

# **De-fragmenting Gandhāran art: advancing analysis through digital imaging and visualization**

Ian Haynes, Iwan Peverett, Wannaporn Rienjang  
with contributions by Luca M. Olivieri





# **The Global Connections of Gandhāran Art**

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Gandhāran 'Atlas' figure in schist; c. second century AD. Los Angeles County Museum of Art, inv. M.71.73.136 (Photo: LACMA Public Domain image.)



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# De-fragmenting Gandhāran art: advancing analysis through digital imaging and visualization<sup>1</sup>

Ian Haynes, Iwan Peverett, Wannaporn Rienjang

with contributions by Luca M. Olivieri

Students of Gandhāran art are necessarily acutely conscious of the impact of fragmentation upon their field. The very attributes that have drawn scholars to Gandhāra's visual culture have also, historically, made it vulnerable to patterns of collection that would invite universal condemnation today. Sculpture has been hewn from the structures for which it was originally created, often leaving it without a documented provenance, almost always without a specific archaeological context.<sup>2</sup> Not infrequently, sculptural groups have ended up at diverse locations, in different collections, circumstances that present their own challenges for researchers, even where the relationship between dispersed pieces is recognized. This paper considers two approaches that may both help mitigate these difficulties and offer new avenues of research. The first approach addresses the value of object scanning, focusing particularly on issues relating to the high-relief schist sculptures that characterize Gandhāran art. The second uses the remains of Saidu Sharif in Pakistan, an exceptionally well-excavated and documented site, as the basis from which to explore the potential for digital visualization of sites. It argues that the generation of such visualizations, or 'provocations', has its own value as an analytical method, testing hypotheses about the interplay of art, architecture, and agency.

## Imaging Gandhāran sculpture

The use of laser scanning, white light/video scanning (WLS), structured light scanning, and Structure from Motion (SfM) photogrammetry to generate 3D digital models of sculpture is now widespread.<sup>3</sup> The range of systems and the rapidity of development of these methods can appear bewildering. The speed of technical innovation, both in terms of data capture and data processing, means that detailed comment on a single device in a publication such as this can become redundant even before it reaches a larger audience. There are nevertheless several general observations that are likely to have a longer-term significance, these are rehearsed here.

There are several reasons why 3D modelling of sculpture has grown in popularity. First, and arguably most importantly, it allows researchers to look at objects afresh. The levels of precision – sub-mm levels of accuracy are readily achieved – can generate unwieldy data sets, but properly managed they are a major asset. The digital output not only allows for a closer examination of abraded and eroded detail, it also allows for enhancement and manipulation at no risk to the original object. Faces of the digital model can also be studied in higher resolution on a computer while being illuminated by raking light from a range of angles, furthermore images of the object can be produced without shadow more easily than a photograph can. But the advantage goes beyond this. Precisely because the models are 3D, they record detail which a photographer, even a specialist photographer, might not consider significant at the time

<sup>1</sup> Ian Haynes gratefully acknowledges the insightful comments of Alex Turner on white light scanning undertaken in this project.

<sup>2</sup> The term 'archaeological context' is used here in the specific, technical sense, of location of use within a place.

<sup>3</sup> Structure from Motion imaging essentially draws upon overlapping images taken from multiple angles to create a 3D model. A good quality digital camera, with a fixed focal length lens, can now be used to produce these images, but the key to a successful SfM transformation is the software used. An obvious attraction of SfM is that the data capture process can be less expensive than the use of a purpose-built scanning unit, but a key consideration remains the greater precision that scanners can usually achieve when recording an object. Historic England (2018) offers a valuable introduction, with case studies, to the effective use of laser scanning to document a range of archaeological material, including sculpture.

the object is documented. In Gandhāran art, for example, damage done to the back of objects when they were removed is seldom photographed, but it can be significant in determining the relationship of one dispersed fragment to another, and potentially also determining the structure from which it was removed. The value of recording such information, particularly when a fragment is to be wall mounted in display and thus less readily examinable, can be considerable.

Research is in turn greatly facilitated by digital models. While close examination of the original object must always be the aspiration of every specialist, the very fact that these precise models can be made available over distance and to multiple users simultaneously and at minimal cost enhances the scope for informed scholarly exchange. Details can be studied, conjoined identified and, with the exciting developments in the study of ancient colour now well advanced, the implications of different colour schemata can be modelled onto the 3D surface at no risk to the original object. Not only can various imaging systems now record with precision the colour and texture of the surface as it appears at the time of recording, but colours can be added, adapted and variously digitally manipulated. With the development of 3D printers, the outputs are not restricted to the digital realm; tangible full-size or scaled versions can be generated. As an instrument for taking innovative research straight into the public realm, the force of such models is considerable.

The threat to Gandhāran art from illicit trade, looting, and iconoclasm is not just a facet of recent history.<sup>4</sup> At a time when both random and calculated attacks on cultural heritage are sadly familiar, consideration must be given to both its safeguarding and, in the event of loss or destruction, its 'reconstruction'.<sup>5</sup> While a literal replacement may not be attainable, and the profound sense of loss will remain, the presence of digital models can go a long way to alleviating the injury, capable as they are of preserving detail down to the signature style of the original sculptor.

In a test to compare the effectiveness of different forms of imaging when recording Gandhāran sculpture, colleagues from the Ashmolean Museum, the Classical Art Research Centre at Oxford, and Newcastle University undertook a programme to scan objects in the Ashmolean's collections.<sup>6</sup> While the extensive range of successful imaging of worked stone left no doubt that results could be achieved, the aim of this exercise was to take a deeper look at the challenges posed by the particular qualities of Gandhāran art. How would structured light scanning and SfM imaging manage the challenge of recording the deep relief of the sculpture? How would the schist respond to white light scanning? Would the higher resolution photography of SfM produce a more detailed representation of the surface texture of the sculpture than video-based structured light scanner? How time-consuming would the post-processing of structured light scanning data prove when registering the different outputs of consecutive scans to one another?

<sup>4</sup> L.M. Olivieri also notes the threat posed by the number of fakes appearing not only in the trade in antiquities, but also in museum collections. Some of these fakes are now being mistakenly included in scholarly publications.

<sup>5</sup> The case of the Bamiyan Buddhas is not only one of the best known instances of this threat, it is also one where a wide range of imaging and scanning techniques have been brought in to attempt virtually to recover what has been lost (Jansen et al. 2008; Toubekis et al. 2011). Impressive though this work is, it can only hope to recover a fraction of the information that scanning before destruction would have recorded. L.M. Olivieri notes the amazing work undertaken in 2013–2016 by Giuseppe Salemi, Fabio Colombo, Livia Alberti, and others (ISMEO-ACT) in 2013–2016 for the restoration of the Buddha of Jahanabad in Swat. The face and other elements had been destroyed by insurgents in 2007. The team made extensive use of 3D scanning technology to aid in the restoration. See Olivieri 2014, for the first phase of restoration work. A further report was delivered at the 2018 EASAA Conference in Naples.

<sup>6</sup> The team acknowledge with gratitude the support of Dr Mallica Kumbura Landrus, Keeper of the Eastern Art Department and Senior Curator of Indian, Himalayan and Southeast Asian Art at the Ashmolean for granting access to the collection. The scanning team consisted of Alex Turner, David Heslop, and Ian Haynes. SfM recording was undertaken using a Canon 750D SLR with 24.2 megapixel resolution. The software used to process the images was Photoscan, augmented by 3D modelling software (a combination of Meshmixer, Meshlab, Blender, and Autodesk Recap Pro). Two WLS scanners were employed, the ArtecEVA, capable of scanning with a resolution of up to 0.5mm, and the Artec Spider, with a resolution of 0.1mm.



Figures 1a and 1b. Scanning of a grey schist standing figure of the Buddha c. second to third century AD (EAOS.26; height 0.95m) in the Ashmolean Museum. The scanner in use is the Artec EVA. The images of sculpture are both derived from rotations of a scanned digital model. (Model by Alex Turner, Newcastle University; copyright Ashmolean Museum, Oxford.)



Figures 2a, 2b, 2c. Different views of a digital model of the schist sculpture of Hārītī, c. second century AD (EA1997.3; 19.5 x 13 x 7.5 cm). Derived from scans by the Artec Space Spider. The images of sculpture are derived from rotations of a scanned digital model. (Model by Alex Turner, Newcastle University; copyright Ashmolean Museum, Oxford.)

While the evolution of recording systems means that the test's conclusions should be revisited whenever further imaging is envisioned, a clear result was that structured light scanning yielded the most satisfactory results in terms of precision and speed (Figures 1 and 2). Outputs from the test are shown here in 2D form.<sup>7</sup> The latter allows a basic zoom and rotate facility. The full scan data, suitable for manipulation and research, is available with permission from the Ashmolean Museum.

### Visualizing Gandhāran Art and Architecture

At its inception Gandhāran sculpture formed an integral part of a wider visual landscape. Its position in that landscape affected the way it was encountered by the viewer. Understanding the built environment of which it was a part is therefore integral to its analysis, but this remains intensely difficult for the reasons noted above. One approach to this problem is to exploit the potential of digital visualization.

Like imaging, visualisation has now become a familiar instrument in the study of the past. Yet, it presents intellectual and ethical challenges too. The capacity of visualization software to generate photo-realistic images of partially or wholly hypothetical reconstructions of structures and spaces now partially or wholly destroyed is not unproblematic. Even though the advanced capabilities of architectural software can check the generation of hypothetical reconstructions that look fine on a page, but could never have stood – a notable problem in an earlier age – there is still a clear gap between an image of what is, and one of what is thought to have been.

Concern about the implications of this gap are not new. Such is the power of images that the professionally rendered visualization may not only mislead the interested amateur but can also subtly impact on the understanding of experts too. To address this concern a group of specialists in historical visualization launched the *London Charter*.<sup>8</sup> Integral to the *Charter* is the expectation that a detailed justification for each element of the visualization should be available. This expectation not only reflects the fact that expert visualizations are research outputs in their own right, but it also enables the viewer to distinguish between what is known, what is surmised, what is proposed based on analogy, and what is mere conjecture (Denard 2009: 7–8). While these criteria are seldom met in practice, the goal they embody remains an important one and crucially, it has the capacity to lead to further advances in scholarship. Attempting to visualize a structure in three dimensions and its entirety demands the resolution of debates that are otherwise unnecessary in text and can be avoided even in line-drawings and architectural plans. The quest to resolve key points frequently requires input from a range of specialists. Each stage of visualization in turn provokes new reactions and responses. This latter point is essential, and it is why the term provocation is to be preferred to visualization. The *London Charter* inspires us to document these so that the process of knowledge-building is rendered more transparent. A visualization/provocation is thus a vehicle for refining, question-setting, debate, rather than a depiction of what was, but it can crucially also help ascertain what was not. The capacity to test sight lines within such a 3D model, for example, is a powerful instrument when seeking to understand the role that, say, figural art played within a wider complex. Were two points inter-visible? How much detail could a viewer actually see?

In order to explore this approach further, the authors generated a series of visualizations/provocations of the site of Saidu Sharif. The site was chosen because it offers an exceptionally well documented body of material for both its art and architecture. So precise was the excavation and so good the preservation, that Francesco Martore who worked with Domenico Faccenna, was able to generate

<sup>7</sup> The test objects were initially also made available through Sketchfab via the Gandhāra Connections Resources page. They are now archived at the Classical Art Research Centre and the Ashmolean Museum in Oxford.

<sup>8</sup> See <<http://www.londoncharter.org>> last consulted 5th June 2020.

fine plans, elevations and even a museum model (of the Main Stūpa).<sup>9</sup> Nevertheless, the application of digital methods allowed the team to explore further points of debate about the structure's original appearance.

### The Buddhist site of Saidu Sharif

The Buddhist site of Saidu Sharif stands in the Saidu Valley, at the foot of the Shararai mountain, in Swat. The site is located on the side of an alluvial plateau formed by three rivers – the Swat, Jambil, and Saidu rivers – at the outskirts of an ancient urban area (today Mingora) (Faccenna 1995: fig. 1). At the junction between Saidu Jambil and Swat Rivers are other Buddhist sites of Swat, notable amongst which are Butkara I, Butkara III and Pāṇṇ I.<sup>10</sup> The site of Saidu Sharif was built over a graveyard (Noci, Macchiarelli & Faccenna 1997). The chronology and stratigraphic relation of the graveyard to the monastery and sacred area has been recently reassessed (Olivieri 2016; 2019b).

From the geographical point of view, although the mountainous Swat valley is a cul-de-sac (Olivieri, forthcoming), for centuries it was deliberately chosen as a 'short-cut' on the route that connects Tibet and western China with Gandhāra (Kuwayama 1991). It was used by the fifth-century Chinese pilgrim Faxian who travelled from China to India in search of Buddhist texts (Legge 1991). Today one can drive from Swat to Gandhāra in the Peshawar valley in less than four hours. It is well known that Gandhāra is one of the nodes of the ancient northern route, *uttarāpatha*, that connects the north-west of the Indian subcontinent with northern India, Bactria, and Central Asia (Neelis 2010). The Swat valley is one of the richest double-crop pocket zones in the north of the subcontinent (Olivieri, forthcoming).<sup>11</sup> It is also home for mineral sources including semi-precious stones such as emerald (Kazmi & Donoghue 1990), as well as schist and steatite which are soapstones commonly used for Gandhāran sculptures (Law 2011; Shah 1997; Kempe 1986; Rafiq et al 1983; Faccenna et al. 1993; Di Florio et al. 1993; 1995). The location and physical geography accommodated the growth of the Buddhist sites in the Swat valley during the time when Buddhism flourished in the north-west Indian subcontinent.

Two principal buildings constitute the structure of the Buddhist site of Saidu Sharif – the Main Stūpa and the monastery – and several minor structures, including subsidiary *stūpas* and shrines (Figure 3). The excavation of the site began in the twentieth century with the Istituto Italiano per il Medio ed Estremo Oriente (ISMEO) under the direction of Domenico Faccenna and Pierfrancesco Callieri (who directed the excavation of the monastery). Results from the excavations were published in four large reports (Callieri 1989, Faccenna 1995 [2 vols.], Noci, Macchiarelli, & Faccenna 1997, Faccenna 2001 [in Italian]). The first phase of excavation took place between 1963 and 1968 and focused on the *stūpa* terrace (Faccenna 1995). The second phase of excavation continued a decade later, lasting for five years between 1977–82, during which the monastery and more of the *stūpa* area was unearthed (Callieri 1989). Most recently, between 2011 and 2015, excavation and conservation at the site were completed by the new ISMEO under the direction of L.M. Olivieri (Olivieri 2014; 2016; Filigenzi et al. 2016). Thanks to the meticulous work of the Italian team, the Buddhist site of Saidu Sharif is one of the very few Gandhāran sites that can offer archaeological and architectural information with high precision and accuracy.

The Main Stūpa is located on the lower terrace and is surrounded with several subsidiary *stūpas*, shrines, and columns built over periods. The monastery, built on a rectangular plan, stands on the upper terrace to the east of the Main Stūpa. The construction of the buildings at the Buddhist site of Saidu Sharif can be divided into three main building periods (Faccenna 1995; Callieri 1989). This paper presents the visualization of the beginning of the construction, i.e. the first phase of the first period of the

<sup>9</sup> For the new Swat Museum, Saidu Sharif (Gallery 4; 2012).

<sup>10</sup> See description in Olivieri 2019a.

<sup>11</sup> See Olivieri et al 2006; Olivieri and Filigenzi 2018, on the implications for the Buddhist communities.





Figure 3. General view of the stūpa area and the monastery of the Saidu Sharif Buddhist site. (Photo: after Callieri 1989, fig. 3, courtesy ISMEO Italian Archaeological Mission in Pakistan.)

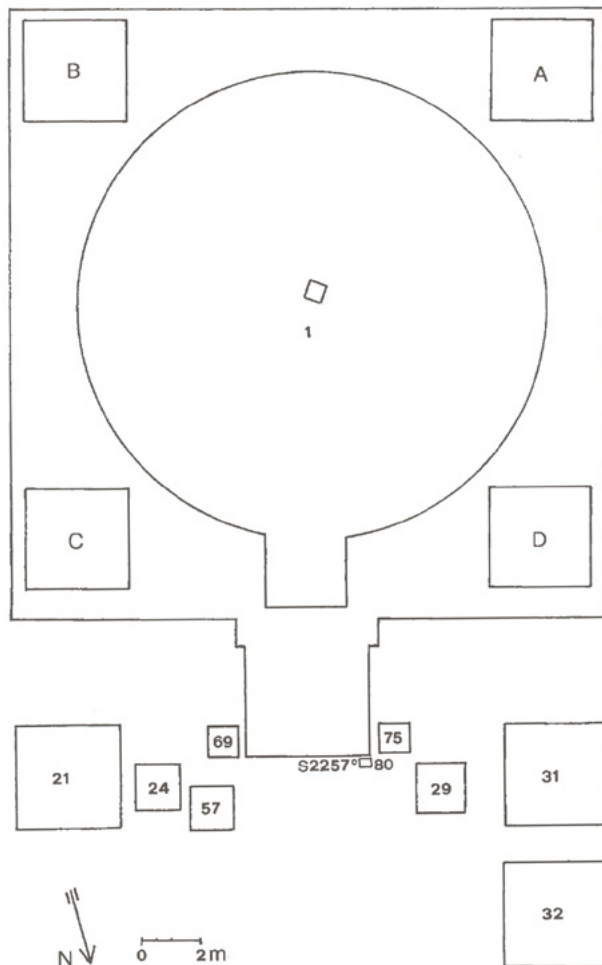


Figure 4. Site plan of the Saidu Sharif stūpa terrace during the first phase of the first period. (Plan: after Faccenna 1995, fig. 9, courtesy ISMEO Italian Archaeological Mission in Pakistan.)

construction (Figure 4), which is the period corresponding, according to Faccenna (1995), to the first half of the first century AD.<sup>12</sup>

<sup>12</sup> The dating of these periods is based on a combination of evidence including numismatic and epigraphic evidence, and comparisons of the typology of structural techniques with the neighbouring Buddhist sites including Butkara I and Pānṛ. The majority of coin finds from Saidu Sharif I belong to the Kushan kings (from Soter Megas to Vasudeva I and the Later Kushans). But the coin of the earliest date is that which appears to be an issue of Azes II (Callieri 1989: 231, 232 fig. 161a) which was found in the monastery area. In contrast to a second coin (see Callieri 1989: 120), the 'Azes II' issue is firmly associated with the second floor [layer (3a)] of the Monastery's courtyard in Period I B. The latter certainly corresponds to the last phases of Period I on the Stupa Terrace (last half of the first century AD; Faccenna 1995: 144, pl. XX) (Olivieri, pers. comm.). In fact, according to Joe Cribb (pers. comm.), the coin is most likely a posthumous issue of Azes II, which was probably issued during the latter half of the first century AD. Kharoṣṭhī inscriptions on pottery that were found in the monastery area are dated by Fussman (1989) to the period between mid-first century BC and second century AD or later.

The construction during the first period began with the Main Stūpa and monastery. There are also remains of nine square bases on the stūpa terrace, to the north of the Main Stūpa, that were also built during the first period. According to the analysis by Faccenna (1995), these are bases for small stūpas (nos. 21, 31, 32, 57), columns (nos. 24, 29, 69, 75), and an unidentified structure (no. 80) possibly a pillar or an image (Faccenna 1995: 53, 197-98). It may be worth noting that no chapels to house images (*vihāra*) were built during the first period.

The Main Stūpa, built with soapstone in an ashlar masonry, stands on an irregularly square platform.<sup>13</sup> The stūpa is preserved up to the second storey, i.e. the first storey of the drum which rests upon the platform. Inside the platform, at the top and slightly off-centre, is a reliquary recess with its relic deposit *in-situ* (Faccenna 1995: 441, pls. 43, 44, fig. 188).<sup>14</sup> There is no record of enlargement of the Main Stūpa. The architectural reconstruction of the Main Stūpa by Faccenna (1995: fig. 283) shows that the stūpa is accessed by a stairway to the north which leads to the top of the platform.<sup>15</sup> An upper stairway leads up to the *pradakṣiṇapāṭha*, encircling the stūpa drum.<sup>16</sup> Remains of a base plinth at a corner of the Main Stūpa in combination with remains of large fallen columns, with parts of shaft and capital, on the terrace floor next to the Main Stūpa on the south, east, and north suggest that four columns stood in each corner of the Main Stūpa base (Faccenna 1995: 481; Faccenna & Callieri 2003: 311). Part of one column (Column C), excavated between 2011-2012, shows that the column was fashioned with the Gandhāran Persepolitan capital.<sup>17</sup> There are also remains of a *harmika*, which was decorated with a motif of rosette-type within filleted lozenges, as well as elements of the railing and cornice. Evidence of elements of *chatrāvalī* for smaller stūpas was also near the wall of the Main Stūpa (Faccenna 1995: 598).<sup>18</sup>

<sup>13</sup> The dimension of this square platform are 21.14m x 21.09 m x 20.34m x 20.22m (Faccenna 1995).

<sup>14</sup> L.M. Olivieri is currently completing a study on the building processes related to the Main Stūpa foundation and relic deposition at Saidu Sharif I, and their chronology (pers. comm.). On relic deposits and Saidu Sharif I see also Provenzali 2019.

<sup>15</sup> The reconstruction is based on excavated structures and associated materials at Saidu Sharif, in combination with comparisons of these elements with contemporary Buddhist sites in Swat including Butkara I, Panr I, Tokar-dara and Gumbatuna (Faccenna 1995). The elevation of the Main Stūpa at Saidu Sharif is based mainly on metrological analysis of the excavated structures and materials at Saidu Sharif with those of the stūpa of Tokar-dara (Faccenna 1995: 514-525).

<sup>16</sup> Faccenna (1995: 502) based his reconstruction of the *pradakṣiṇapāṭha*'s position on the comparison with stupas of Tokar-dara and Gumbatuna.

<sup>17</sup> Faccenna's reconstruction of the four columns, each topped by a seated lion, is based on the comparison with sculptural fragments of lion documented at Butkara I and Panr I. A sculptural fragment in the form of a lion was found next to a column at Panr I, and on the *pradakṣiṇapāṭha* of the Great Stūpa of Butkara I (Faccenna, Khan & Nadeem 1993: appendix A; Faccenna 1980-81: 644, pls. 207b, 208a). There were also sculptural fragments of a lion at Saidu Sharif but their original context could not be determined at that time (Faccenna 1995: 497, note 1). During the excavation of Column C in 2012, fragments of the associated seated lion was found and inventoried in the Swat Museum as SS I 29, 30 and 31 (three fragments: front and head, back, and one front leg) (Olivieri, pers. comm.).

<sup>18</sup> Two small square bases [69] and [75] are located close to the corner sides of the Main Stupa's staircase, respectively to the E and W. In the model presented here, they are completed as two columns surmounted by a disc, following the arrangement suggested by Faccenna 1995: 565, fig. 283. Both monuments are coeval to the Main Stūpa (Period I, phase a), certainly part of the monumental gate of the latter, and part of the overall monumental project of the Main Stūpa. With regard to their structure and elevation, [69] and [75] can be interpreted either as columns, or as pilasters, in both cases freestanding. They were topped by a finial which in the first case might have been a sitting lion, in the second case, a stone disc (*cakra*) (see Faccenna 1984: 321-322). The hypothesis was formulated by Faccenna on the basis of his study on monuments of Butkara I nos. 65 and 68 (columns) and no. 135 (pillar) (Faccenna 1984: 321-322, 325-327). Pillar 135 at Butkara I was surmounted by a four-sided, square, Gandharan-Corinthian capital surmounted by a *cakra* whose fragments were brilliantly reconstructed, also with the help of sculptural representations from Loryān Tangai and Shnesha (Faccenna 1984). The surviving architecture of [69] and [75] leaves no space for a detailed interpretation of the section of the elevation (square or circular). However, excavations at the site (including those directed by L.M. Olivieri) yielded several fragments of statues of sitting lions in soapstone, including (in 2012) fragments pertaining to the lion topping Column C (collapsed from the NE corner of the first storey of the Main Stūpa). Amongst the various fragments, there are some which certainly belong to the Main Stūpa's Columns A-D (total H. c. 1.5 m), others (referring to at least two complete statues, total H. c. 1 m), which can be associated with columns [24] and [29] (to the left and right of the Main Stupa staircase), and another one even smaller (SSI 225; total H. c. 0.70 m). The dimensions of the latter would fit the reconstructed height of both [69] and [75], if they were supporting columns. The visual effect of the two lions topping columns [24] and [29] before the entrance, the two smaller ones guarding the sides of the staircase ([69] and [75]), would certainly have been redundant, with the four bigger lions dominating from the tops of the Columns A-D. However, such redundancy would not

The dominant feature of the Main Stūpa is perhaps the main frieze<sup>19</sup> depicting the life of the Buddha<sup>20</sup> that decorates the stūpa drum (Faccenna 1995; Faccenna & Callieri 2003; Filigenzi 2006). One hundred and twenty-two fragments, most of which were found near the Main Stūpa, and which came from approximately seventy panels, have survived (Faccenna 1995: 526 n. 1, 528). Based on material, styles, and technical characteristics, these panels are most likely to have been built during the first period and under the supervision of one sculptural master (Faccenna 1995: 525-540; Faccenna & Callieri 2003; Filigenzi 2006). The frieze is made of green schist but the indirect evidence of the documented sculptural material suggests that they may have been gilded (Faccenna et al. 1993: 133, fn. 3; Faccenna 2001; Pannuzi 2015; Zaminga et al 2019; Ramaso 2019). The visualization of the two square bases on the left and right of the stairway as bases of columns each crowned by a *chakra* is based on evidence of such columns found at Butkara I and their depictions on sculptures both in Swat and the Peshawar basin (Faccenna 1980-81; 1984).

The monastery, also built in the first period, comprises ten rooms of the same size on each of the east and west sides, and twelve cells of different sizes on the south, with a square courtyard in the middle (Callieri 1989: fig. 5). Along the fourth side of the courtyard is a porch with fourteen pillars on each side. The monastery is accessed through a staircase on the west side.

One of the main concerns for the visualization is the issue of colour. There was no trace of any colour other than white for the body of the Main Stūpa, however, traces of red colour were found on the plaster coat of a column shaft of the Main Stūpa (Faccenna 1995: appendix A, 488 n. 2, 492). As mentioned, the main frieze was possibly gilded.<sup>21</sup> In any case, onlookers would have hardly escaped the amazing impression given by the contrast between the whitish soapstone of the railing of the first staircase and plinth, the sage green or gold of the main frieze, and the white plaster of the dome, all framed by the red shafts of the columns, and topped by the probable red details of the *chatrāvālī*.

### Visualization of the Saidu Sharif stūpa complex

As part of the process of developing visualizations of the Saidu Sharif site, the team used concept (shape only) and rendered models (3D models where colours, textures and the fall of light are incorporated/simulated). The figures in this paper represent 2D shots taken at static points within the models.

A preliminary stage was to generate a basic model placing the Main Stūpa in relation to the monastery building and drawing on the excellent reports of Callieri (1989) and Faccenna (1995) (Figure 5). The desire to encompass the two major structures in one model, something not previously attempted, was

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have been so unusual for the onlookers in mid-first century AD. One would immediately think of the clusters of sitting lions at the entrance of the stūpas in the representations from the frieze of Amarāvati in the British Museum. [Note by L.M. Olivieri.]

<sup>19</sup> According to the reconstruction by Faccenna (1995: 525), there are two superimposed sculptural registers on the Main Stūpa drum: register A with a figural motif and register B with a pseudo-railing motif. Faccenna (1995; Faccenna & Callieri 2003) places the figural motif (register A) below the pseudo-railing motif (register B). The visualization in this paper follows a reconstruction by L.M. Olivieri and F. Martore. Basing their argument on the dimensional data of the materials, Olivieri and Martore suggest that the figural panels may have been positioned above the pseudo-railings. According to Olivieri, this hypothesis was formulated in consideration of (a) the better visibility of the panels during the ritual circumambulation, and (b) the perspective of the figures which were sculpted so as to be seen at eye level (Olivieri, pers. comm.). This hypothesis was also considered by D. Faccenna amongst others (Olivieri and Martore pers. comm.; Faccenna 1995: 529 ff.). However, Faccenna's final reconstruction was guided by the comparison with surviving sculptural representations and miniature stūpas (Faccenna 1995: 528-540; 2001; 2002: 127; Faccenna & Callieri 2003: 319). An updated study of the frieze, on the basis of the new elements discovered during the 2011-2015 excavation seasons, is currently in progress (a study directed by A. Filigenzi with A. Amato), and it will be preliminarily presented at the forthcoming EASAA Conference in Barcelona (Olivieri, pers. comm.).

<sup>20</sup> Identified scenes include the dream of Māyā, the birth of Siddhārtha, the wrestling match, the meeting with hunters, the farewell of Kanthaka, the quarrel over the Relics, and the transportation of the relics (Faccenna 1995: 526 note 1, 528).

<sup>21</sup> Elsewhere at Butkara I, traces of colour, including red, golden-ochre, blue, and black, were found on the drum of the Main Stūpa and smaller stūpas during different periods (Faccenna 1980-81: pls. E.a-b, F.a-b, G.a-b, M.a-b).

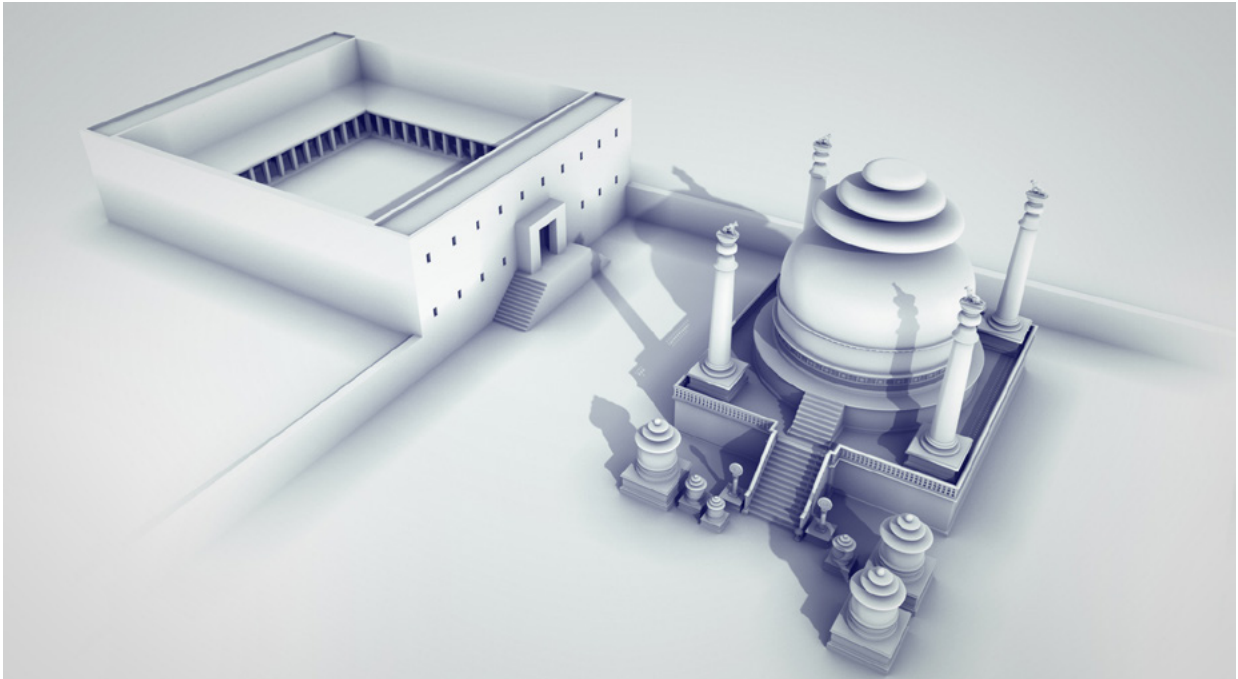


Figure 5. Basic model showing the relationship of the monastery and the Main Stūpa. (Iwan Peverett/New Visions Heritage.)



Figure 6. Work-in-progress model showing the view of the Main Stūpa from the Monastery entrance. (Iwan Peverett/New Visions Heritage with Ian Haynes.)

partially driven by the wish to understand better lines of sight between the two. This allows us to consider, for example, the sight that greeted a monk as he passed through the monastery courtyard and out of the building's main entrance (Figure 6). There is a challenge in visualizing the monastery elevation on current evidence, so we have offered a minimalist model, which draws upon the report (Callieri 1989) but does not elaborate the façade (Figure 7).





Figure 7. Work-in-progress model of the Sacred Area. (Iwan Peverett/New Visions Heritage with Ian Haynes.)





Figure 8. Close up of the Main Stūpa, incorporating models derived from figures in Callieri and Filigenzi (2002, pl. XI, cat. 126 (s 1137) and fig. 47, S. 1112). (Iwan Peverett/New Visions Heritage with Ian Haynes.) The image places the surviving fragments in what is believed to be their correct location. Details of the two cornices are indicative.

The colour (rendered) models were developed in part in order to visualize the impact of different reconstructed colour schemes. The process threw up challenging questions from the start. Was the practice of gilding the sculptures, well attested in later Gandhāran art (Pannuzi & Talarico 2018), a feature of the earliest phase at Saidu Sharif, for example? If it was, might that gilding have been partial, or might it have covered the entire surface? In our models, we have visualized the sculpture both with and without. This is one example of the challenge of incorporating material from analogies elsewhere. Another is to ask how far even the decoration of contemporary sites in the same region employed similar colour schemes. Butkara I (Faccenna 1980-81) for example, has yielded many examples of coloured material, but in the absence of directly comparable evidence from Saidu Sharif would it be appropriate to use it in the visualization?

Having the capacity to move around the model also raises that question of how those making a circumambulation of the stūpa would have seen the sculpted frieze. Faccenna (1995: fig. 282) envisioned the frieze below the false railing, but as mentioned above,<sup>22</sup> this alternative restoration follows the arguments of Luca M. Olivieri, that the frieze was sculpted to be visible at eye-level and that it would have been more visible if it was positioned above the false railing. Olivieri further notes that positioning the false railing below achieves what was probably the desired perspective, that the railing was in the foreground, the frieze behind (Olivieri, pers. comm.). Our model confirms at least that this configuration would place the frieze on a more natural eye line for the average visitor. Models such as this can also be used, with due and explicit caution, to consider how pieces without a precise archaeological context may once have been displayed.

<sup>22</sup> See n. 15 above.

It will be evident to readers, that these visualizations are very much work in progress, that certain points of detail have been omitted.<sup>23</sup> We are in the process of inserting these elements but note that the generation of appropriate 3D digital models for insertion even from the excellent technical photos in Callieri and Filigenzi's (2002) study of the Saidu Sharif sculpture is a difficult and time-consuming process (Figure 8). The scanning of original fragments as outlined in the first section of this paper must always be the preferred approach for accuracy and efficiency. What we do have here though is a provocation, in what we hope is the best sense of the word, a model that raises its own further and important questions about how we understand Gandhāran art and how it operated in its original setting.

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<sup>23</sup> The bases of the columns should, for example, be scotia-type on a high moulded pedestal. We have also inserted a south boundary wall for the *stūpa* terrace in Figure 3. Though the latter was hypothesized by Faccenna (1995: 56) it was not documented in the excavation (Olivieri pers. comm.).

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