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The Mahathupa and 'modern' technology

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Abstract

Sri Lanka's City of Anuradhapura is host to many monumental structures such as stupas. These stupas contribute to Sri Lanka being unique, as host to so many stupas from ancient times.

Curiously, of all the imposing architectural works of the time, the construction of one stupa is chronicled in copious detail, seemingly to convey it to the future generations to discover its true purpose. This particular stupa harmonises with the other such monumental works of architecture in the general landscape and is yet 'like no other'.

The Mahathupa, known also as Ruwanwaeliseya, Ruanmeliseya, or Maha Seya is one of the key monuments. The building of this amazing structure is chronicled in the Mahavamsa and other ancient writings with much detail of its architecture highlighted.

This paper suggests that the architecture of this venerated structure has a significant similarity to modern day technology. The significance of the position of the stupa in relation to the surrounding landscape and the associated activity of meditation and mind alignment is also considered. Due to the antiquity of the stupa, further verification is not possible other than in a non-invasive manner.

It is suggested that the materials, the function/s and resultant form of this great monument is very likely to be of great national importance with international and indeed universal connotations. If so, it could lay claim to being a 'first of its kind' globally.



Ruanmeliseya or Maha Seya



Figure 1 - Location Of Anuradhapura In Sri Lanka

Source: Internet. (Base Map)



Figure 2- Present – day Map of Anuradhapura Sacred City.

Source:'A Guide to Anuradhapura'(2004)

Introduction – Location & Site

Among Sri Lanka's many varied facets are its ancient structures at Anuradhapura in the North Central Province dominated by '**pinnacles of power**' soaring into the sky (Amendra,2003). The major structures are many, some large, others smaller. Of these the 340 ft. tall Ruwanweliseya or Mahathupa stands out. This monumental work of architecture enshrines the sacred relics of Lord Buddha and is holy and sacred to Buddhists and is a monument of National importance. This paper is presented with all respect and in no way is meant to detract from the veneration and reverence due to the Mahathupa or any related events or activities.

The site, according to the ancient texts, was originally hallowed by the Buddhas Kakusandha, Konagama, Kassappa in earlier times and further by Gotama Buddha's presence on his third visit to Lanka. It was subsequently marked by Venerable Arahant Mahinda, emissary of King Asoka, on his visit to Lanka and confirmed by King Devanampiyatissa who reigned in Lanka around 247-207 B.C. [Figures 1 and 2]. The Mahathupa was ultimately built several generations later by King Dhuttagamani. It was completed by his brother King Saddhatissa.

It is mentioned in the sub commentary to the Mahavamsa that the stupa was constructed above a shallow tank named 'Kakudha vapi' (Kumbuk weva) and that during the reign of King Lasanji Tissa the tank was

filled to make a road to reach the Thuparama. In such conditions it may be possible that the soil below or around the stupa could be in a reduced state rich in ferrous ions, thus having a negative charge.

Records

This presently existing 2nd Century B.C. work of architecture has been recorded copiously in writing several centuries ago. The records relating to this stupa, the background and location are extensive particularly given the antiquity of the object of this paper. Much of this paper refers to the earliest records in writing such as the Mahavamsa and related chronicles. It is not possible in this paper to quote every reference given in the writings due to the lengthy record.

The building of these structures have been recorded in several writings - The Mahavamsa (or Great Chronicle of Ceylon), the Thupavamsa, and others. The Mahavamsa was written around the 5th – 6th centuries A.D. based on even earlier records such as the Dipawansa and other Porana records. The commentaries on the Mahavamsa, the Wansatthappakasini (Mahawansa Tika) are a useful elucidation. The texts have been commented and translated by many writers and the work (as available today) is enriched with many footnotes and references.

The Mahathupa or Ruwanweliseya is known by several other names as well. The name Mahaseya or Mahathupa (the Great Tope) was used in the Golden Age of Anuradhapura.

The terminology used in the parts of the stupa

The terms chaitya, cetiya, thupa, stupa and seya refer to the type of structure in Pali, Sanskrit and Sinhalese languages and absorbed into English, stupa being the most commonly used. The term dagoba is derived from *dhathughabba* or relic chamber. *Dagab vahanse* is a reverential term used in Sinhala generally applied to the entire structure. The circular base is built up with surrounding terraces (*medhi* or *malaka, maluwa*). Concentric rings (*pesa*) serve for flower offerings or *pupphadhana* . The circumambulatory path (*padaksinapatha*) is reached by stairways (*sopana*). Within this circle is the *dhathugabbha* or relic chamber. Raised on the circular platform is the dome (*anda*, *gharbha* or *gharbapatra*). The top of the dome has a socket (*yupi*) for the parasol (*chatta* or *chatra*) which is surrounded by a railing (*vedika*) forming the square turret or tee (*chaturassa-caya*, *harmika*). The early single parasol, as mentioned to be on the Mahathupa or Ruwanweliseya, evolved to have several tiers known as *chatravali*. This later became a conical spire (*koth-karalla*) or the present day pinnacle. [Figure 3]. The chatra, the chatravali and the pinnacle were all terminated by a metal finial (*sthupi*) on which rests the crystal (now known as *chudamanikkya* or *silumina*).

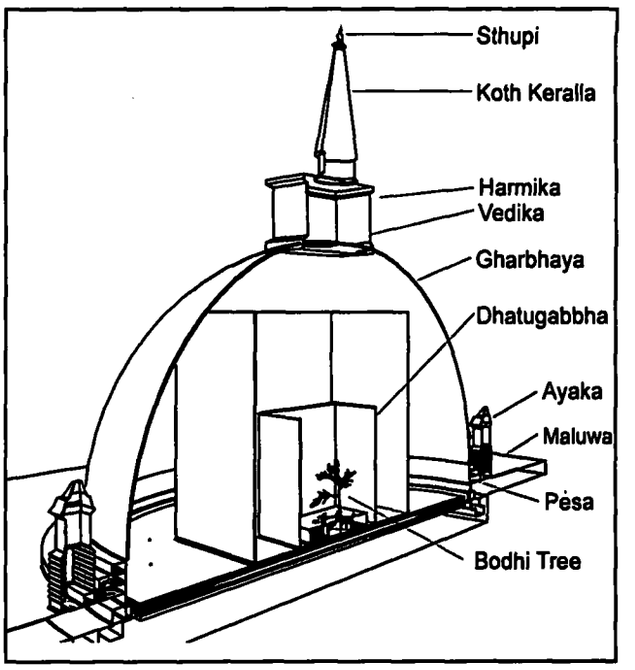


Figure 3 – *The parts of a stupa, 3D cut-away*
Graphics: Sajith Amendra

The conical spire often rested on a cylinder. The four frontispieces although of great antiquity is said to be a later addition by King Lanji Tissa to the already constructed Mahathupa. The frontispiece is known as *ayaka* or *vahalkada*. The terms used here are well known and in general use, and also from many litererary sources. (Kulatunga 2002, Marshall & Foucher 1982, Paranavitana 1946, Silva 1988, Smither 1894.) There are many shapes to a stupa, bubble-shape, paddy-heap shape, bell shape and so on.

The building of the Mahathupa in particular, records that it was to be made in a bubble shape (*bubulakara*) of particular dimensions at the behest of the King, guided by the Theras.

Materials

The sourcing of materials and their nature is a marvel. A. Denis N. Fernando refers to the Mahavamsa's Chapter XXVIII as ".... The first recorded mineral survey."(Fernando, 2000) The Mahavamsa records that ...'four splendid gems had formed in size like to a small mill-stone, in colour like flax-flowers, radiantly beautiful' which were found at a given location North of the City. Copper and silver were 'found' to the East and South, where the town is known even today as Ridhigama. *Ridhee* (*ridi*) is the Sinhalese name given to silver. Pearls and coral were brought by the fisherfolk. It is curious that the Mahavamsa (the Great Chronicle of Ceylon) so copiously records in detail the building of the Mahathupa in particular. It appears that the writer was very keen on leaving to posterity details, which are significant. Initial thoughts in this regard were, why copper and silver, two metals used even today as the best electrical conductors, were used in its foundation at a time pre-dating our currently known use of electricity. Also the

specific use of 'mountain-crystal' as recorded in the Mahavamsa. It is well known today that the pink quartz mountain at Namal Uyana is not too distant from Anuradhapura.

The Mahathupa was found in a seemingly collapsed state and clothed in vegetation, when a Major Skinner made his way to Anuradhapura which lay seemingly deserted for hundreds of years after its decline from the Golden Age. J.G. Smither, in his work the Architectural Remains of Anuradhapura, Ceylon meticulously notes the architectural findings along with measured drawings, recording the physical existence of the stupas. But of the interior of the Mahathupa there is no archaeological excavation work to date and we are left to faith and conjecture.

The main events recorded in the Mahavamsa in relation to the Mahathupa are,

The Visits of the Buddhas and the selection of the site, marked by a stone pillar.
Several generations later the finding of the materials for the building of the Thupa
The preparation of the excavated ground and laying of the foundation and foundation stone by the King (an international event)
The arrival of the relics and the building of the relic chamber
The enshrining of the Sacred Relics
The passing away of the King Dhuttagamini and faux completion of the stupa to satisfy the dying King
The actual completion of the stupa
Further additions and acts of adoration by following rulers

The Climate Of Anuradhapura – Significant Aspects

It is noted in the records that significant events took place in the 'bright half' of the months of *Vesakha* and *Asalha*. These months correspond to March:April or April:May for Vesakha and May:June or June:July for Asalha. The names are the Indian lunar months according to Fleet, (Journal of the Royal Asiatic Society, 1909) as described in the footnotes of the Mahavamsa. Meteorologic data upto recent times, and traditional indigenous knowledge indicates that rains occur after the poya (uposatha or full-moon). Thus it is likely that cumulus or rain-bearing cumulo-nimbus clouds carrying a differential charge would be present around that time. It is known that the two lightning seasons in Sri Lanka last for around one to one-half months in March:April and again around October. (Abeysinghe 1997). Also the air in Anuradhapura is of low humidity before this time (*Vesakha* and *Asalha*), and the air just preceding a rain, carries a higher percentage of ionised particles. Wind directions follow the regional pattern of South-Westerly and North-Easterly directions respectively.

'Modern' Technology

I would like to introduce some aspects of technology stemming from science.

Capacitors & semiconductors

The figure shows a type of capacitor, a device whose principal electrical property is capacitance, the ability to store an electric charge. This is known as a Leyden jar after the University of Leiden where it was invented by Pieter van Mussenchenbroek independently of E.G. von Kleist of Prussia in 1745. [Figure 4]. Capacitors are important components in many kinds of electrical equipment, including radio and television transmitters and receivers, automobile ignition systems, and some types of motors. Capacitors are used in circuits that filter electrical signals. (New Standard Encyclopedia)

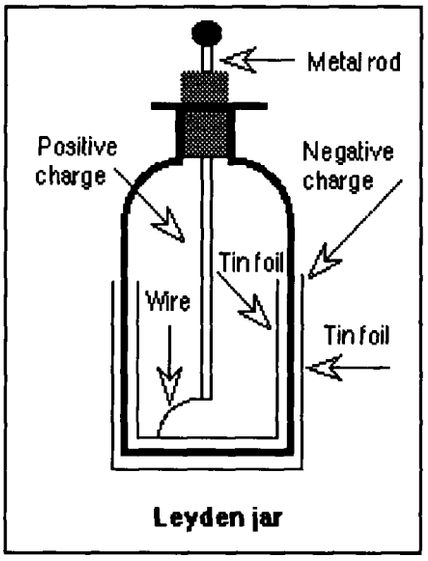


Figure 4 - Leyden jar capacitor (diagrammatic) Source: Internet

More recently, research into some of the mysterious electrical properties of semiconductors led to the development of the transistor, a device for controlling the flow of electrons in solid crystal. Such control was previously gained using bulky vacuum tube technology. Transistor technology enabled the reduction in size of electronic devices to a miniature scale.

Semiconductor devices are made by introducing controlled amounts of impurity atoms into a semiconducting crystal. This process is called doping. When silicon is doped with phosphorus resulting semiconductor regions (with excess negative charge) are called "*n*-type" regions. [Figure 5]. If *n*-type regions are embedded into *p*-type silicon on either side of the conducting plate it would provide a conducting path **if a positive charge is present**. [Figure 6] Similarly, *p*-type transistors are a reversed situation (Harman, 2004/2005). Silicon and germanium are presently the more commonly used materials for semiconductors. Silicon is one the most abundant materials on this planet, found as silica.

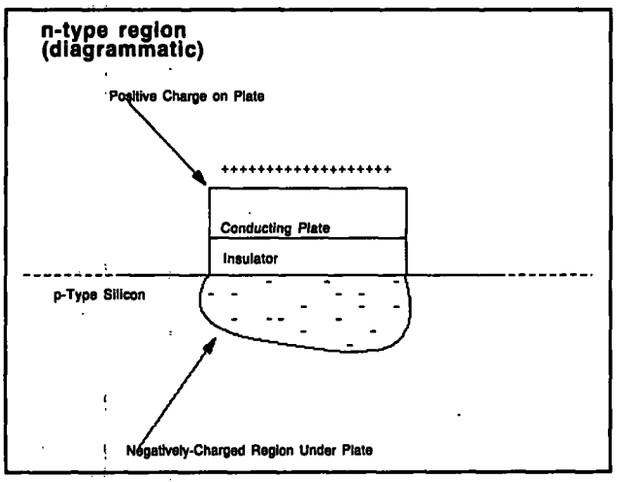


Figure 5 : 'n'-type region (diagrammatic)
Source: Harman (2004/2005), Silicon Chip Technology

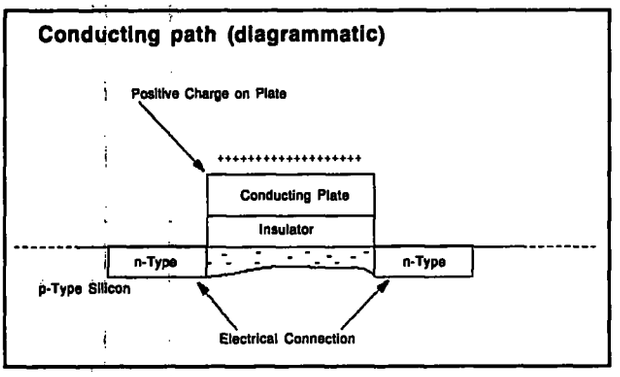


Figure 6 : Conducting path (diagrammatic)
Source: Harman (2004/2005) Silicon Chip Technology

Silica or silicon dioxide (found as quartz) is an insulating material, as is silicon obtained from quartz through heat treatment. The atomic structure of the material is significant to the process of doping. Semiconductors have the following characteristics: They are;

- Sensitive to temperature
- Sensitive to electro-magnetic radiation (e.g. light)
- Their conductivity can be controlled during manufacture by introducing (doping) carefully controlled amounts of impurities (usually phosphorous for *n* -regions and boron for *p*-regions or 'holes')

Silicon Technology, CMOS and SOS

Silicon technology is that which uses silicon as a semiconductor, especially in the manufacture of silicon chips by the processes of refinement, doping and polarisation.

Silicon chips are used as solid state electronic devices in computers and other electronic equipment.

Complementary metal oxide semiconductor (or CMOS) is that which puts together the '*n*-' and '*p*-' regions (as source and drain) and powered with a known circuit to form two-way transistors. It is the currently dominant silicon technology.

This is essentially a two-way device, unlike a junction transistor. CMOS transistors are field effect transistors. The CMOS is similar to the boot-up device for the computers and could be a data storage device. CMOS is sometimes referred to as Complementary Metal Oxide Silicon.

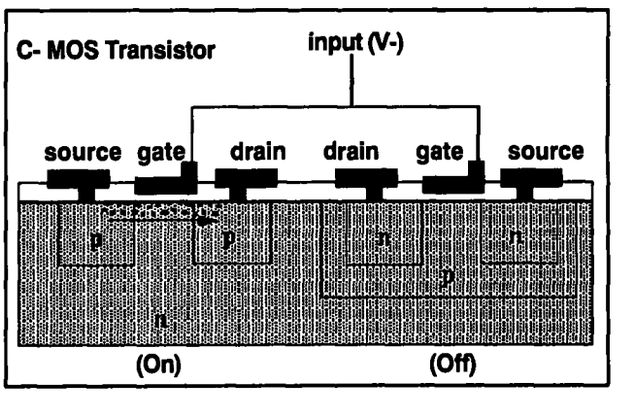


Figure 7: A Complementary metal oxide semiconductor (c-mos) transistor (diagrammatic) Source: Internet

All these have been presented to us as recent inventions – from the 1800's onwards. Indeed the study of electronics which deals with electron tubes, solid-state diodes and transistors is said to have its origins in the 19th century but its greatest growth was around 1950's with applications in tv's, radios, tape recorders, computers and many more. The space programmes of the 1960's was made possible due to miniaturization and many familiar electronic devices are in the miniature form. Silicon chips were manufactured from refined silicon in wafer form, and along with robotics and printed circuits gave rise to transistors bolstering miniaturisation.

Crystals and their properties

Many crystals are known to possess piezo-electric properties – i.e. if a mechanical force is applied to its faces the particular faceted crystal has the property to generate a voltage between these faces. A photo-electric effect is the emission of electrons from the surface of a body due to electro-magnetic radiation (such as light) striking it.

Binary numbers and computers

Computers also use the binary system for data storage and retrieval and most of you are familiar with bits and bytes, 8 bits to the byte and the power of computers being expressed in these terms. Data is expressed in the form of zeros and ones with binaries as a power of 2. Thus 8, 16, 32, 64, 128, 256, 512, 1024 .....etc. (Amendra, 1974)

I would like to draw your attention to the copiously recorded construction of the Ruwanweliseya, the Mahathupa. I have summarised this along with my interpretation.

The construction of the base of the mahathupa according to chapter xx1x of the mahavamsa and interpretations

The circumference for the stupa was marked and the ground was excavated in the specifically chosen location upto a depth of 7 cubits and ring of terraces (*pesa, pupphadana*) constructed. In the central area the base was laid with specified materials in an ordered manner. To quote:

"Round stones...broken by hammers... stamped by ... elephants.....the clay... spread over the layer of stones....bricks laid over the clay....rough cement and ... cinnabar, over this a network of iron, ... over this ... *Marumba* from the Himalaya....over this ...mountain-crystal.....stones spread; everywhere ... butter-clay serve (as cement). With resin of the *kapitha* tree, dissolved in sweetened water. ... over the stones a sheet of copper eight inches thick ... with arsenic dissolved in sesamum-oil .... A sheet of silver seven inches thick. (Mahavamsa XXIX 3 – 12)

The mention of the materials are extracted from the total writing, which is enriched with reverence and respect for the king and theras.

Layers Of The Base Of The Mahathupa (Mahavamsa).

As recorded, the above noted layers, from the lowermost to the surface, is tabled as follows along with an interpretation as forwarded in this paper.

	THE MAHAVAMSA	**INTERPRETATION** as forwarded in this paper
1	Round stones .... Broken with hammers....stamped down by great elephants whose feet were bound with leather (...depth of seven cubits)	Foundation
2	Clay [butter-clay - *navanita*] from where the heavenly ganga falls down....	Foundation
3	Bricks	Foundation
4	Rough cement	Foundation
5	Cinnabar (*Kuruvinda*)	Mercuric ore (poison) wards of burrowing insects (HgS)
6	A network of iron	conducting layer? Heat sink?
7	Sweet-scented *marumba* [sprinkled] brought .... From the Himalaya	Sweet scented earth or sand for besprinkling a damp living cell (Mahavamsa and Pali dictionary) absorbs excess moisture? Steatite?
8	Layer of mountain-crystal (...did the lord of the land command....)	Quartz (silica – SiO_2) insulator. Semi-conductor if 'doped' with impurities,
9	Layer of stones	Insulator
10	[Everywhere throughout the work did the clay called butter-clay serve (as cement)] *navinata*	Fines, Binder and filling of pore spaces allowing for unimpeded conductivity
11	Resin of the *kapitha* tree...	Binder (sticky resin of *divul* (*givul*)– *Feronia limonia*-see note*). Abundant in phosphorus
12	dissolved in sweetened water *(rasodaka)***	Conductivity of sweet water high. Or could it be *rasasodhaka* (see note**)
13	Sheet of copper eight inches thick	Metal - Electrical conductor
14	Arsenic dissolved in sesamum oil	Insulator?? Or conducting interface
15	Sheet of silver seven inches thick	Metal - Electrical conductor
16	Eight vases of gold and eight (vases) of silver	Transistor gates?? The following1008 + 8 + 8 = 1024 significant in computer technology as 2^{10} and byte multiples
17	...in a circle around these .... A 1008 new vases	1008 is divisible by 4 indicating symmetry to the two crossing axes of the cardinal points (of the magnetic compass??) (see note***)Mahaseya is slightly skew (6 deg) to the other stupas aligned to solar cardinal points
18	Eight splendid bricks [*pavara* – gold] did he lay each one apart by itself .... He laid on the East side .... The first foundation stone	Data in or data out ?? Transistors?? Gates???

Note* - The *kapitha* tree is *Feronia limonia* (footnotes to the Mahavamsa), mentioned as *givul* in the Thupavamsa and presently known as *divul* in Sinhalese and woodapple in English. An analysis of 100 gm. mucilage of the fruit has 110 mg of phosphorous (Maankotte, 1996). As a comparison the values for other fruits are guava – 28mg, sweet orange – 20mg, passion fruit – 30mg, pineapple 9 mg. rambuttan – 15mg. These fruits did not have their origins in Lanka unlike woodapple which is indigenous to the region.

Note** - The term *rasodaka* as given in the Mahavamsa is not found in the dictionaries. The Tikawa makes no comment to clarify the translation. Some are of the view that it is a conjoined word of *rasa* and *udaka*, in Pali language, meaning 'tasty water'. The Pali term '*udaka*' is translated to mean in Sinhala *jalaya* or *diya*. Some scholars then join the two words to read in Sinhalese *rasa-diya* or *rasadiya*, which translated to English is mercury (Hg). However, it is found that the Pali term for mercury is *Parada* (Buddhadatta Mahathera, 1955). For doping of silicon for semi-conducting properties, the impurities used are phosphorous (available in the resin of the Kapitha tree) and boron. Boron is obtained from the mineral borax. A search for the Pali term for borax revealed that borax is known as *rasasodhaka* or *bilalona* (Buddhadatta Mahathera, 1955). It is likely that in transcribing the Mahavamsa writings that the term *rasasodhaka* was written as *rasodaka*, which considered onomatopoeically and considering the used script/s of the time is exceedingly close to the substance being borax. Thus it is likely that the substance was indeed borax or *rasasodhaka*.

Note*** - An assigned dimension of 6" height and 4" width was applied to the 'vases' on a graphic model to the 1008 jars and it was seen the vases had to be spread closer to the perimeter of the presently known dimension of the circle so as to avoid overlap. At the perimeter such vases could be placed with a 4 inch gap between vases.

The Architecture Of The Superstructure (*Garbha, Gharbapatra*)

The overall bubble shape (*bubulakara*) was indicated by the master-builder (*sthapathi*) by a bubble of water "like unto a half-globe of crystal." as it is recorded in the Mahavamsa. It is noted that all workmen were paid a wage. The flower terraces were constructed in brick and consolidated nine times providing strong ring foundation on which the superstructure could be carried. It is recorded that the bricks were very carefully selected being made of specified clay materials and closely supervised. A pious bikkhu wanting to participate offered a 'lump of clay' but the difference in composition was noticed and it was rejected.

The above indicates that the outer ring foundation was particularly strong and also considerable quality control was exercised to provide a required smooth shape. It may be inferred that any projections or roughness of the required smooth shape would negate its function.

The Design And Construction Of The Upper Termination Of The Stupa (Pinnacle) And Its Significance

By studying and analysing the architecture of the Mahathupa I came to realise that the design of the top of the stupa was significant. The present pinnacle now includes a lightning protection device. The present pinnacle is the *koth karalla* (conical spire- Figure 8) or evolved version of the early pinnacle. A large disc shaped stone of around 4 ft. diameter can be seen on the upper *maluwa* displayed as an archaeological artefact. It is said to be the smallest disc of the former three-tier *chatravali* [Figure 9]. The early pinnacle was a *chatra* or *chatravali*. The earliest *chatra* [Figure 10], or parasol formed the termination of the stupa and evolved later into a series of slabs known as the *chatravali*. This can be seen on the Great Stupa at Sanchi, India which was built in the 2nd Century B.C. The *chatra* is graphically © presented based on the Manjusri BhashithaVasthuvidya sastra (Jayasuriya, Prematilleke, Silva, 1995) showing the *upakila* or copper leaf and topped by copper *sthupi* and crystal [Figure 11]. According to the chronicle, the *chatra* was to be finished and adorned with lotuses, pearls and gems referred to as the *vajra-chumbaka vallalla* meaning 'ring of magnetic crystal'. This probably refers to the minute oscillation due to the piezo-electric properties of the crystal or crystals. The total structure thus had metal at its uppermost level in the sthupi, copper leaf (*upakila*) and copper pin fixing of the *chatradanda* to the *gajasthambha* and at foundation level the silver and copper layers. It is postulated that the pinnacle while protecting the stupa from lightning, utilised, or 'harvested', the electrical charge of the clouds in a manner that the stupa was probably meant to function as a capacitor and that this charge (positive) would then possibly activate the solid state electronic components. The term 'harvested' and concept of harvesting electrical charges from the clouds is introduced in this paper as the original design appears to deliberately induce a static charge and deter discharge of the cloud by lightning [Figure 12]. The smooth shape would assist an induced charge on the outside of the stupa in the manner shown in the diagram. It may also be possible that given the components within the foundation and relic chamber that the crystal atop the pinnacle would 'pulse' due to its piezo-electric properties.

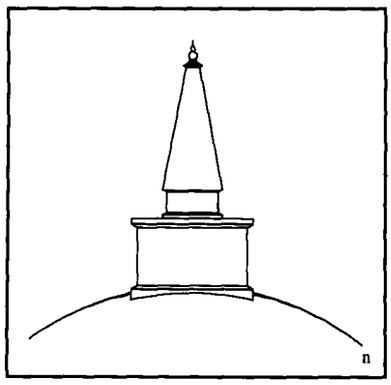


Figure 8: Present-day koth karalla with finial (diagrammatic)
Graphics: Sajith Amendra

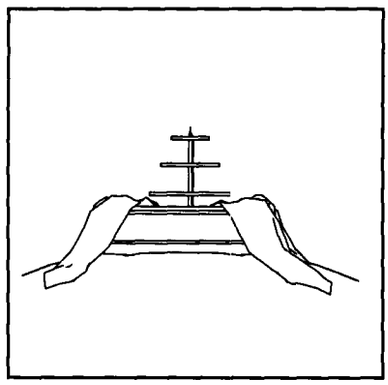


Figure 9: Chatravali as in Sanchi stupa (diagrammatic)
Graphics: Sajith Amendra

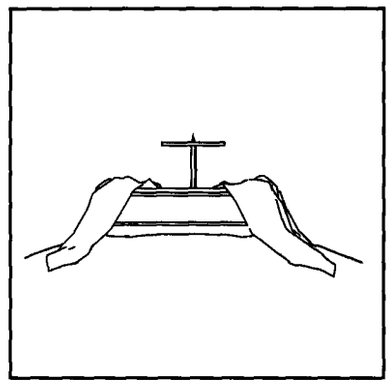


Figure 10: The earliest known type of termination,the chatra (diagrammatic)
Graphics: Sajith Amendra

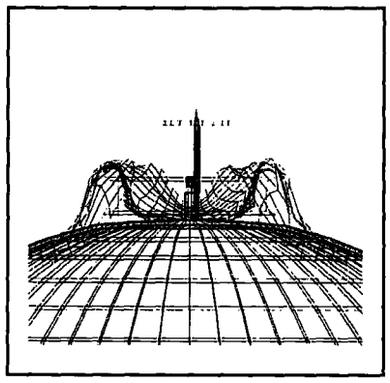


Figure 11: Re-construction of chatra design as a wire frame based on Manjusri Graphics: Sajith Amendra

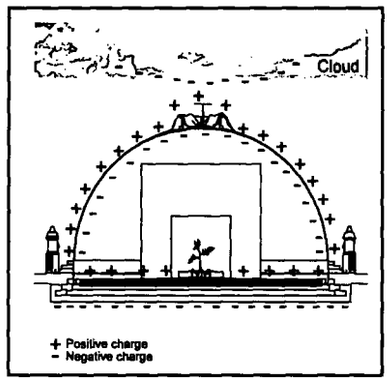


Figure 12: The possible manner of distribution of induced charges through 'harvesting' electrical charges from clouds as proposed in this paper. (diagrammatic)
Graphics: Sajith Amendra

The Recorded Architecture of The Relic Chamber And Interpretations

The relic chamber is also significant in that special stone (*medhapindika* - fat coloured) was imported for its walls, base and top, perhaps a porous material such as sandstone unavailable in Lanka to allow for radiation through it. The Mahavamsa records that a silver bodhi tree of 5 branches with coral roots resting on sapphire – also four crystals the 'size of small mill-stones' (see Section on 'Materials') is placed in the relic chamber with a railing (*vedika*) around... The size of the sapphires are likened to *thiyambara* as mentioned in the Thupavamsa. This is found to be a fruit of the *kaekiri* family (Rhys Davids, Stede, 1921), which is Cucurbitaceae. This family includes fruits such as melons, pumpkins and gourds. Coral is an insulator similar to ceramic. Silver is a metal and good conductor of electricity.

A very recently known solid state electronic device is called SOS or 'silicon on sapphire' (Wikipedia 2006). Sapphire is also considered an excellent electrical insulator. It may be possible that this acted as the 'control' transistor given the importance of having the Sacred relics placed on the couch at the base of the silver tree. This arrangement has the ingredients of SOS or 'silicon on sapphire' technology.

Mentioned in the Chronicle are many more artefacts placed in the chamber along with paintings on the walls depicting the Buddha's demise. Among these artefacts are mentioned pitchers filled with oil, rows of vases some empty and some filled with flowers. Why 'empty vases'? Were these capacitors, similar to Leyden jars? Also among the many figures of devas and devatas (celestial beings) bearing flowers, playing instruments of music and so on are 'devas with mirrors in their hands'. Were these to reflect or deflect rays or waves of some kind?

Moreover, the statement in commentaries to the Mahavamsa, in Pali language, reads '*meghalatanama vijjukumariyo*' and the Porana texts read as' *meghalata vijjukumari medhapindikabhittiya samanta caturo passe dhatugabbhe parikkhippi*' (Mahavamsa XXX footnote to 96)

meaning

'around all the four sides of the fat-coloured walls of the relic chamber were placed lightning cloud-creepers'. Referring to the same Pali sentence Smither mentions 'streams of lightning' illumining the walls and conjectures that jewels and crystal let into the stone created this effect. The Mahavamsa states that it was for the adornment of the chamber. The Thupavamsa refers to the same as '*viduraliya*' (*raliya* –wave, *viduli* –electricity in Sinhalese language). I wish to postulate that these were real sparks or discharges of electricity from capacitors. These sparks probably traversed all four sides of the relic-chamber. The function of such sparks or discharges could be several – security, effect,

discharge of excess energy or some other purpose. In the graphic model© two sizes of chamber are shown because the size of "80 cubits.." as given in the Mahavamsa is unclear. Some writers indicate that the cubit is nearly 2 ½ ft., others as 17 inches to 18 inches and yet others as 7 ½ to 8 inches, which is actually the *hastha*. From the Abhidhanappadipika, T.W. Rhys Davids (1877) indicates a cubit to be around 17 inches, which gives a larger size of nearly a 90 ft. cube (or chest (*ghatikakara*), to the chamber which, by graphic construction, barely fits into the overall dome shape and would be a structural feat as well. Taking the *viddhathi* as a measure, the graphics were worked using a 60 ft cube which, if taking into account the Mahavamsa's stated "canopy over the Bodhi tree..." would probably have had supporting posts in the four corners allowing for three 20ft divisions of the chamber. Also the statement that "...it was not too crowded."

There are many other elements within the sacred relic chamber, which while seemingly meant for the pious adornment of the chamber to house the sacred Buddha relics, may also have other functions. Significant among these are the many gems and 'empty vases' among paintings, statuary and so on. The couch as a repository for the sacred relics was of silver and placed at the base of the tree, which has five branches with the canopy above. It was thus possible that these were in some manner connected forming a pathway.

External Features

Yet another curious feature is the five-finger ornament of *pancangulika-patthika* displayed externally by King Saddhatissa. It may be possible that this was a five pronged metal element planted around the upper vedika of the thupa in order to induce a static charge from the external charge of thupa (see section on Pinnacle). This would in turn, in the dry air of Anuradhapura, ionised prior to the thunderstorms, during the waxing moon in the months of *Vesakha* and *Esalha* give rise to a phenomenon called now as 'St. Elmo's Fire' thus illumining the Mahathupa akin to carnival lights. This particular aspect is conjectured based on the meteorological circumstances, Mahavamsa record and similar ancient records.

Two other features are of significance. One feature is the carving of the conventional representation of the Buddha's feet (*siripathul*) "Between the feet is a chatta supported on a tall stem resting on a moulded base."(Smither 1894) This is to be found on the upper pesava. The other being a carving on the side face of the Western ayaka showing a cobra (naga) motif with a similar chatra behind. [Figure 13]. It is not known when these carvings were done although it is known that the ayaka was a later addition.

Interpreting these features, it appears that the chatra relates to the earlier postulated 'harvesting' of electrical charges from the clouds. It is known among meditators that bare feet (or any part of the body) touching the ground discharges ('grounds') electro-magnetic waves. For protection against 'strike' by electrical current one is advised to insulate the body from the ground, that is, not to have bare feet touching the ground. Thus, the first feature may indicate a location for discharge (or drain) commonly called 'grounding' of an electrical current.

The second feature indicates the naga motif. The naga's were of the 'water world' (Mahavamsa I, 61-62). The naga motif is used to indicate irrigation works and places where there is water. It is presently the emblem of the Department of Irrigation in Sri Lanka. The lower chamber of the Mirisweti stupa indicates the naga-world and motifs are found therein. This is depicted in a model at the Museum in Anuradhapura. It is also known that in domestic dwellings and other buildings that the 'grounding' of lightning conductors is done at a selected damp place close to the building. It is possible therefore that this naga motif with the chatra indicated a similar location for discharge (or drain) of an electrical current.

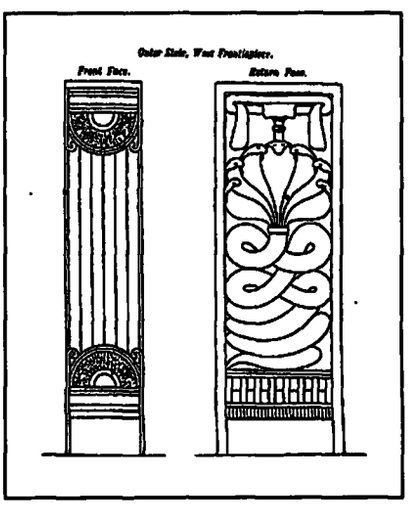


Figure 13 : The carvings of the front face and return face of the outer stele of the Western frontispiece of the Ruwanwaeli dagaba. Source: Smither, Architectural Remains, Anuradhapura, Ceylon.

Requirements For A Solid State Electronic Device

Thus all the required ingredients of a solid-state electronic device are present. The quartz and silicon, the metal plates, capacitor, doping elements, and the positive charge. The manner of activation (in/out, source/drain) of the device is uncertain. Electron flow could have been induced with the doping elements. However, it is recorded (in the Chronicles), that "the great earth quaked and many wonders came to pass in diverse ways" on the enshrining of the Sacred relics. It is known that electro-magnetic radiation is one manner of activating electron movement in a semi-conductor. Perhaps the sacred relics embody a source of powerful electro-magnetic radiation or energies we are yet to understand.

Discussion

Many possibilities arise as to the application of the apparent technology of the ancients on the functions of the Mahathupa. The possible conducting pathways and inter-relations between the parts are as yet unclear.

The following are possibilities.

1. Built embodying solid state electronic devices for data storage and retrieval.

The in / out of the device having a relationship to terrestrial humans in the vicinity of the stupa, particularly those with aligned minds and brain-stems. Some sort of wireless zone for communication. Perhaps the piezo-electric properties of the pinnacle crystal provided a path (beacon) for extra-terrestrial energies.

2. Built to enshrine a powerful energy source for transmission to a 'field' through the functioning of the electronic components.

The metal plates (7 in. silver and 8 in Cu) are gelled with arsenic and oil forming a capacitor. The sacred relics at the focus are the energy source. There is no external input. Perhaps the Sacred relics embody energies we are yet to understand.

3.The stupa was certainly built as a monument for reverence given that it enshrines the Sacred Relics of Lord Buddha. This ensures protection into posterity given that 2140 years since the stupa was built is but a small period in universal time. The Teachings of Lord Buddha and so-called 'miraculous' events indicate futuristic and perhaps extra-terrestrial aspects. The record of visits of four Buddhas to the very same location are significant. Perhaps the specific location embodies telluric currents, which were to be tapped. Studies are yet to be done in this regard.

4. A chronometer – the piezo electric properties of the many gems and jewels within perhaps indicate an oscillator (often used as a timing device) being present. Given the numbers it is unlikely to be an analog chronometer. Perhaps digital. (There are 16 *siripathul* or holy footprints, carved on the terrace at the cardinal points of the compass and equally spaced out. Devotees pay homage at these locations)

The significance of many other materials and their make-up do not give credence to this being simply a chronometer alone.

Perhaps even all of the above possibilities condense into one.

Further Research

I appeal to anyone taking up any further research on this aspect that it be non-invasive on a marvel that has been built and existed, protected with faithful fervour (*saddha*) as an icon of Buddhism, and also as a National monument for well over 2000 years. Perhaps even 'guidelines' may become necessary in the event of the necessity to conduct research in the vicinity or on or near the monument. It is recommended that laboratory experimentation may be done as a collaborative with this paper in accordance with set parameters.

Concluding Remarks and Conclusions

Perhaps the features did not function in the manner expected. Perhaps it did function for some time until later additions such as grounding the electric charges negated its designed purpose. At a much later date following the building of the Mahathupa, the actions of King Bathika Abhaya (38 – 66 A.D.) as recorded in the Mahavamsa while being of deep reverence and adoration, were perhaps attempts to 'activate' the dormant functions of the stupa.

Also perhaps we now don't know how to use the functions of this venerated stupa. Could this have even been a wireless zone given the wireless technology we now rely on (e.g. infra-red, Bluetooth etc.). What were the messages? Who was / is messaging / listening? Who were the recipients? perhaps remotely 'plugging-in' to the data? Was it one-way? Was there exchange? Terrestrial to extra-terrestrial? Or vice-versa? Galactic or Universal? Perhaps the Sacred Relics themselves were the data source transmitted through a wireless zone to the meditators on the maluwa. Did the crystal at the top of the *chattra* pulse as in a beacon? There are more questions than answers at this stage.

Conclusions

The following are proposed in this paper:

- That the Mahathupa, as recorded in the Mahavamsa and related texts was constructed in a manner possibly embodying **electronic and solid-state electronic components**
- That lightning was recognised, controlled and natural electrical charges utilised through the design of the structure to perhaps power the electronic components for certain functions
- That gems, known for their piezoelectric properties, and other materials were selected and used with full knowledge of their properties and performance
- That the five-finger ornament was meant to illuminate and adorn the Mahathupa with colourful sparks in the ionised air (now known as St. Elmo's Fire).
- As such, that the Mahavamsa records should be time and again read and understood in the light of present and future technology and concepts

- That the Mahavihara monks had access to special technology seemingly unknown at the time, but pre-dating the present knowledge of electricity and electronics by many centuries

- That the Mahathupa may be our world's first intelligent building.

- That the function of the Mahathupa is beyond 'what the eye sees'

As the Mahavamsa concludes each of its chapters with the statement 'compiled for the serene joy and emotion of the pious', may I state that these findings are not meant in any way to detract from the present functions, veneration or reverence of this awesome work of architecture. It is but only to bring to light that which has always existed or else has always been on record in the Mahawamsa and to be privileged to place before you all, that this particular work of architecture of the 2nd century B.C. is 'like no other' but probably embodies technology of solid state electronic devices thought to have been 'found' only in the 19th or even 20th centuries. It's form was decided over 20 centuries ago and while functioning throughout this short period of earthly time we, perhaps, have yet to understand the Ruwanweliseya's true function.

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