About the NIAS Logo

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The NIAS logo can be traced back to a remarkable Sanskrit work called the Sulva-sutra which, while being one of the four Kalpa-sutra texts concerned chiefly with vedic ritual, displays a deep knowledge of geometry from pre-Euclidean times. Sulva (or sulba) stands for rope, string or cord, and is derived from the root sulv, meaning 'to measure'; the Sulva-sutra is therefore literally 'The Manual of the Cord'. (To this day a cord is part of the basic equipment carried by an Indian mason, to be used in surveying or in laying out a structure in any construction activity.) The text is in fact a handbook of ritual geometry, and describes a series of geometric 'constructions' or procedures (using only strings and pegs) for the lay-out of sacrificial altars and fires of various shapes and dimensions, usually specified with extraordinary precision.

The Sulva-sutra attributed to Baudhayana is considered to be the oldest as well as the most systematic and detailed version of the text. Scholars are not agreed on the precise date of the sutra, but the text clearly pre-dates Panini and is generally thought to have been written sometime between the 4th and 8th centuries B.C., most probably in the 5th or 6th century B.C. However, the procedures described in the text must almost certainly have been known much earlier. The NIAS logo displays the arrangement of bricks in the first layer of an altar called syena - cita, in the shape of an eagle or falcon (= syena), and is described in Chapter 11 of Baudhayana's text. The construction of the altar needs a total of 200 bricks of five different shapes in the first layer. The second layer is similar in shape and also needs 200 bricks, but five additional brick types are required. In constructing the altar, the bricks were laid in such a way that no brick rested on another of the same size and shape. Generally there were five layers, the odd ones being replicas of the first layer and the even ones of the second layer.

Using the dimensions of the bricks given in angulas in the text, and taking 1 ft = 16 angulas (as suggested by Fleet), I estimate the span of the altar-falcon as 40.5 ft or 12.3 m. The altar would have been knee-high. Its area is quoted as 7 1/2 square purushas; a purusha being the height of a man with uplifted arms (given as 120 angulas, i.e. 7 1/2 feet or 2.3 m), the area works out to 56.25 sq.ft. or 5.29 sq.m.

Vedic fire-altars were of two kinds: there were the perpetual ones (nitya) and the optional ones (kamya). The syena -cita is an optional fire, meant for those who desire heaven (suvarga-kama, 8.1). It is constructed in the likeness of the falcon, after the shadow cast by it while flying (utpatatam chaya.ety.arthah , 8.5). The falcon shape is symbolic; the Taittiriya Samhita says,

"He who desires heaven may construct the falcon-shaped altar; for the falcon is the best flyer among the birds; thus he [the sacrificer] having become a falcon himself flies up to the heavenly world."

Although the word syena is generally used for a falcon, it is actually a comprehensive term for eagles, falcons and hawks, which constitute one of the three groups into which birds of prey were classified in ancient Indian texts. (All birds of prey are supposed descended from the primeval garuda.) In fact syena is often used as a synonym for the vedic suparna, the celebrated golden eagle that is the strongest and fastest of the family. The female golden eagle, which is larger than the male, can have a wing span of over seven feet. The female is preferred by falconers for the chase, and is also known as the gayatri; syena (although a word that is masculine in gender) is in fact thought to stand for the female. Indeed the Kapisthala Katha-samhita speaks of a gayatri - cita.

Although the Sutra is basically a manual of applied geometry, it is remarkable that, apart from 'the formidable geometrical problems solved' there (Barrow 1992), many general geometrical propositions are stated (even more are implied) and frequently used. For example, the theorem now commonly attributed to Pythagoras (ca. 540 B.C.; 'proved' in Euclid, ca. 300 B.C.) is explicitly stated in the following form in the very first section of the work (1.12, translation of Sen & Bag 1983): 'The areas [of the squares] produced separately by the length and the breadth of a rectangle together equal the area [of the square] produced by the diagonal'. Such results were essential for constructing the altars to the specified shapes and sizes, especially when there were such requirements as (for example) the construction of an altar with double the area of but exactly the same shape as a smaller one.

The syena-cita was therefore a creation for the spirit, founded on (or utilising, or even inspiring?) great mathematics and engineering- an apt symbol for all the things that NIAS stands for.

Incidently, all of us learnt at school the elements of geometry to Euclid, and the creation of geometric constructions using only a ruler and compass. How different would it be if we did gemetry with a string and a peg? - that may be worth exploring.

References

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