

Conservation in action

The restoration of the small Buddha at Bamiyan

R. SEN¹



FIG. 1. A view showing the weathering of the rock and dislodgement of boulders

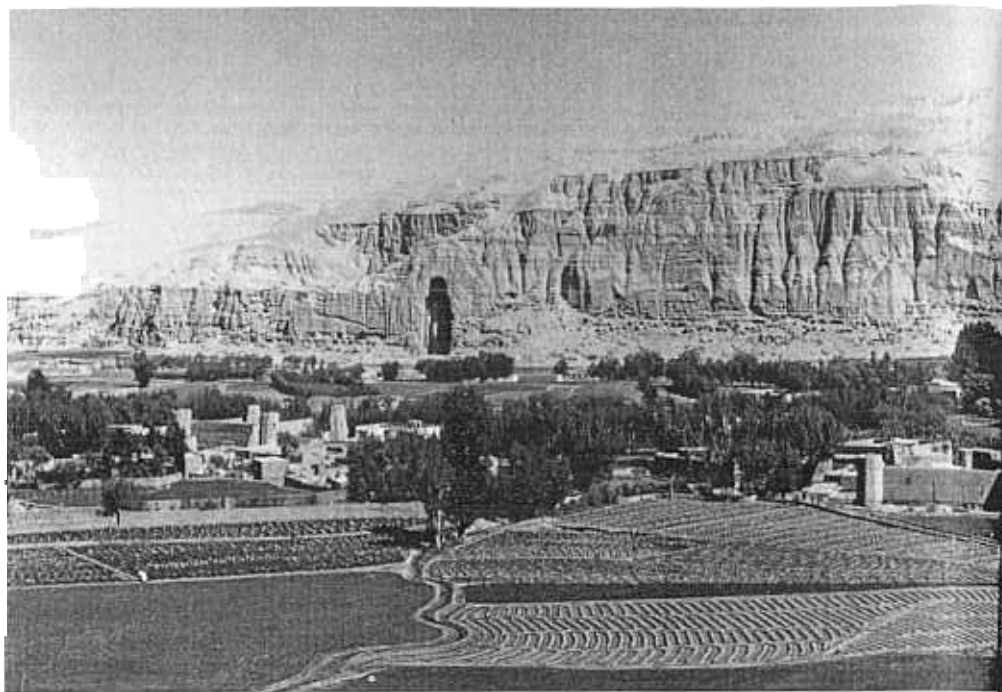
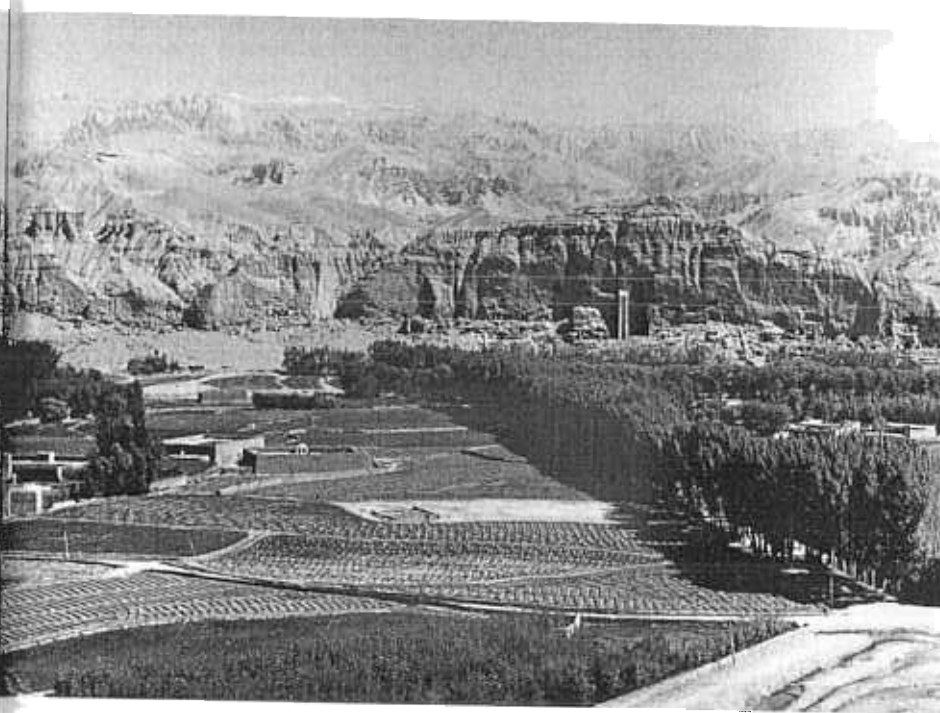


FIG. 2. A panoramic view of the Bamiyan Valley.

Recently, the Buddhist rock-cut shrines at Bamiyan in Afghanistan have become familiar to conservators, through the campaigns launched by Unesco for the preservation of mankind's cultural heritage. Indeed, the world's tallest Buddha images, one 55 m high and the other 38 m high, with beautiful murals on the walls and ceilings of their shrines, rightly deserve to be classified among the great works of art. The shrines were gradually disintegrating due to the lack of any systematic preservation and the Government of Afghanistan, which naturally was much concerned, sought help from all possible quarters.

India, having long-standing historical, cultural and friendly relations with Afghanistan, shared this concern and in 1963 offered to cooperate with the country in its difficult task. The offer was readily accepted, and experts from the Archaeological Survey of India under the leadership of the writer, started work in 1969 with materials not available in Afghanistan. The Afghan Government provided the team with residential accommodation, transport, labour and building materials locally available.

Bamiyan is situated about 250 km north-west from Kabul. Nestled between the mountain ranges of the Hindu Kush and Koh-i-baba, at an



altitude of about 2850 m, the valley (*Fig. 2*) on the ancient Silk Route that connected western Asia with India, offered an ideal camping place and developed into a major centre of Buddhism in this region, with two Buddha colossi and hundreds of shrines where devotees could spend their time in meditation and worship.

The activities which were to convert the valley into a vast group of monastic establishments are believed to have been initiated some fifteen hundred years ago. The two large images, the Big Buddha (55 m) and the Small Buddha (38 m) were probably carved out around the sixth or seventh century AD; of the two, the former was the earlier. The site was visited by Hiuen-Tsang in the seventh century and later by the Korean monk Hue Chao in the eighth, but it seems to have fallen into disuse from the ninth century onwards.

The architecture of the shrines is essentially a copy of contemporary structural forms. In India rock-cut shrines primarily followed wooden prototypes, whereas in Afghanistan mud-brick structures predominantly served as the models. There are thus examples of buildings in which pillars with an inward inclination, as in adobe houses, are used to support the roof. Long halls there remind one of a Mithraeum, with raised

benches running along the walls and a niche in the back, and there are others with multi-tiered beams placed diagonally at the corners to close the roof, or with just a flat roof. But irrespective of the ground plan of the shrine, be it squarish, oblong, circular, hexagonal or octagonal, the most common type of roof is domical, obviously in imitation of a *stupa*; the sculptural decorations in plaster are provided on the intrados. Those shrines have squinches at the corners to provide an octagonal base for the dome. The octagonal shrines best enabled the Buddhists to depict the seven- or eight-fold solar aspect of the Buddha, with an image portrayed in each of the niches provided in seven of the sides; the eighth side contained the entrance to the shrine. In these monolithic shrines there is neither interplay of stresses and strains nor is there any problem of rainwater seepage. However, the Bamiyan monuments, dug in the conglomerate of the Hindu Kush range, have other problems to face.

According to seismological investigations, the Hindu Kush area appears to be most vulnerable to frequent and severe shocks. In the past, Bamiyan also appears to have experienced shocks, which produced several cracks in the ceilings of the niches containing the two Buddhas. These cracks, over fifteen hundred years old, filled up from above with clay carried by the snow-water and were then plastered over at the bottom by the Buddhists before they painted the ceiling. The greatest damage to the shrine of the Small Buddha was caused, some fifty years ago, by a shock that produced a major crack which ran from the east along the cliff and travelled beyond the caves through the west wall of the niche. Gradually the cracked portion of the west wall was separated from the parent body and several cracks appeared on its inner face, giving it a shattered look. Inside the wall, the gap in the staircase was wide enough near the bottom to engulf a visitor; some steps were missing and the space was blocked by the masonry of the buttress wall. The staircase was therefore abandoned.

The rock in which the shrines have been carved is conglomerate, a mixture of heterogeneous materials such as pebbles, gravel, sand and clay with layers of sandstone blocks deposited alternately. The conglomerate, not having the compactness of rock, has undergone extensive weathering caused by cold and arid conditions. Snow deposited in the crevices and fissures eventually widens them, leading to the dislodgment of chunks of rock (*Fig. 1*). Again, when snow starts melting, water runs down the rock face and causes deep scars separating portions of the rock from the sides; then these scars, developing into cracks, gradually spread laterally at the back, eroding the supporting portions of the rock from the sides. The handiwork of nature thus lends the cliff the look of a massive facade sculptured with innumerable spires of various shapes and dimensions. Spasmodic earthquakes topple them, exposing a new facade, and the entire process is repeated. Apart from dislodging chunks of rock, snow-water also dissolves the clay matrix of the conglomerate, causing

further disintegration. At the foot of the hill there are huge accumulations of pebbles washed down from the hill.

Of necessity, therefore, the restoration work had to start with control of the snow-water, and an elaborate masonry drainage system to carry and discharge the snow-water away from the facade of the shrines was provided on the rock roof of the shrine of the Small Buddha. To divert the offending rushing water, three lines of channels were provided at appropriate levels on the mound at the top. Observations made during the next few seasons proved the efficiency of the drainage.

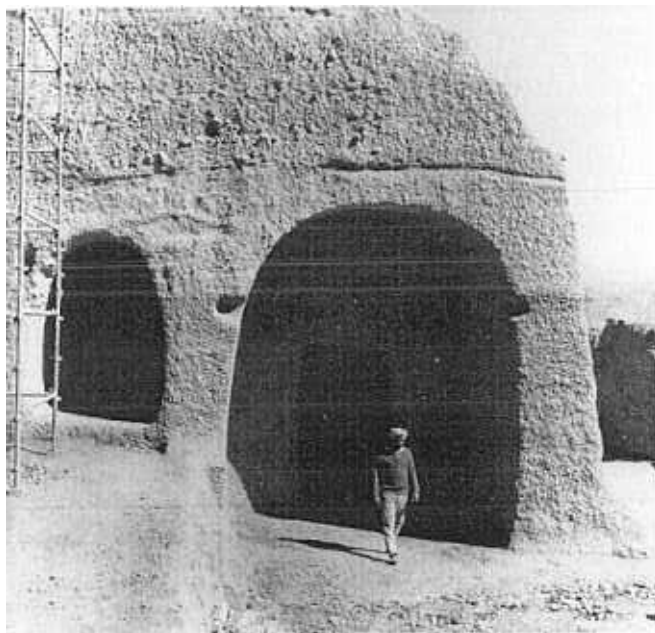
After removal of the cause of the rock erosion, restoration work was carried out. In repairing the various members of the rock-cut shrines, rubble masonry was largely used to make up the volume of the disintegrated or missing mass of the rock; then the surface of the masonry was finished with a coat of cement-concrete plaster varying in thickness from 3 to 5 cm so as to match the rock surface. The plaster used on the rubble masonry was stronger than that used on the rock. The relative quantities of cement mortar, sand and graded gravel to be used were determined in the light of such factors as temperature, snowfall and attrition caused by wind-borne sand; the percentage of gravel was adjusted according to the composition of the rock surrounding the location of each work. For surfacing the rock the strength of the plaster was adjusted to match the strength of the rock by increasing or decreasing the ratio of sand and gravel. The main consideration, apart from aesthetic ones, was to avoid creating any imbalance between the strength of the surfacing material and that of the core, whether of rubble masonry used for restoration purposes or of natural rock. The finished surface was invariably made to merge with the rock in colour, texture and composition.

At ground level there are several rock-cut shrines in the side walls and back wall of the main shrine of the Small Buddha. These shrines had undergone additions and alterations for residential purposes some twenty years ago. After removal of these modern accretions the shrines were restored in the manner described above. The shrine in the centre of the back wall, earlier reported as having a circular ground plan, turned out to be octagonal with a niche in each of seven of the sides.

The shrine at the outer end of the eastern wall was damaged and had lost a portion of its roof. There were traces of paintings in the extant squinches. The entrance to this shrine was blocked with rubble masonry, and after its removal and cleaning of the shrine, the missing portion of the side wall and the roof were restored in rubble masonry provided with nominal reinforcement. From the top of the roof a masonry wall was raised to support the overhanging portion of the rock. The masonry was covered with a coat of plaster (*Fig. 3*) to match the rock.

The shrines at the upper levels were also cleared of modern accretions. The repairs to these shrines were of a minor nature, but the major crack

FIG. 3. A damaged shrine after restoration.



that extended both to the west and east passed through the porch of shrines in the second level (*Fig. 4*). These cracks had to be filled in (*Fig. 5*), and on the western side, the cracked portion was secured by rock-bolting. The crack on the eastern side had been filled in earlier and a mud-brick staircase (*Fig. 6*) had been built to lead up to the shrines at the upper level. The crack was then properly filled in by rock-bolting and the staircase was restored (*Fig. 7*) with cement-concrete. For the safety of visitors dwarf walls were put up in front of those shrines which had open fronts. These walls were aligned so as not to be mistaken for parts of the original layout.

As stated previously, the flow of snow-water has eroded away the rock facade. From the evidence of the extant paintings of the Sun God, it appears that at least a metre or so of the outer edge of the ceiling of the shrine of the Small Buddha has been washed out. Snow-water flowing down the facade had also travelled over the painted surface. In order to prevent further damage, and also to strengthen the disintegrated rock in the soffits of the vaulted roof of the shrine, the missing portion was restored by creating a ledge of cement-concrete reinforced with mild steel rods, duly anchored deep into the rock mass. At the outer edge of the ledge a drip course has been provided and the surface of the concrete has been treated with a waterproofing compound.



FIG. 4. A crack passing through the porch of a shrine.



FIG. 5. The shrine after restoration.



FIG. 6. A damaged staircase.



The staircase after restoration.

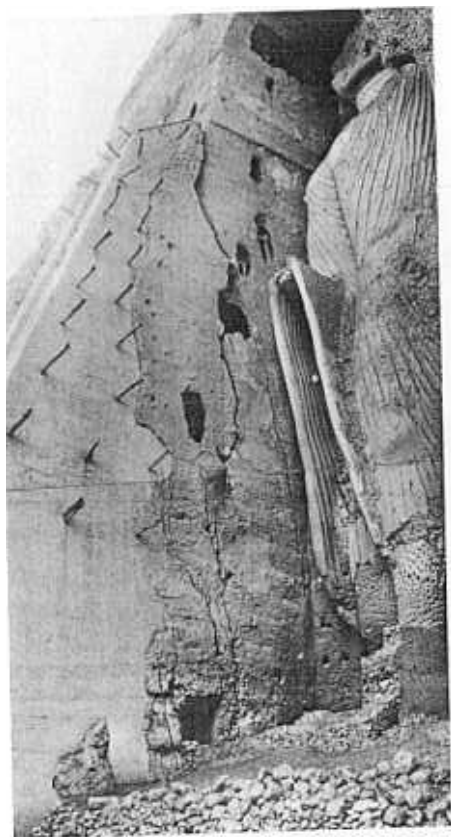


FIG. 8. The fractured west wall of the Buddha shrine and the buttress wall.

Once arrangements had been made to divert the water that would otherwise flow over the facade and travel inside the ceiling, attention was turned to the major task of repairing the fractured wall. The gap (Fig. 8) at the top between the separated portion of the wall and the parent rock was widening gradually due to annual deposition of snow. The severed portion of the rock had to be secured in position and the buttress wall treated in a proper manner. This involved filling in all the cracks and fissures in the wall to stop any ingress of water and tying up the fractured portion so that it might not slip down or be thrown out by tremors of even moderate intensity.

Before treating the wall, it was necessary to secure the fractured

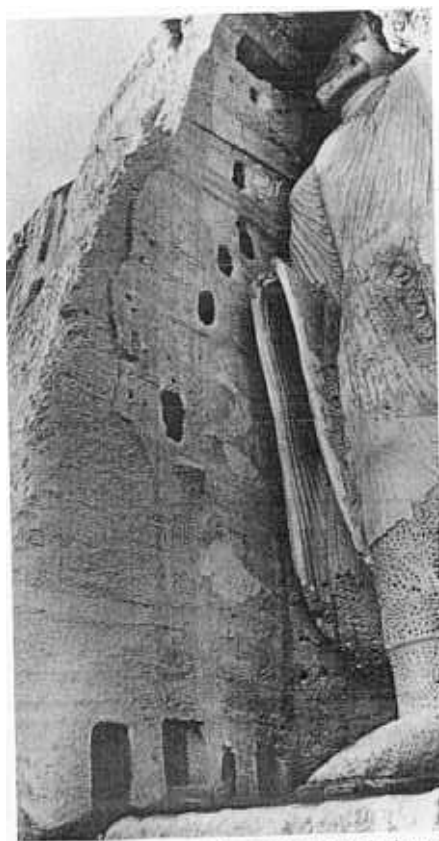


FIG. 9. The west wall after restoration; the buttress wall has been reconditioned and the original entrance to the staircase has been restored.

portion by rock-bolting. Advantage was taken of the existing support, so that the proposed work should not create any disturbance. To reduce the vibration to the barest minimum, a rotary core-drilling machine with diamond bits was used. In the mass of the rock the depths of the holes were staggered. The cracks on both the faces of the wall were stitched with a network of mild steel rods embedded in the rock and covered with cement concrete. The wide gaps were filled (Fig. 9) with rubble masonry, and the cracks, depending on their width, were filled with either a weak concreted mortar or a liquid lime, cement and sand mortar commensurate with the strength of the rock. As an additional protective measure against the tremors, belts of flat iron bars were installed around the separated chunk of rock. The iron bars were concealed in chases cut into the rock and covered over with concrete. The ends of the bars were driven deep into the solid rock of the back wall for anchorage.

Inside the west wall there is a spiral staircase which leads from ground level to the shrines at the three levels, one above the other, and to the tunnelled gallery in the three sides of the shrine, from which one can view the painted ceiling. With the separation of the rock, a fissure (Fig. 10) had developed and the staircase was severely damaged; a portion of it, above the bottom-most flight, was missing. At one place the fissure had torn off the stairs in the middle; at another, travelling along the inner wall, it had



FIG. 10. The damaged staircase.

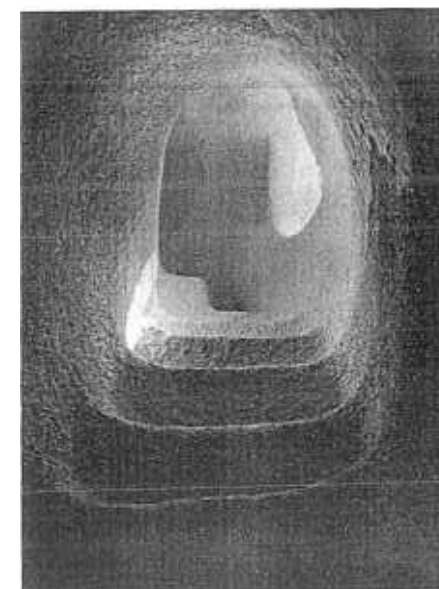


FIG. 11. The staircase after restoration.



FIG. 12. The buttress wall after reconditioning, and after the repair of the image.

pushed out the stairs with the separated portion from the parent body, and at yet another place the outer wall was moving out. The disrupted staircase, therefore, was consolidated by the introduction of reinforced concrete portals hooked into the walls and tied at the bottom. The damaged steps were then reconditioned. The portion of the staircase blocked by masonry was dug out and steps with a headway in conformity with the existing pattern were created to restore its original form (Fig. 11). The original entrance at ground level, which had been blocked with rubble masonry, was also restored. This internal treatment of the staircase was a considerable help towards fastening externally the detached portion to the parent body once more. After securing the fractured portion of the wall in position, it was decided to partially remove the obtrusive buttress wall without disturbing the balance established by the buttress wall as a prop. The unsightly wall was only to be trimmed and treated in an aesthetic manner to merge with the rock. The cavity of the shrine on which the buttress wall was erected was filled up with masonry and a reinforced concrete column was raised on it. To ensure the stability of the wall, and to prevent any dislocation of the material below its foundation, a toe wall in rubble masonry was constructed after removal of the loose materials.



FIG. 13. The brick-faced masonry buttress wall and the modern house in front of the image.

The brick-faced masonry wall (Fig. 12) was trimmed, and the entire surface covered with cement-concrete plaster, in a manner designed to simulate the undulating rock surface (Fig. 13). The use of 'cut blocks' of rock in the supporting structure was suggested by one conservator; but masonry with cement-concrete plaster was used in preference to these, mainly because, owing to its strength, homogeneity and mass, it was more durable. It could also more readily be made to match the irregular surface and contour of the rock. In the case of the Nubian monuments in Egypt, the precious stone carvings were to be preserved along with the shrines, and for this reason the entire mass of rock was sawn into blocks which were transported to the new site and re-assembled there; whereas at Bamian the main job was to secure the detached mass of plain rock by providing a 'suitably fashioned' support that would not interfere with the general disposition of the rock facade, yet would remain separate from the original rock.

The image of the Small Buddha, described in earlier publications as being 35 metres high, has been found in fact to measure 38 metres. Like that of the Big Buddha it was in reality carved out of the rock in *alto rilievo*, then covered with plaster in three layers and painted. Traces of pigments on the plaster show that the exposed parts of the body were painted in gold and the garment in blue. The rock surface of the image of the Small Buddha was provided with round holes for keying the layers of plaster. In the case of the Big Buddha wooden pegs were driven into the rock to hold the thick layers of plaster. The holes and chase in the rock indicate that the face had to be made with the help of a wooden framework. Similarly, from the presence of charcoal and burnt clay in the groove of the arms, it would appear that wooden armatures had to be used in creating the hands which were burnt.

In the course of the preservation work no part of the body has been replaced. The feet have been consolidated and finished with an irregular surface (Figs 14, 15) without there being any attempt to reproduce the toes. The crack above the ankle has been repaired by inserting bolts and then filling the gap with cement-concrete to match the rock surface. The broken edges of the garment have been filleted and the holes and hollows found on the surface filled up to arrest any further damage. The shoulders, bereft of any plaster, presented a surface of bare eroded rock. This exposed rock surface (Fig. 16) was treated with a layer of plaster and the folds of the garment were repaired with a rough surface, as though the finishing coat of plaster were lacking. The contrast is well demonstrated in the area between the neck and the right breast. Even where patching has been done, the repaired surfaces (Fig. 17) have been so finished as to look weathered. On the portions of the chin and the neck where the plaster is missing, no attempt has been made to replaster the surface; the broken edge of the plaster has merely been filleted to halt any further disintegration. Such restraint was exercised mainly with a view to

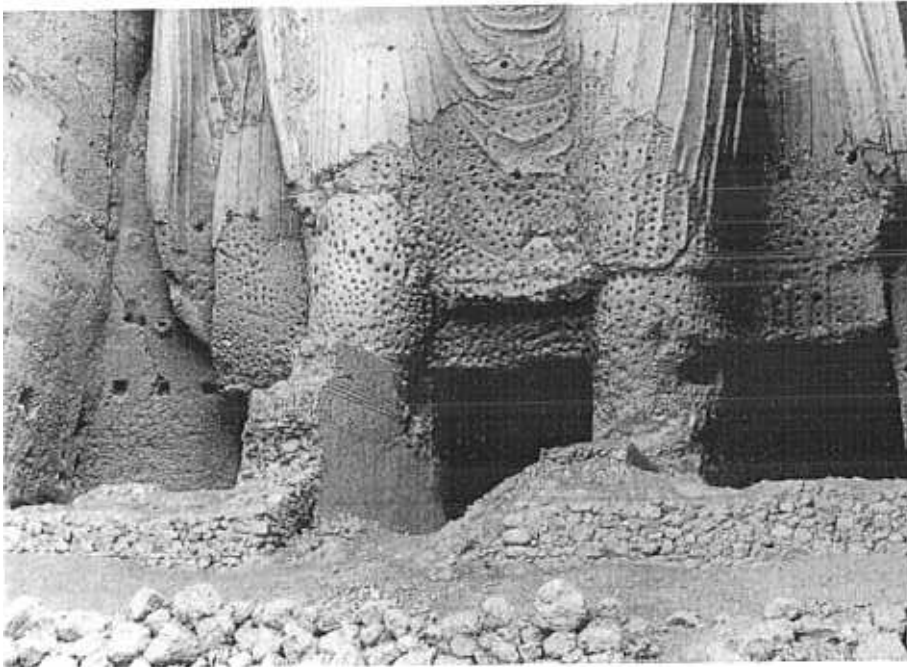


FIG. 14. The feet of the Small Buddha, showing the damage and the remains of modern walls.

respecting the 'traditional look' of the weathered and damaged image, without effecting any material change in its general appearance. With the damage repaired in an aesthetic manner and the unsightly buttress wall made to merge with the rock, the entire look of the surroundings of the Small Buddha has been immensely improved. The image of the Buddha, properly preserved, now looks far better.

The walls and the ceilings of these shrines had extensive remains of paintings which had suffered considerably owing to both physical and chemical weathering. The pigment had become loose and flaky; the plaster carrying the paintings was found to be very weak and in places detached itself from the rock surface. Deposits of sooty and tarry matter, dust and dirt, insects nests, etc., had caused further damage in certain cases where the murals were covered with a layer of mud plaster. Most of those within reach of the occupants of the shrines were defaced. The paintings on the curvilinear ceiling of the main shrine, which were beyond reach, seem to have served as shooting targets.

For preservation of the paintings, therefore, the loose plaster was consolidated and fixed to the wall, and broken edges were filleted. Holes,

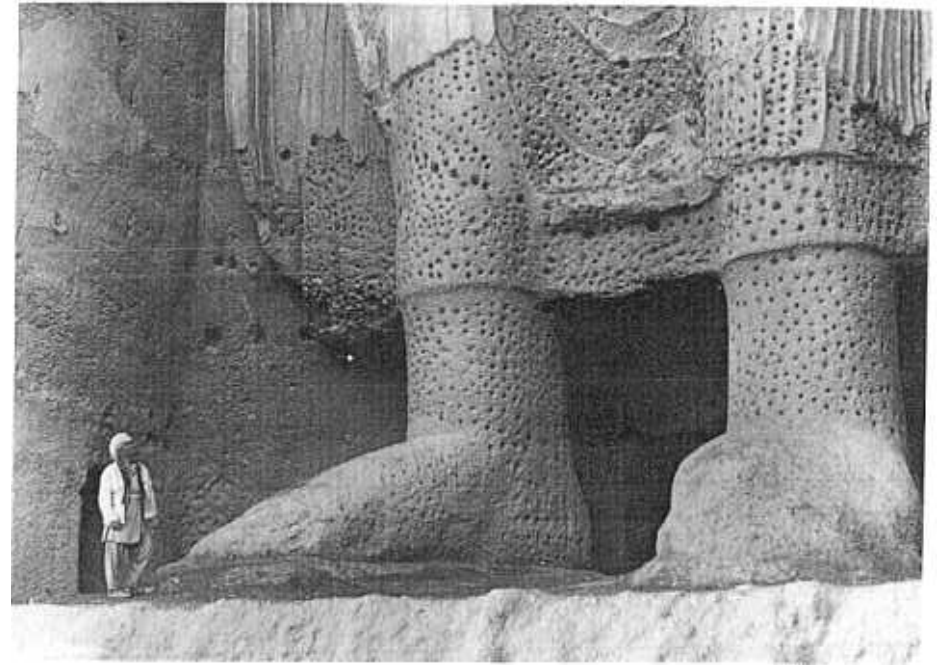


FIG. 15. The feet of the Small Buddha after consolidation.

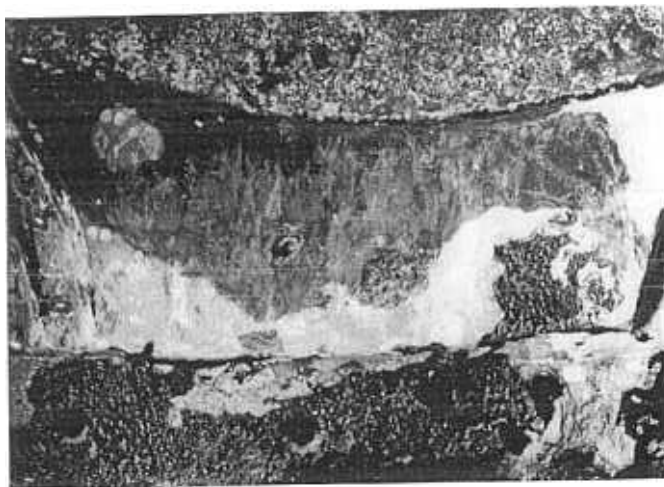


FIG. 16. The chest of the Small Buddha, showing the damage.



FIG. 17. The chest of the Small Buddha after restoration. Its traditional appearance has been preserved.

FIG. 18. A thick coat of soot on the whole of the painted surface.



gaps and cavities in the painted surface were filled in with plaster of Paris, tinted to match the colour of the paintings in the adjoining area. In the cold and dry climate of Bamiyan no alteration of the plaster of Paris was expected. The surface of the filler plaster was kept recessed to show that the paint layer was missing. No attempt was made to retouch the paintings or to paint the surface of the filled-in patches. The effect of this treatment was found to be satisfactory and aesthetically more acceptable.

For cleaning the accretionary deposits from the painted surface the solvents used were ethyl alcohol, acetone, cellosolve, ethylene glycol, ethylene dichloride and butylacetate. The loose pigments were fixed with a thin solution of polyvinyl acetate dissolved in toluene, alcohol and ethylene dichloride. For a preservative layer polyvinyl acetate was used, often more than one coat having to be applied as the painted surface was found to be highly absorbent but care was taken not to produce a glossy surface. Polyvinyl acetate was chosen as a preservative mainly because it was reversible.

The chemical treatment of the plastered surface covered with a layer of soot (Fig. 18) has revealed some interesting paintings hitherto unknown. For the first time in the mural paintings in Afghanistan, an incident from Buddha's life—the miracle of Sravasti, (Fig. 19) could be identified. In it the Buddha is shown with flaming shoulders, as shown in a few Gandhara sculptures and in an image recently found at Mathura in India. Another notable discovery is that the face of the huge figure of the Sun God, painted on the ceiling of the main shrine of the Small Buddha somewhat in the fashion of Zeus, has two pairs of eyes, one pair over the other.

FIG. 19. The painting of the 'Miracle of Sravasti' after cleaning off the soot and conservation.



Evidently drawn by an unsure hand, the lower pair was discarded and another pair drawn at a higher level to maintain the proportions of the face.

Résumé

La vallée de Bamiyan, en Afghanistan, à 2850 mètres d'altitude, entre les chaînes de l'Hindu Kush et du Koh-i-Baba, a toujours été un lieu de passage. Ce site archéologique de première importance était une étape sur la fameuse 'route de la soie', suivie par les caravanes reliant la Chine à l'Inde et à l'Asie mineure. Un grand centre monastique bouddhique s'y développa à partir du V^e siècle après J.C. Selon une formule originale, les sanctuaires et les couvents furent creusés dans la falaise où furent aussi taillées deux effigies de Bouddha debout, protégées par de profondes niches. La chronologie de ces statues est incertaine; on les attribue ici au VI^e siècle et la 'petite' statue (38 m) semble plus ancienne que la grande (53 m). Ce remarquable ensemble, orné de stucs et de peintures murales, a été décrit par deux célèbres voyageurs, Hiuan-Tsang, moine chinois du VII^e siècle et Hue-Chao, moine coréen du VIII^e siècle, qui y étaient venus en pèlerinage. Tombés en désuétude à partir du IX^e siècle, les sanctuaires et les statues de Bamiyan souffrirent beaucoup du fait des hommes, du temps et de la nature.

La vallée, à haute altitude, jouit d'un climat sec aux hivers rigoureux. A la fonte des neiges, l'eau ruisselle le long des statues et y dépose de l'argile. Cette

érosion, jointe à l'action des congères, a altéré l'aspect des statues et des niches taillées dans un conglomérat de roches, très hétérogène. L'Hindu-Kush est, d'autre part, une zone soumise à de fréquents séismes. Au cours des âges, les sanctuaires et les statues ont été plusieurs fois ébranlés par des tremblements de terre comme l'attestaient de profondes fissures affectant les parois et les plafonds des sanctuaires ainsi que les statues elles-mêmes.

L'Unesco s'était émue de cette situation et, en accord avec le Gouvernement afghan, avait lancé une campagne pour la conservation des monuments de Bamiyan. Dès 1963, les autorités indiennes offraient de participer à ces difficiles travaux et une équipe d'experts et de techniciens indiens sous la direction de R. Sengupta, vint s'installer à Bamiyan, de 1969 à 1973. Cette équipe se consacra à la restauration du 'petit' Bouddha: drainage sur la falaise pour détourner l'eau de ruissellement, consolidation des parties fissurées, remplacement des manques, reprise du revêtement de surface de la statue. Cette intervention s'est faite avec le souci de conserver l'aspect pris par la statue au cours des âges, dans le respect des données archéologiques. Ainsi, l'enduit de surface sur les parties restaurées fut particulièrement étudié pour se

fondre dans la masse, tout en restant discernable pour un examinateur averti. Les mêmes scrupules archéologiques ont guidé la restauration des sanctuaires rupestres entourant le petit Bouddha, endommagés par les tremblements de terre.

Les peintures murales des sanctuaires de Bamiyan sont d'un grand intérêt. L'une d'elles, dégagée sous une couche de suie, représente le 'Miracle de Sravasti', scène rarement illustrée dans l'iconographie bouddhique. L'expérience acquise par le Service archéologique des Indes pour le traitement des peintures murales (à Ajanta, en particulier) a permis de trouver une méthode appropriée pour fixer et restaurer les peintures de Bamiyan, peintures à tempera exécutées selon une technique et avec des matériaux—enduits, liants et pigments—employés dans les peintures murales indiennes de même époque.

Les travaux menés à bien ont permis la mise en valeur des statues et des sanctuaires de Bamiyan et ont contribué, en stoppant les processus d'altération en cours, à leur bonne conservation.

Resumen

El valle de Bamiyan, en Afganistan, a 2.850 metros de altura, entre los montes del Hindu-Kush y del Koh-i-Baba, siempre fue un lugar de pasaje. Este sitio arqueológico de gran interés era una etapa en el 'camino de la seda', seguido por las caravanas que iban desde China hasta India y Asia Menor. Un gran centro monástico búdico se desarrolló aquí desde el siglo V después de JC. Según una solución original, los santuarios y conventos fueron cavados en la Peña donde también fueron labradas dos efigies de Buda, en pie, protegidas por profundos nichos. La cronología de esas estatuas no está segura; se les atribuye aquí al siglo V, siendo la 'pequeña' (38 m) más antigua que la grande (53 m). Este notable conjunto, también decorado con estucos y pinturas murales fue descrito por dos célebres peregrinos, Hui-an-Tsang monje chino del siglo VII, y Hue-Chao monje coreano del siglo VIII. Caído en desuso desde el siglo IX, los santuarios y las estatuas de Bamiyan sufrieron muchos desperfectos de los hombres, del tiempo y de la naturaleza.

El valle, en altura, goce de un clima seco con inviernos rigurosos. Cuando se derrite la nieve, el agua

chorrea a lo largo de las estatuas, depositando barro. Esta erosión, juntándose a la acción del viento, ha alterado el aspecto de las estatuas y de los nichos cavados en un conglomerado muy heterogéneo. El Hindu-Kush, por otra parte, es una zona que padece frecuentes seísmos. Al correr de los siglos, los santuarios y las estatuas varias veces fueron sacudidos por terremotos, como lo testimoniaban hondas grietas en las paredes y los techos de los santuarios así que en las estatuas mismas.

La Unesco se había enterado de esa pésima situación y, en acuerdo con el Gobierno afgano, había patrocinado una campaña para la conservación de los monumentos de Bamiyan. Desde 1963, las autoridades indias proponían participar en estas difíciles obras y un equipo de peritos y de técnicos indios, bajo la dirección de R. Sengupta, permaneció en Bamiyan de 1963 a 1973. Este equipo se dedicó a la restauración del 'pequeño' Buda: drenaje en el acantilado para desviar las aguas chorreando, consolidación de las paredes agrietadas, sustitución de los elementos desaparecidos, restauración del revestimiento superficial de la estatua.

Esta intervención se hizo con la preocupación de conservar el aspecto tomado por la estatua en el transcurso de los siglos, respetando los datos arqueológicos. Así, el revoque superficial sobre las partes restauradas ha sido particularmente estudiado para fundirse en el conjunto, quedando discernible para un examinador enterado. Los mismos escrúpulos arqueológicos han guiado la restauración de los santuarios rupestres rodeando al pequeño Buda, estropeados por los terremotos.

Las pinturas murales de los santuarios de Bamiyan son de gran interés. Una de ellas, encontrada bajo una capa de hollín, representa el 'milagro de Sravasti', escena raramente ilustrada en la iconografía búdica. La experiencia del Servicio Arqueológico Indio en el tratamiento de las pinturas murales (en Ajanta, en particular) ha permitido encontrar un método apropiado para fijar y restaurar las pinturas de Bamiyan, pinturas a tempera, con técnica y materiales usados en las pinturas murales de India de misma época.

Las obras llevadas a cabo han permitido la puesta en valor de las estatuas y de los santuarios de Bamiyan y han contribuido, parando los procesos de alteración, a su conservación en buen estado.