

TRACING THE ORIGIN OF JAPANESE PAGODAS ALONG THE SILK ROAD

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Abstract

This paper will trace the origins of a geometric tradition in the construction of Japanese traditional Buddhist pagodas, especially the five- and three-storied pagodas, as well as the Gorinto and Hokyointo pagodas, at the Western end of the Silk Road. Our guides along the way are geometric figures, the circle, square, and the regular polyhedra. The main conclusion is that the five-storied and Gorinto pagodas have been traditionally associated with the Shingon sect of Japanese Buddhism, which was fond of the circle and the number 5, while the three-storied and Hokyointo pagodas were favored by the Tendai sect, which seemed to like the square and the number 3 more. The rivalry between these two big sects continuing to this day reminds us of a philosophic tradition from the ancient Greece.

1. Introduction

In Japan, the construction of Buddhist pagodas begun as early as the 7th century and thus, they became symbols of traditional Japan. Among them, the most remarkable ones are the large wooden five- and three-storied pagodas, and the small stone Gorinto and Hokyointo pagodas. Furthermore, there is also a special wooden two-storied Tahoto pagoda which may have been the origin of the multi-storied pagodas in Japan (Fig.1).

Curiously enough, they have been designed according to strict geometric rules, although it is often said that Japanese are traditionally not fond of geometry. Various attempts have been made to solve this riddle but failed to provide conclusive results.

This paper proposes to answer the conundrum through the medium of basic geometric figures: the circle, square, and the regular polyhedra, all of which are heavily featured in the ancient cosmologies of Greece, India, and China situated along the Silk Road [1].



Fig.1 Typical pagodas in Japan. From left to right, the five-storied pagoda at Horyu-ji temple, Nara, 7th century, the three-storied pagoda at Hokki-ji temple, Nara, 8th century, a Gorinto pagoda at Sainan-in temple, Mt.Koya, 14th century, a Hokyointo pagoda at Tokugen-in temple, Shiga, 14th century, and the Tahoto pagoda at Ishiyama-dera temple, Shiga, 12th century.

2. Regular polyhedra

The regular polyhedra are 3-dimensional solids whose faces are congruent regular polygons assembled around each vertex in the same manner. There are only five of them: the regular tetrahedron, the octahedron, and the icosahedron, composed of regular triangles, the cube composed of squares, and the regular dodecahedron, composed of regular pentagons. In the 5th century B.C., the Greek philosopher Plato claimed that the shapes of the four elements that make up the universe coincide with the first four of them: a tetrahedron for fire, octahedron for air, icosahedron for water and a cube for earth. Furthermore, Plato imagined that the Universe itself is shaped like a regular dodecahedron. Because of this, the regular polyhedra have come to be known as the Platonic solids (Fig.2).

Aristotle, Plato's best student, repudiated this idealistic cosmology based on polyhedra and claimed that we must think more realistically, in terms of quality, rather than shape. It has been therefore said sometimes that every person in the world is either a pupil of Plato or Aristotle. Plato was an idealist, sometimes with his head in the clouds and preoccupied by geometry, the circle and the number 5. Aristotle, on the other hand, was a down to earth realist, who believed in arithmetic, the square and the number 3.

It is also said that Western cultures, which excel at geometry originated in Greece, may be Platonic. To the contrary, Eastern cultures are very good at arithmetic originated from India and may be Aristotelian. Ancient Japanese, living in the Far East, were of course Aristotelian and had no great liking for geometry, though some simple regular polyhedra, such as a tetrahedron, cube or an octahedron, were occasionally used to shape objects of daily necessity. The Emperors' treasure house in Nara stores even a regular dodecahedral incense burner from 8th century Persia. Furthermore, Japanese traditional mathematics (Wasan), which developed between the 17th and 19th century, dealt with primitively the regular polyhedra.

Nonetheless, it was only after the Meiji Revolution (1868) that accurate geometric knowledge about them was finally introduced.

On the other hand, since the dawn of Japanese culture, the circle, square and the regular polyhedra have been appearing in the shapes of various cosmologies inherited from China and India.

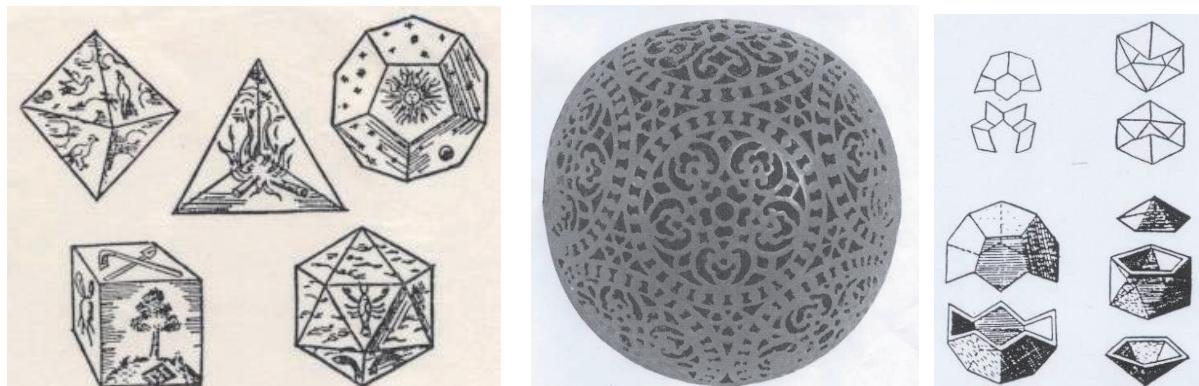


Fig.2 From left to right, pictures of regular polyhedra associated with Plato's cosmology (from "Harmonices Mundi" by J. Kepler, 1619), a regular dodecahedral copper incense burner stores in Shoso-in treasure house, Nara, 8th century, the oldest pictures of a regular dodecahedron and icosahedron in Japan (Upper, from a book about the measurement by Toshino Matsumiya, a Wasan mathematician, 1728. Below, the resembling pictures in the above-mentioned book by Kepler).

3. Wooden multi-storied pagodas

Traces of a circle, square, and regular polyhedra in traditional Japan can be seen at wooden multi-storied pagodas erected to commemorate the Buddha since the 7th century. 100 or more three-storied, 20 or more five-storied, a small thirteen-storied pagoda, and 80 or more special two-storied Tahoto pagodas remain since before the Meiji revolution (Fig.1).

These pagodas (with the exception of a Tahoto pagoda) were designed according to the serious geometric rules: The number of floors is usually an odd number ranging from 3 to 13, and the shape of the floor is a regular polygon whose number of edges is usually an even number ranging from 4 to 8.

Various images of Buddha in a pagoda are usually installed on the ground floor. The upper floors are merely decorations that protect a vertical spinal column, called Shinbashira, which passes through the center of the pagoda. The upper part of the Shinbashira thrusts through the top roof and is decorated as a Sorin, which shows a stacking of a cube, hemi-sphere, nine circles, some sets of smoky water-shapes, sphere, and a Chintamani (a magic, onion-shape mythical jewel known as a "Hoju" in Japanese), from bottom to top. It is said that the Sorin is the most symbolic part of a pagoda, which was originally designed after the model of an ancient Indian stupa, such as the one at Sanchi, for example (Fig.4).

The most typical wooden pagodas consist of a five- or three-storied stackings of square floors. Each of the five floors in a five-storied pagoda symbolizes one of the five elements of the Universe in Indian cosmology: earth, water, fire, air, and the Universe, in this order from bottom to top.

The somewhat unusual two-storied Tahoto pagoda is composed of a square lower floor, circular upper floor, and a Sorin on the roof. There is a plausible theory which posits that the original shape of a Tahoto was in fact a one-storied cylindrical pavilion sheltered from the rain by four eaves surrounding the body. We believe, to the contrary, that the Tahoto which consisted of a square earth underneath and a circular heaven symbolizes in fact the ancient cosmology of Japan.

4. Stone Gorinto and Hokyointo pagodas

As a place-holder for big, expensive wooden pagodas, miniature versions of them made of various materials have also been erected since antiquity.

The most typical stone pagoda is the Gorinto, which is a common form of tombstone from around the middle of the 12th century (Fig.1).

A Gorinto is, as a rule, composed of five blocks: a cube, sphere, pyramid, semi-sphere and a Chintamani, from bottom to top. Each of them is usually inscribed with the Chinese characters or Sanskrits for earth, water, fire, air, and the universe, in the same order. It follows, therefore, that a five-storied Gorinto is probably a substitute for the wooden five-storied pagoda.

There are many theories attempting to explain this shape as a symbol of the sitting Buddha or an imitation of ancient Indian altar fittings including the stupa (Fig.3). One of the most convincing opinions is that it shows a solid version of a planar Sotoba-panel, which is composed of five planar geometric shapes: a long rectangle, circle, triangle, semi-circle and a Chintamani-shape, from bottom to top. According to a Buddhist sutra from around the 5th century, a square, circular, triangular, semi-circular and a Chintamani-shaped islands are said to be floating on a huge circular sea representing the universe. The square island at the center is the Heaven and Mankind is living on the triangular island at the south. This cosmology is also represented in Mandalas.

The original shape of this Sotoba can already be seen as an emblem of Mithraism, a Western Asian religion pre-dating Christianity. Therefore, today, it is said that the solid Gorinto has been devised in Japan, while the planar shape must have originated in India or the Western areas of Asia.

The Hokyointo is another typical form of Japanese tomb stones, used from around the same time as the Gorinto (Fig.1). In contrast to the simple, five-storied geometric Gorinto, the Hokyointo shows complicated non-geometric features. Its outline, however, consists of three parts: a pyramid-shaped stacking of several square blocks, a cube with some circular engravings as symbols of the element of water, and a stacking of more flat square panels with flame-like decorations at the four corners and a Sorin on top. These may be interpreted to symbolize the earth, water, and fire elements, from bottom to top.

The origin of a Hokyointo is thought to be a small golden-pagoda made by a king of China at 10th century, who in turn followed the design of stupas by King Asoka of India at 3rd century B.C. (Fig.4). A so-called Asoka pagoda usually shows three-storied towers. If so, a Hokyointo may therefore be thought of as a substitute for the three-storied pagoda and a counterpart to the five-storied one. Therefore, a Gorinto as a five-storied pagoda and a Hokyointo as a three-storied pagoda are sometimes erected side by side.

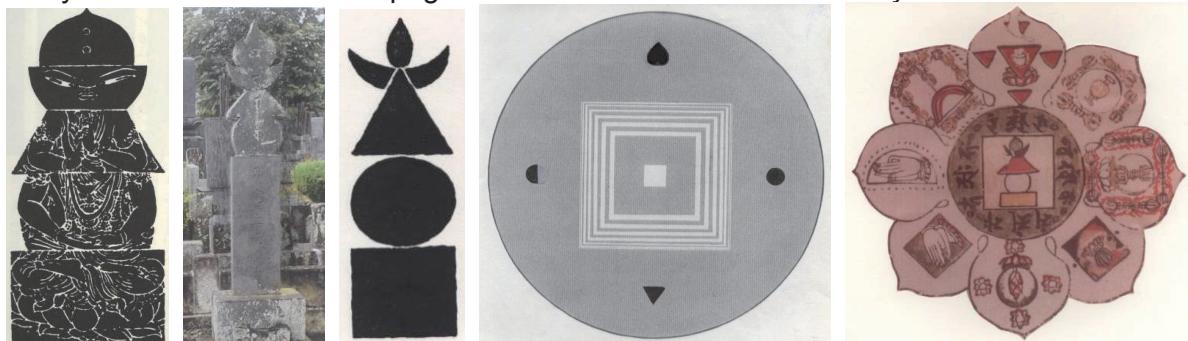


Fig.3 From left to right, a Gorinto representing a sitting Buddha as imagined by Kakuban, a monk at the 12th century, a stone Sotoba-panel in Japan, an emblem of Mithraism, the plan of the Universe as imagined by Buddhists in ancient India, and a Gorinto in a square at center of a Mandala surrounded by petals painted in a circle, triangle, semi-circle and a Chintamani-shape.



Fig.4 From left to right, a miniature stupa of King Ch'ien Kung-Ch'u, 10th century, China; the Asoka-pagoda as a three-storied pagoda at Ishido-ji temple, Shiga, Japan, 8th century; the great stupa at Sanchi designed by King Asoka showing a three-storied pagoda on top, India, 3rd B.C. ; modern Gorinto and Hokyointo pagodas standing side by side, Osaka, Japan.

5. Kukai as Plato and Saicho as Aristotle

In the past, the Gorinto and the Hokyointo may have been symbols of a strong rivalry. K.Yabuta has claimed that a Gorinto was originally a monument of the Shingon sect of Japanese Buddhism, while the Hokyointo belongs to the Tendai sect [2]. Because of this, it seems that Shingon temples tend to be fond of five-storied pagodas and Gorinto, while Tendai temples favor the three-storied pagoda and the Hokyointo.

The Shingon sect was originated by the Japanese monk Kukai, while Tendai was founded by another monk, Saicho around the same time in the 9th century. Kukai and Saicho were the first great rivals of Japanese Buddhist. The Shingon sect of Kukai seems to have a liking for the number 5 and the symbolism of the circle, while Saicho's Tendai is fond of 3 and of square shapes. The sphere that represents water in a Gorinto is thus changed to a cube in the Hokyointo. The circular upper floor of a Tahoto pagoda is also sometimes changed to a square floor by the Tendai-sect. Furthermore, according to various legends, the character of Kukai was suitable for a pupil of Plato and Saicho of Aristotle.

Therefore, we believe that the Gorinto of Kukai shows the influence of Plato's idealistic regular polyhedral cosmology: The earth block is surely a cube. The water block is a sphere because Plato said that the element of water is a regular icosahedron which rotates like a sphere. The fire block of a modern Gorinto is usually a square pyramid but was mostly a regular tetrahedron in older Gorintos (Fig.5). The air block is a hemi-sphere because Plato said that the element of air stands halfway between the non-spherical tetrahedron and the spherical icosahedron. The oldest wooden Gorinto shows half of a regular octahedron as the air block. The block of the universe, a Chintamani, shows the most meaningful shape. It looks like a regular dodecahedron, in other words, the outer shape of the Universe as imagined by Plato. The dome of Islamic mosques also shows a Chintamani decorated by a polyhedral pattern. A small polyhedral Chintamani representing a hexagonal pattern seems also to have been passed on to Japan. Judging from the oldest picture of the Chintamani-shape seen on wall paintings in the Qizil cave at China, H.Yagi has claimed that the original shape of the Chintamani must have been a polyhedron (Fig.6) [3]. Some cuboctahedral Chintamanis can be seen on the top of roofs in Japan.

Based on this evidence, we have devised a Gorinto and Mandala composed of regular polyhedra, which can be seen in Fig.6.

In contrast to a Gorinto, a Hokyointo of Saicho is composed of numerous squares and complicated strange decorations which may be an attempt to represent matter realistically. Because of this, it is surely Aristotelian in spirit.

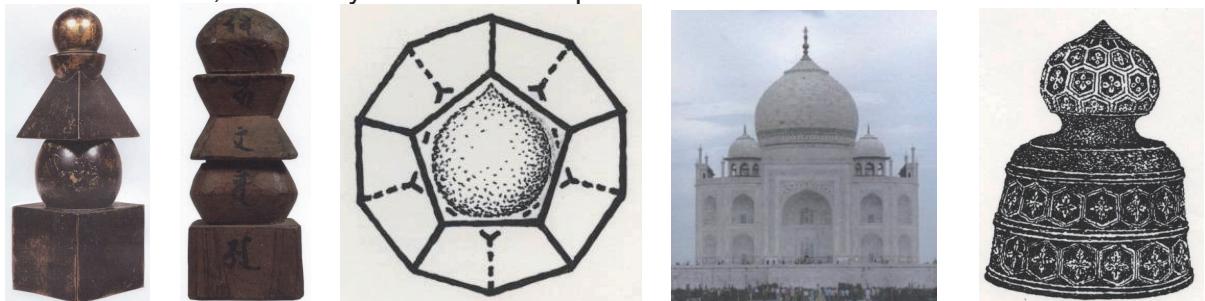


Fig.5 From left to right; an old Gorinto showing a regular tetrahedron as the fire block, Konomiya-jinja shrine, Shiga, 12th century; the oldest Gorinto showing half of a regular octahedron as the air block, Shikobuchi-jinja shrine, Kyoto, 12th century; a Chintamani inscribed in a regular dodecahedron; the Chintamani-shaped domes of Taj Mahal, India, 17th century; the Chintamani decorated with hexagonal patterns, Tsurugaoka-Hachimangu shrine, Kamakura, 14th century.



Fig.6 From left to right, the oldest known wall painting of a Chintamani seen in the Qizil cave, China, 3rd ~8th century; a cuboctahedral Chintamani, Shugakuin-rikyu, Kyoto, 17th century; an imaginary Gorinto composed of regular polyhedra and three Sotobas composed of planar projections of regular polyhedra; an imaginary Mandala composed of planar projections of regular polyhedra.

6. Conclusion and a remark

In this paper we have established the following two sequences of concepts, the flow of which can be traced along the Silk Road:

- Five-storied pagoda – Gorinto – 5 – Circle – Heaven – Geometry – Idealism
– India – Mithraism – Kukai – Plato
- Three-storied pagoda – Hokyointo – 3 – Square – Earth – Arithmetic – Realism
– China – Christianity – Saicho – Aristotle

It is usually said that Japanese traditionally showed little interest in geometric thinking. Nonetheless, whether the ancient Japanese liked them or not, images of such geometric figures as the square, circle and the regular polyhedra have been used in the design of the various forms of pagodas, which are symbols of Japanese culture since antiquity.

Regarding these, there is a final remarkable issue that demands special attention: our conclusions were derived from observations of traditional pagodas mainly erected before the 17th century, at a time when Kyoto (in the West of the country) was the capital of Japan. However, after the capital was changed to Edo (today's Tokyo) in the East during the 17th century, various traditional manners and customs were greatly changed and sometimes entirely reversed. For example, we have found out that in the Edo area, many of the five-storied pagodas belonged to the Tendai sect of Saicho, while three-storied pagodas belonged to the Shingon sect of Kukai. As a result, today, many of Japanese including historians and monks who have no interests in geometric figures mistakenly believe that five-storied pagodas denote a rich temple, while three-storied ones belong to poorer temples. An important part of Japan's history is thus distorted and in danger of being forgotten.

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