [Tarzi 1977, vol. 2, p. 115]

those by cannon shots, they presume that the faces were destroyed in a deliberate act of mutilation. Consequently, the drawing by Burnes shows the faces as if broken away. In the 1920s and 1930s, Godard and Hackin still followed this hypothesis.[43]

In 1885, Maitland sketched the two statues in a remarkably detailed way. His drawings show clearly that the faces were not broken off, but cut-out systematically, leaving a smooth vertical wall above the mouth. All later photographs corroborate the state indicated in his drawings (fig. 23). Cutting out the faces meticulously to leave a regular recess without damaging the surrounding parts does not look like the result of spontaneous violence – comparable to the shooting with cannons or hacking holes into the faces of deities painted on murals.

During the Indian restoration in 1969-78, the faces could be reached from a scaffold and examined in a much closer way than before. A trench was discovered between the horizontal and the vertical wall of the recess (fig. 24), suited to insert a support structure. Pieces of charred wood and charcoal were detected as well. This led to the conclusion that the faces were probably cut-out from the beginning and modelled over a rack of wooden poles which afterwards was covered with clay plaster.[44] The reasons why such an unusual and unique design for the faces was chosen cannot be explained yet.

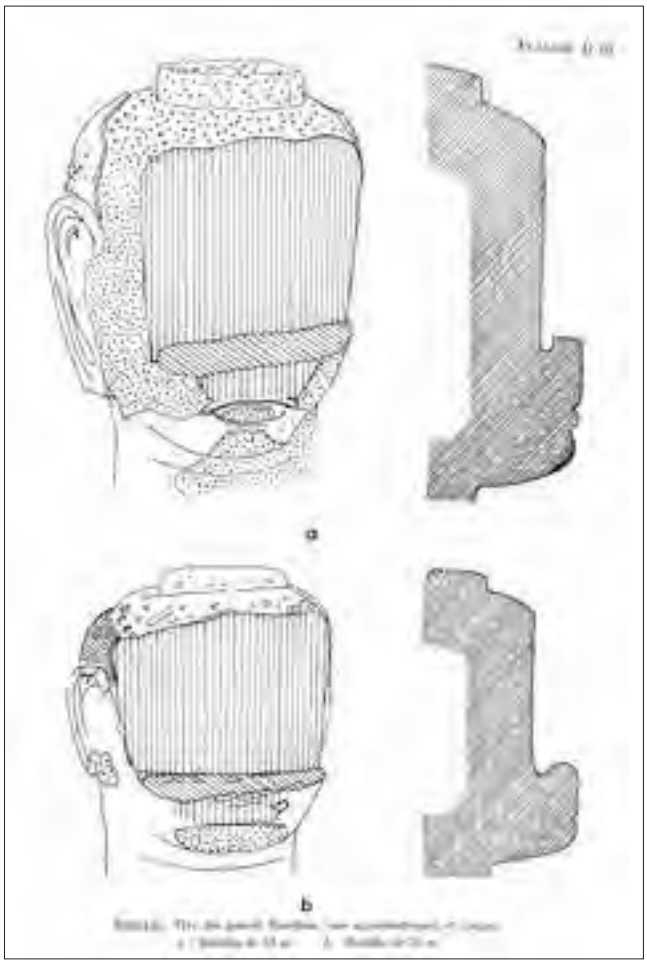


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Fig. 1. Metal trays with collected wooden beams, pegs and ropes [Melzl]

Fig. 2. Samples of wooden elements for analysis [Pfeffer/Blänsdorf]

Fig. 3. GBL 2368: Sculpted ornament with floral decoration, re-used as peg on the Western Buddha [Melzl]