

## **A Comparative Study of the Lucas Ratio and Human Proportions of the Medicinal Troughs in Sri Lankan Buddhist Ritual Space**

**C. Abeywardana<sup>1</sup>, P. Rathnayaka<sup>2</sup>, A.S. Kaluarachchi<sup>3</sup>**

### **Introduction**

The concept of space, process, technique and purpose within these rituals have been explored in both Sri Lankan and foreign studies. Despite the significance of Sri Lankan Buddhist rituals, academic research on human health aspects remains scarce. This comparative study was based on concept of the Buddhist architectural human proportions of medicinal trough, ritual space (microcosms) and Lucas ratio. The Lucas sequence is an integer sequence named after the mathematician Francois Edouard Anatole Lucas (1842-1891), the first few numbers are 2, 1, 3, 4, 7, 11, 18, 29, 47, 76, 123, 199, 322... and so on (<http://en.m.wikipedia.org>). The shape of the Pyramid has based on the mathematical ratios which religiously significant (Bartlett et al., 2014). Since the figural formula they employed gave a primary golden ratio division of 7:11. Idealism of human proportions (Lucas ratio) were used to depict the gods, painting and sculpture by the pharaohs in their reliefs (Bartlett et al., 2014). The investigation sought to discern the mental and physical equilibrium of individuals engaging in Buddhist rituals through the utilization of their six senses.

### **Methodology**

This comparative study was based on concept of the Buddhist architectural human proportions of medicinal trough, ritual space (microcosms) and Lucas ratio. Qualitative and quantitative comparative studies were done. Utilizing qualitative and quantitative methods, a comparative analysis was conducted incorporating archaeological evidences from Egyptian and Sri Lankan traditions.

The investigation delved into the architectural proportions of medicinal troughs, microcosmic ritual spaces, and the application of the Lucas ratio.

- 
1. Postgraduate, University of Kelaniya, 11600, Sri Lanka. [chandana\\_abeywardana@yahoo.com](mailto:chandana_abeywardana@yahoo.com)
  2. Chair professor, Department of Drama, Film & Television, University of Kelaniya, 11600, Sri Lanka.
  3. Senior Lecturer, Department of Pali & Buddhist, University of Kelaniya, 11600, Sri Lanka.

## Results and Discussion

It was observed by the author that the shape of the Pyramid, rooted in mathematical ratios, embodies religiously significant ideals of human proportions (the Lucas ratio), as depicted in the paintings and sculptures of ancient Egyptian civilizations.

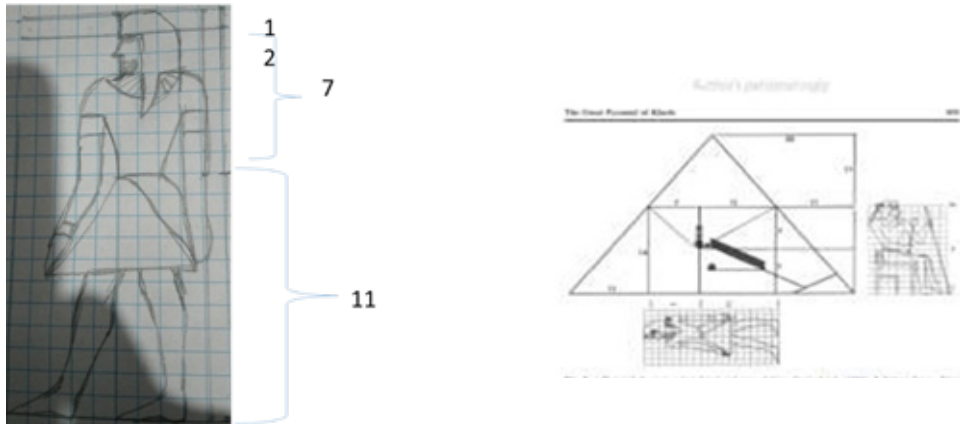


Figure 01: sculpture (human) proportions in the Great Pyramid in Egypt (Bartlett et. al., 2014).

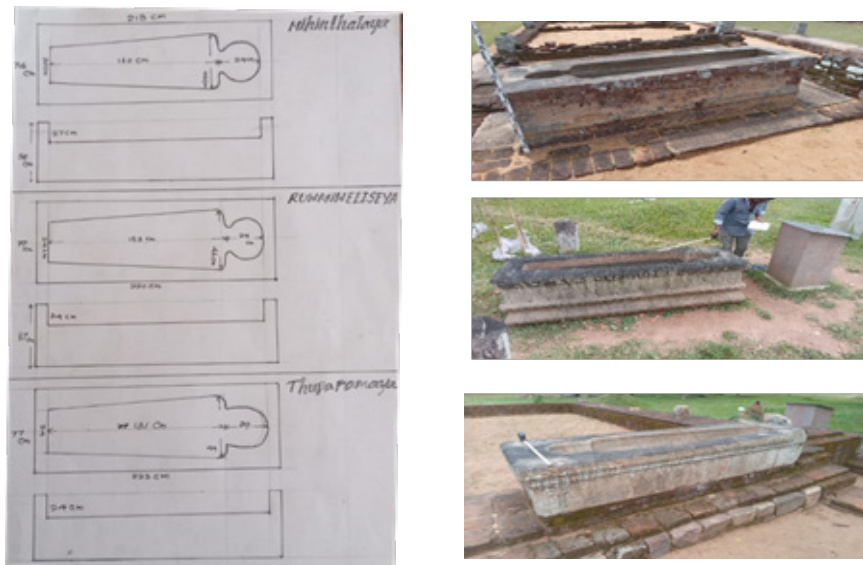


Figure: 02 propotions of medicinal troughs in Mihinthale and the Royal hospital in Mahavihara, Source : photographed by Dr Thusitha Halloluwa on 26<sup>th</sup> Feb 2024

Hospital	Head & neck length	Shoulder up to Foot	Internal length (cm)	Width of shoulder level	Width of feet level	depth	Length of the medicinal trough
Royal hospital	29cm	153cm	182	46cm	29cm	24cm	220cm
<u>Mihinthale</u>	24cm	160cm	184	49cm	30cm	27cm	213cm
<u>Thuparamaya</u>	29cm	131cm	160	49cm	29cm	24cm	222cm
<u>Madangirya</u>			190				230cm

Table 01: proportions of the medicinal troughs in the ancient Buddhist hospitals

The Egyptians built this massive pyramid based on some specific important design principles. The perfection of the exterior proportions precisely matches the interior chambers and corridors, working in exact accord. Moreover, evidence suggests that the design exhibits the same proportions as the Great Pyramid. Empirical evidence reveals the presence of the golden ratio and, with slightly less correlation, the Pi ratio (Bartlett et al., 2014). This suggests that the ancient Egyptians intentionally built the Great Pyramid to exhibit the mathematical concepts of either  $\Phi$  or  $\pi$ , or perhaps to reflect both. Yet, there doesn't seem to be any substantial reason to conclude this, unless it was to demonstrate to future generations an advanced level of mathematical knowledge, which would seem rather indirect given their other spiritual and funerary concerns (Bartlett et al., 2014).

Unlike the golden ratio, a visual proportion mentioned as an ideal relationship in virtually every text on art and design, arguing that pi serves as an aesthetic proportion for the visual arts is challenging (Bartlett et al., 2014). Christopher believes pi produces an aesthetically pleasing visual result, while the Golden ratio and the Lucas ratio have strong following in the arts. However, even the mathematically interesting ratio proportion's implicit aesthetic beauty remains debatable and hard to prove psychologically. Nevertheless, the ratio serves as a compositional design basis, bringing harmony and unity through self-similarity and continuity of proportional divisions. Christopher has published on the geometry of composition in painting, notably in "Decoding Interior" in Smithsonian's American Art Journal, where he detailed Porter's compositional use of  $\sqrt{\Phi}$  in his most recent paper. Huylebrouk termed the 'chi ratio' rectangle

(1:1.356) and its applications in the geometrical composition of painting. It is a proportion that shares generative properties with the golden ratio rectangle, dividing into similar 1.356 rectangles and golden ratio rectangles ad infinitum (Bartlett et al., 2014).

The investigation delved into the architectural proportions of medicinal troughs, microcosmic ritual spaces, and the application of the Lucas ratio. It was observed by the author that the shape of the Pyramid, rooted in mathematical ratios, embodies religiously significant ideals of human proportions (the Lucas ratio), as depicted in the paintings and sculptures of ancient Egyptian civilizations. Human proportions were used to depict the gods and the pharaohs in their reliefs. Major results are that nearly similar ratios of human proportions in the Mahavihara, Mihinthale and Madirigiriya medicinal troughs were designed out of three in Anuradhapura era in Sri Lankan Buddhist contexts. The layout of the medicinal trough in the ancient Buddhist hospital at Mihinthale (8 AD) features a consistent arrangement, with larger room positioned in the North-Eastern corner. Each room (measuring 3.3m×3.3m except four large rectangular rooms in the corner) were facing towards the opened central square shrine with stepped Pyramid (Prasada) roof in the rectangular inner court of the hospital. Striking similarities between the Buddhist architectural proportions in Sri Lanka and the sacred ratios in Egypt were revealed by this comparative analysis. The study concluded that these proportions play a crucial role in fostering one's health, supporting for sustainable and healthy living practices based on the concept of mental and physical balance facilitated through engagement with the six senses. Striking similarities between the Buddhist architectural proportions in Sri Lanka and the sacred ratios in Egypt were revealed by this comparative analysis.

## **Conclusion**

Striking similarities between the Buddhist architectural proportions in Sri Lanka and the sacred ratios in Egypt were revealed by this comparative analysis.

The study concluded that these proportions play a crucial role in fostering one's health, supporting for sustainable and healthy living practices based on the concept of mental and physical balance facilitated through engagement with the six senses.

## **Further researches**

These ratios and human proportions can be used for further researches for creating more sustainable ratio or proportions. These human/architectural proportions can be used in modern sacred spaces and architectures.

**Keywords:** Architectural proportions, medicinal trough, mental and physical balance, Sri Lankan Buddhist ritual performance, Lucus ratio

## References

- Bartlett, C. & Huylebrouk, D. (2014). *Art and math of the 1.35 ratio rectangle symmetry*: Nexus Network Journal “Architecture and Mathematics, Kim Williams Books, Turin, 16, pp 301-304.
- Bentharage, L. (2004). “*Pahatharata Shanthikarmavala vasthuvidyathmaka lakshana*”, S & S Printers, Colombo.
- Kottegoda, J. (1997). “*Pahatharata Shanthikarma sahithya*”, Daluwaththa printers, Colombo.
- Mueller-Dietz, H. E. (1996). Stone „, Sarcophagi” and Ancient Hospitals in Sri Lanka, *Medizinhistorisches journal*, Franz Steiner Verlag, pp 49-65.
- Paranavithana, S. (1954). *Epigraphia Zeylonica*, London, 5.
- Silva, R. (2004). *Archaeological Survey of Ceylon, Annual Report, 1910-1911*, State Printing Corporation, Colombo, p 20. Available at: [http:// www.sites.google.com /](http://www.sites.google.com/) (Accessed: 30 August 2020).