



## THE JETAVANA STUPA REDISCOVERED

### HISTORICAL BACKGROUND

The third most ancient great Buddhist monastery in Sri Lanka, the *Jetavanaramaya* or the *Jetavana Monastery*, is situated in the *Nandana Pleasure Garden or Nandana Uyana*, where *Arahath Mahinda* preached Buddhism to 7,000 people over a period of seven days. King Mahasena (276-303 AD), the first of the great tank builders of Sri Lanka, was the founder sponsor of this monastery. According to the great chronicle *Mahavansa*, King Mahasena had tried to frustrate the monks of the *Maha Vihara* by getting a separate monastery established in the premises that had already been donated to *Arahath Mahinda* the founder of their school. Although King *Mahasena* commenced the establishment of the *Jetavana* monastery, the work was completed by his son King *Kithsirimevan* (304-340 AD) and thereafter all kings who belonged to the Anuradhapura Period continued to develop it. In 1017, the Anuradhapura kingdom fell into the hands of the South Indian *Chola* Empire and the Buddhist kings established their kingdom in Polonnaruwa. In 1070, King *Maha Vijayabahu* recaptured Anuradhapura and ruled it for two years but established his capital in Polonnaruwa where the three chapters of the Buddhist Order, the *Maha Vihara*, the *Abhayagiriya* and the *Jetavanaramaya* established their monasteries. This resulted in an abandonment of the monasteries in Anuradhapura by the Buddhists. When the South Indian invader *Kalinga Magha* captured Anuradhapura in 1215, all Buddhist monks and Buddhist rulers left the city. From then started the deterioration of the *Jetavana* Monastery. In 1236, King *Parakramabahu II* recaptured Anuradhapura and repaired the three Monasteries, *Mahavihara*, *Abhayagiri*, and *Jethawanaramaya*, and that could be identified as the last phase of the development carried out by the *Sinhala* kings. Although various *Sinhala* kings and Buddhist devotees thereafter visited Anuradhapura, the deterioration continued for about 800 years until the establishment of the British rule in Sri Lanka in 1815.

### THE LAYOUT OF THE MONASTERY COMPLEX

The monastery site covering about 80 hectares contains elements of the pagoda (*chethiya*), the image houses (*pilimage*), the bo-tree shrine (*bodhighara*), the chapter house (*uposathaghara*), the assembly hall (*sannipathasala*), the refectory (*danasala*), and the residential complexes (*pannasala*). There are many residential complexes or colleges where scholars lived and many other buildings whose purposes have not yet been identified. The main elements of the monastery were established around the cardinal points of the pagoda where the shrine room is situated to the west, the refectory to the east, and the bo-tree shrine, the chapter house and the assembly hall to the south. The residential complexes are located around the pagoda with their main entrances facing it.

The whole monastery complex, which used to house about 3000 monks, gradually evolved commencing from the northern end of the site in the third century AD. The pagoda, whose height was about 400 ft, was the third tallest building in the world at the collapse of the Roman Empire. Keeping it as the focal point the monastery complex spread towards the north-west, the south, and the east over a period of six centuries. The ruins visible today above the ground level belong to the last cultural phase of the ninth and tenth centuries AD.

### PREVIOUS ARCHAEOLOGICAL WORK

In the years 1828 and 1832, Major Forbes visited Anuradhapura and he reported that during his first visit the *Jetavana* Pagoda had been covered with thick jungle and that during his second visit it had been completely cleared by a Buddhist priest found injured due to the collapse of a part of the spire during the heavy rain reported in 1829. In the survey plan drawn by Deputy Assistant Quartermaster General Major Skinner in 1833, the height of the Pagoda was given as



244ft. After the establishment of the Anuradhapura District and the City of Anuradhapura as the administrative capital, the emphasis given to the Anuradhapura ruins was increased. Sir William Gregory, the Governor of Sri Lanka commissioned Mr. Capper, a surveyor to determine the heights and measurements of Pagodas in Anuradhapura, and since this was not completed, Architect Ferguson appointed Mr. J. G. Smither to prepare architectural details of the Pagodas. After the appointment of Mr. J.F. Dickson as the Government Agent for the Anuradhapura District, Jetavana Pagoda received the greatest attention ever experienced during the British period. Mr. S.M. Burrows excavated the Eastern Ayakaya in 1884/85, while Mr. Fisher noted a slip in the western side of the Hatareskotuwa on the night of 6<sup>th</sup> December 1885. At the same time during the visit of the new Governor Sir Arthur Gordon, it was decided to repair the summit of the Jetavana Pagoda to preserve the remaining portion of the Spire. The work involved was to rebuild the Hatareskotuwa using thick brick masonry on a lime concrete foundation with the completion of the faces with a Buddhist railing pattern and a Wheel of Dhamma in the center. In this restoration a concealed spiral staircase was built to provide access from the top of the Hatareskotuwa to the top of the Spire. This work was completed in October 1890 using prison labour. The first Archaeological Commissioner Mr. H.C.P. Bell, stating that the work had been carried out without proper archaeological excavations, continuously objected to the work carried out in the Hatareskotuwa. Mr. R.W. Levers drove a tunnel through the Pagoda in 1887 on a suggestion made by Mr. J.F. Dickson in 1884. On the 27<sup>th</sup> December 1896, the new west face of the Hatareskotuwa collapsed and several cracks appeared in the rest of the structure. In 1894, Architect J.G. Smither published the documentations of the Jetavana Pagoda in which the total height was given as 232 ft. to the point of ruin from the stone-paved platform and the diameter of the platform was given as 367 ft.

At the beginning of the 20<sup>th</sup> Century the confusion in the identification of the Abhayagiriya and Jetavana Monasteries were cleared by Mr. H.C.P. Bel, and a number of important renovations were carried out in the monastery. In 1903, Architectural Engineer F.O. Oertel was given the task of preparing a report on the restoration of the ancient monuments at Anuradhapura. He provided detailed plans and estimates for the restoration of the west face of the Hatareskotuwa, which could never be carried out. In the years 1912, 1916, 1920 and 1921, the Department of Archaeology carried out minor restoration works in the pagoda by filling and grouting the cracks and clearing the jungle every year.

### **RESPONSIBILITY OF THE CENTRAL CULTURAL FUND**

With a Cabinet approval from the Sri Lanka Government and a recommendation by the UNESCO, a systematic programme was launched in 1978 to excavate, conserve and display the significant archaeological monuments and sites within a triangular area linking the ancient capitals of Anuradhapura, Polonnaruva and Kandy. The area was named as "the Cultural Triangle". In 1980, by Central Cultural Fund Act No. 57 of 1980, a fund called "The Central Cultural Fund" was established to provide funds for the archaeological activities and to monitor the progress of the Cultural Triangle Programme. The activities of the programme spread to six sites, namely,

- i) Abhayagiriya Monastery, Anuradhapura
- ii) Jetavana Monastery, Anuradhapura
- iii) Alahana Parivena, Polonnaruva
- iv) Sigiriya Water Gardens
- v) Dambulla Cave Frescoes
- vi) Palace Complex, Devalayas and two monasteries of Malwatta and Asgiriya in Kandy.



This programme emphasised the conservation of the two tallest pagodas in the country, namely Abahayagiriya and Jetavana, through systematic archaeological and scientific investigations and the restoring programme of the Jetavana Monastery commenced in June 1981.

### WORK CARRIED OUT FROM 1981 TO 1993

The work of the Jetavana Pagoda commenced in 1981 with the restoration of the pagoda to its original state. The Design Group Five was appointed as the architectural consultants to the project, in which Architect Ashly de Vos and later Architect Tudor Sirisena acted as Director - Conservation. The archaeological investigations and the descriptive and photographic documentation of the findings were entrusted to Senior Lecturer Dr. Hema Ratnayake of the University of Colombo. The contract was handed over to the State Engineering Corporation of Sri Lanka while the Government of Japan donated all required scaffoldings, lifts, and conveyer belts. The Director General, Dr. Roland Silva, supervised the entire work programme.

Initially, the pagoda was seen as a small mountain covered with vegetation and soil. There were only the remains of 84 original layers of brick near the eastern *ayaka* and the original lime plaster at the base where the dome met the third *pesawa*. To the south at a point of 120 ft. above the base of the dome, there were remains of original bricks with the plaster. So it was decided to commence the restorations at the base up to the 84<sup>th</sup> bricklayer while the rest is being investigated. The remains of the four *ayakas* were removed for better protection and the conservation commenced with the laying of fare-faced wire-cut bricks. The discussions continued with regard to the use of wire-cut bricks instead of ancient bricks. In the mean time, the State Engineering Corporation completed the restoration of 84 bricklayers, two investigations commenced to identify the shape and size of the *pagoda* and the strength and the size of the bricks to be used for the construction of the remaining portion.

The contour survey carried out in 1983 suggested that the dome whs of parabolic shape. It further revealed that the average size of a brick was 16" X 12" X 2", and that their crushing strength was about 650 pounds per square inch. That led to the decision that the new bricks should be hand-made to a size of 16" X 12" X 2" with a crushing strength of at least 600 pounds per square inch. The State Engineering Corporation was given the task of supplying hand-made bricks to the recommended size and strength but it failed, and the contract was cancelled on mutual understanding that the Central Cultural Fund had not been able to come to a conclusion about the final appearance of the dome.

Although the work of the dome stopped at the stone-paved terrace, *salapathalamaluwa*, at the outer wall, that at the four gateways and the four flights of steps continued. The excavations at the base of the three basal terraces, *pesawas*, revealed that the foundation of the pagoda was 4 meters below the level of the stone-paved terrace. The conservation of the inner wall was also completed to the existing level, leaving behind the final layer to be completed with the completion of the stone-paved terrace. In the mean time, research into the manufacturing of a special conservation brick continued and finally, in 1992, a brick kiln was built in Galkadawala, about 20 km away from Anuradhapura with the help of National Building Research Organisation. This South Indian-fashioned kiln managed to produce hand-made bricks to the required strength and size.

In 1992, during the UNESCO Review Committee Meeting, the question of the conservation of the pagoda was raised and it was decided to achieve a good progress by 1993. As a result, the task of recommencing the conservation work of the Jetavana Pagoda was entrusted to the present writer when he returned after postgraduate studies at the University of York, UK. Soon after a committee consisting eminent Archaeologists, Architects, Historians and Engineers was formed and a workshop with the participation of three international experts was held from 10<sup>th</sup> to 14<sup>th</sup> May 1993 in Anuradhapura to decide a conservation policy for the Jetavana Pagoda. The



tasks decided at the workshop were:

- to attend to the collapsed parts of the *hatareskotuwa* immediately by buttressing the *devathakotuwa* and the *koth kerella*
- to retain the restoration carried out by the final half of the 19<sup>th</sup> century
- to keep the *koth kerella* at the existing collapsed height preserving its aesthetic character
- to restore and reintegrate the pagoda with a “medium” treatment, clearing the vegetation, reintegrating the eroded parts to prevent water accumulation, and reinstalling the loose bricks
- to treat the three basal terraces, the four *ayakas* and the *slalapathalamaluwa* also in a similar way adapted to the dome and *hatareskotuwa*
- to establish a short-term and long-term maintenance programme together with a monitoring system

Soon after the meeting of the national archaeological experts in June 1993 to decide the operational strategy the work commenced to buttress the *devathakotuwa* and the *koth kerella* and to investigate the dome in a 30ft wide strip. After the buttress work was completed it was decided to investigate the area of the *hatareskotuwa* also to arrive at a final conservation strategy.

#### ARCHAEOLOGICAL INVESTIGATIONS IN THE DOME

Two research officers, Mr. D.P. Gamlath and Mr. Y.K.T. Bandara, carried out the archaeological investigations under the direction of Dr. Hema Ratnayaka. They discovered two large craters in the middle of the dome. The soil, clay, bricks, and water pockets in the dome had helped to grow different varieties of trees on the eroded face. To name a few, the species were identified as *palu*, *weera*, *kohomba*, *milla*, *godakirala*, *kon*, *siyambala*, *tel endaru*, *agil*, *kolon*, *aththikka*, *va*, *bevila*, *sudu bevila*, *ingini*, *hik*, *kalu habarala*, and *lolu*. Zoologist Dr. W.S. Weerakkody, could identify 12 species of birds, 8 species of Mammals, 10 species of reptiles, 1 species of amphibians, 24 species of butterflies, 7 species of land snails and hundreds of species of insects such as spiders; dragonflies, beetles, etc.

Three investigative excavations were carried out in the dome in four different stages. The first stage was a 30ft wide strip commencing from 6ft below the base of the *hatareskotuwa* in the south-eastern section of the dome. The second was a strip near the first of 14.5m X 1m commencing from 47ft below the base of the *hatareskotuwa*. The third was a pit of 3m x 1.5m from about 100 ft above the stone-paved terrace in the western section and the fourth was a pit of 3m X 1.5m from about 100 ft above the stone-paved terrace in the eastern section. The main aim of these three excavations is to identify the construction technology, the deterioration processes and the present condition of the pagoda dome. According to these excavations and the previous excavations, the construction technology could be identified as follows.

- (i) The foundation of the pagoda rose from the bedrock or from a hard surface, which was about 4 meters below the stone-paved terrace.
- (ii) The three basal terraces have been constructed together with the dome and were not later additions.
- (iii) The inner most construction method was not yet identified.
- (iv) The most interior part at the western section consisted of bricks and clay.
- (v) Building a star-shaped brick wall and filling its inner part with broken bricks and soil was the construction pattern of the next part.



- (vi) The next section had been constructed by using half- or middle-shaped bricks of 15-20 cm in length and similar or less in breadth with a maximum of 5 cm in height.
- (vii) The colour of the bricks was red and unburnt bricks were too identified.
- (viii) The binding medium was ground clay of butter earth colour.
- (ix) In some areas the bricks were stacked and filled with soil.
- (x) The outer layer of bricks on the pagoda was a stable construction of a maximum of 60 cm in length, 40 cm in breadth, and 5 cm in height.
- (xi) There were red coloured bricks of 35-45cm in length and 20-30cm in breadth that were shaped to fit the curvature of the dome and bonded by using well ground clay with a space of 0.5- 1cm.
- (xii) This construction had continued up to a height of 130ft from the *salapathalamaluwa* and thereafter a random construction of small bricks of 20-30cm in length and 10-15cm in breadth could be identified.
- (xiii) This method of construction continued up to the base of the *hatareskotuwa*.
- (xiv) The most interesting identification in the dome within the height of 130 ft. was the use of unburnt bricks for the construction.
- (xv) It was observed that up to a height of 70 ft from the *salapathalamaluwa* the use of unburnt bricks was very rare.
- (xvi) Above this level the use of bricks was extensive and three types of unburnt bricks could be identified namely, completely unburnt bricks, semi-burnt bricks, and half-burnt bricks.
- (xvii) Finally, the protective plaster of the dome contained an outer layer of lime as a finishing layer, a 1 inch thick second layer of well-ground lime and sand, and a 2 inch thick third layer of sand, lime and different sizes of quart of light brownish colour.

The main deterioration process was identified as the cracking of the lime plaster due to the effects of different flora growing on the surface. The roots of flora had penetrated deeply into the dome exerting pressure as well as expansion. The water too penetrated into the dome and expanded the clay mortar and thereby caused slips on the surface. The water running through the surface during the monsoon season has created further erosions and many water channels could be identified on the surface. The slips occurred on the east and the west sides of the *hatareskotuwa* had created large craters on the surface of the dome and the water accumulated on these had added to the deterioration process. The faunal action on the surface had also contributed to the deterioration of the surface. All these effects provided evidence of deterioration that had commenced due to negligence for over 800 years. But during investigations it was revealed that the surface had deteriorated only about 10 ft deep from the surface, except on the eastern and western sides, which had created cliffs due to the fall of the *hatareskotuwa*, and the rest was still in a very sound condition.

### ARCHAEOLOGICAL INVESTIGATION IN THE HATARESKOTUWA

In view of planning the reconstruction of the collapsed section and of strengthening the other parts, three research officers, Mr. D.P.Gamlath, Mr. Y.K.T.Bandara and Mr. Thusitha Mendis, carried out the archaeological investigations under the direction of Dr. Hema Ratnayaka and Prof. Sudharsan Seneviratne. These were mainly aimed at identifying the reasons for the collapse of the west face restored in 1890 and the cracks in the other sections. The architect Oertel was of the opinion that the reasons for the collapse was the water seepage through the lime concrete layer at the base of the *devathakotuwa* which resulted in expanding the clay used for the bonding



of bricks. The cracks appearing in the other walls of the *hatareskotuwa* were even 35 cm wide and had developed towards its inner sections.

The excavations carried out commencing from the top of the *hathareskotuwa* revealed the construction medium as follows:

- i) The 0.5 cm outer face had been constructed, using well-burnt yellowish red-coloured bricks of 35 – 15cm in length and 5cm in height and with butter clay-coloured mortar of well-ground clay.
- ii) The second phase had been built, using mainly bricks of similar texture but of 20 – 8 cm in length and 6 – 4 cm in height.
- iii) The third layer too had been built, using mainly bricks of similar texture but of 12 – 7 cm in length and 7 – 5 cm in height.
- iv) The outer layer had been constructed by building dentins depicting Buddhist railings with a large circle in the middle.
- v) The face had been completely covered with a lime plaster.

After determining the construction method of the *hatareskotuwa* its maximum height was to be identified. Its top was found covered with a lime plaster to prevent water getting into the inner areas, which had been built, using clay mortar. Under the lime plaster small- and medium-size layers of bricks were identified. This had been constructed on top of the random construction of small bricks of 20-30cm in length and 10-15cm in breadth commencing from 6ft below the present surface of the top of the dome.

It was further revealed that the reconstruction in 1890 had commenced with the laying of a lime plaster over the dome. The next investigation was to identify the technology applied at the point where the bottom met the top of the dome. Four one-metre wide sections were excavated after removing about 10 cubic feet of accumulated earth. All four excavations provided new evidence of the base moulding of the *hatareskotuwa*, which consisted of a lime and sand mortar of faded brownish colour and washed with lime liquid. This 280cm high moulding was constructed, using bricks of 40 - 38 cm in length and 7 - 6 cm in height; of 15 -20 cm in length and 8 - 10 cm in breadth and 5 cm in height; and a 0.5cm thick layer of clay mortar.

Here it was found that the base lime concrete of the reconstruction had not been properly bonded with the base moulding. Therefore the water seepage from the top of the *hatareskotuwa* had escaped through the space between the moulding and the lime concrete, resulting in slips on the western side and cracks on the other sides. On the other hand the collapse of the *hatareskotuwa* was mainly due to the water seepage through the cracks of the protective lime layer at the top and the expansion occurred in the clay mortar used for bonding the bricks.

## CONSERVATION POLICY

After the above archaeological investigations, the final conservation policy was formulated with the approval of the Department of Archaeology Advisory Council. The following were included in its agenda for restoration following the methods adopted for the conservation of ancient stone and brick monuments and where necessary introducing concrete beams reinforced with stainless steel rods:

- i) the outer *prakara* wall and the four entrance gateways
- ii) the inner *prakara* wall raising it by a few layers above the *salapathalamaluwa*
- iii) the four stone-made gateways at the inner *prakara*



- iv) the *salapathalamaluwa* with a slope to drain off the water
- v) the three basal terraces
- vi) the four *ayakas* removed in 1981
- vii) the dome up to 84 layers of bricks
- viii) the dome to a minimum curve required for the smooth draining of rainwater
- ix) the top part of the dome
- x) the *hatareskotuwa* with all external features
- xi) the top moulding of the *hatareskotuwa* according to plans drawn by Smither in 1894 and Oertel in 1904
- xii) the *devathakotuwa*
- xiii) the *kothkerella* with the spiral staircase built during the British era restorations
- xiv) the top of the Kothkerella at the existing height

For all these construction projects, that materials used were hand made bricks of 16x12x2 inches in size with a crushing strength of 600 pounds per square inch and a cement of lime, sand and mortar in the ratio 1:2:10. The face of the pagoda was not plastered but the mortar gaps were painted with a cement of lime, brick dust, and sand mortar on the ratio 1:1/2:1/2:1/2. In addition the policy suggested the establishment of short-term and long-term maintenance programmes together with a monitoring system.

## PRESENT POSITION

The conservation process of the pagoda continued under the direction of Architects Ashly de Vos, Tudor Sirisena, Lalith Muthukumarana, and Jayatissa Herath, and presently it is under P.B. Mandawala who is the Conservation Director of the project. According to the policy, the conservation work of the Jetavana pagoda has continued since the commencement of the UNESCO/WFP – Sri Lanka Cultural Triangle programme. The restoration of the outer wall and the four entrance gateways were completed. The inner wall along with the four entrances has been completely restored up to the present level of the *salapathalamaluwa*. Two of the four *ayakas*, the south and west, have been fully restored while the east has just commenced. Quarter of the *salapathalamaluwa*, the portion between south and the west has been restored. Quarter of the three *pesawas*, the portion between south and the west has been consolidated and restored. The lime plaster remains found at the bottom of the dome have been consolidated. About 90% of the dome is fully restored and the balance will be completed by the end of year 2003. The lime plaster remains at the top of the dome, which has been completed up to the base of the *hatareskotuwa*, has been consolidated. Two sections, the south and the west, of the *hatareskotuwa* have been fully restored up to the height of the base of the top moulding including the consolidation of ancient parts and removal of the part added during the British period. Restoration and consolidation work beyond this up to the top of the present level of the *kothkerella* has yet to be completed. It has been estimated that the balance work of the pagoda might take at least three more years.

A daily, weekly, monthly and annual maintenance and monitoring programme is now in operation to remove vegetation growing on the surface, to repair the deteriorated bricks seen on the surface, point the loose mortar joints, to consolidate the ancient lime plaster remains and to observe and repair the thermal expansion cracks appearing on the surface.



## TOTAL HEIGHT OF THE PAGODA

The height of the Jetavan Pagoda is yet to be decided. *Mahavansa* written during the Anuradhapura Period states it as 160 *riyan* and *Parakumba Siritha* written during the Kotte period states it as 140 *riyan*. According to Dr. Paranavithana, the ancient carpentry *riyana* was 30 inches and there - fore the height of the pagoda according to *Mahavansa* is 400ft, whereas it is 350 ft according to *Parakumba Siritha*.

Architect J.G.Smith took actual measurements for the first time in 1894. According to him, following are the dimensions of the complete pagoda:

Diameter at the level of topmost *pesava* (16 ft above the platform) - 325 ft 0 inches

Diameter of outer circle of basement	-	367ft 0 inches
Height of first <i>pesava</i> above platform	-	69 inches
Height of second <i>pesava</i> above platform	-	11ft 6 inches
Height of third <i>pesava</i> above platform	-	16ft 0 inches
Height from platform to junction of tee with dome	-	150ft 6 inches
Height from platform to the top of tee	-	183ft 0 inches
Present total height of pagoda	-	232ft 0 inches

In 1963, Dr Paranavithana stated that the total height of the Pagoda was 231 ft. and Dr. Roland Silva calculated it as 330 ft, giving the following dimensions:

Height of the three <i>pesavas</i>	-	17 ft
Height of the dome	-	137 ft
Height of the <i>hathareskotuwa</i>	-	29 ft
Height of the <i>devathakotuwa</i>	-	25 ft
Height of the <i>kothkerella</i>	-	101 ft
Height of the <i>kotha</i>	-	21 ft
Total height of the Pagoda from the <i>salapathalamaluwa</i>	-	330 ft

Mr. D.P. Gamlath gave the following dimensions in his unpublished book *Jetavana Dagoba Garbhaya, Hatareskotuwa and Koth Kerella*:

Height of the first <i>pesavas</i>	-	4 ft 2 inches
Height of the second <i>pesavas</i>	-	4 ft 0 inches
Height of the third <i>pesavas</i>	-	3 ft 9 inches
Height of the dome	-	130 ft 0 inches
Height of the <i>hathareskotuwa</i>	-	38 ft 6 inches
Height of the <i>devathakotuwa</i>	-	31 ft 0 inches
Height of the <i>kothkerella</i> up to the present position	-	32 ft 0 inches
Conjectured height of the <i>kothkerella</i> to the present position	-	38 ft 0 inches
Conjectured height of the <i>kotha</i>	-	34 ft 0 inches
Total height of the pagoda from the <i>salapathalamaluwa</i>	-	315 ft 5 inches
Diameter at the bottom of the <i>pesawa</i>	-	365 ft 0 inches





Finally, it is important to note that with its height either as 400 ft or as 315 ft the Jetavana Dagoba still remains the tallest brick monument existing in the world. No doubt it grandly reflects the architectural, engineering, construction, and artistic abilities of the ancient inhabitants of Sri Lanka.

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