Climatic determinism in daylighting strategies of the traditional Japanese room.

Studies based on investigation of the Shokintei teahouse at the Katsura Rikyū in Kyoto.

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"... the beauty of a Japanese room depends on a variation of shadows, heavy shadows against light shadows – it has nothing else."

Junichirō Tanizaki, “In Praise of Shadows”
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Chapter 1

Introduction

Junichiro Tanizaki in his book, “In Praise of Shadows,” explores the unique character of the traditional Japanese house. According to him, “… the beauty of a Japanese room depends on a variation of shadows, heavy shadows against light shadows – it has nothing else.” This idea has deep roots in the cultural and religious characteristics of Japanese society, even in the Japanese soul itself, but it also “grow from the realities of life.”

By studying daylight strategies of the traditional Japanese house, I am trying to uncover the ways in which “man has conformed to nature; he has accepted the space that nature has given him.” I will discuss strategies including construction, orientation of the building, interior materials and design of the outside surfaces of the building.

Shokintei teahouse will be used as a case study; it belongs to the complex of Katsura Rikyu – the so-called Katsura Detached Palace – situated in the southern part of Kyoto. The reason this investigation is being narrowed to this single establishment lies in the character and qualities of the whole Katsura Rikyu, considered by both Japanese and Western architects and cultural observers as a quintessence of Japanese taste that “epitomizes and culminates the development of an aristocratic tradition of housing (…) and the evolution of the teahouse, which is also a development of the Japanese farmhouse.”

Before addressing the main subject, I feel it is important to illustrate for the reader, as background to my work, the historical Chinese influences on Japanese ideas and to describe the climatic conditions under which they developed.

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2 Tanizaki, J., op. cit. p. 18
4 See Ishimoto, Y. and Tange, K., op. cit, p. 12
Chapter 2

Shokintei teahouse of Katsura Rikyu

Shokintei teahouse, which belongs to the Katsura Detached Palace, developed approximately between 1610-1650 (Fig. 2.1, 2.2), is one of the most admired teahouses in all of Japan, and without doubt the tea ceremonies that were performed by its sponsor, Prince Toshihito, took place here. Shokintei was probably designed and built by the artist, masters of the tea ceremony and architect Kabori Enshu. It was intended as a pavilion for entertainment, where music of the koto, poetry contests and moon viewing sessions took place as well as its main purpose – the tea ceremony. It was built according to the minka style, “a rustic residence of the common people”, and it incorporates two teahouse styles: soan and shoin. The soan – “the grass hut style”, characterised by the incorporation of natural materials, is a place of humility, where man is constantly reminded of his temporariness. The shoin-zukuri – “the reception-room style” of elegant construction is characterised by usage of expensive materials and decoration in form of art pieces and lacquerwares. It is a place of dignity.

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5 koto - a kind of zither, string (13) instrument of Japanese traditional music style.
Fig. 2.2: Katsura Detached Palace (plan of the whole complex) includes: the main building, Shoin; Momiji Stable; a Boathouse; and five teahouses: Shokatei, Shoiken, Gepparo, Onrindo and Shokintei.
Chapter 3

Cultural influences and adaptation of Chinese philosophy

Japanese culture has been under periodic influences from the Asian mainland, mostly China and Korea, throughout its history. It happened in phases, starting in 3 BC, continuing in 6th century AD and again taking place in 16th century, when new religious, philosophical and scientific ideas arrived in Japan.

The process of the introduction of new ideas has been followed by assimilation of foreign traditions into native ones, and finally their transformation into uniquely Japanese art forms and intellectual concepts. The most influential ideas were those directly connected with the thought of Taoism as a base of Buddhism and Confucianism. They created a background for the development of Japanese ideas about the physical and psychological world.

The notion of Yin and Yang and the five basic nature elements (wood, fire, earth, metal and water) was brought to Japan by Buddhist monks and heavily influenced philosophy and religion, as well as building technologies, city planning, gardening and other areas of cultural life. It stems from the philosophical characterisation of changes in nature, particularly the change of the seasons. The opposite character of sun and moon, day and night, summer and winter, male and female inspired thinkers to see the world in dimensions of the polarity and the oneness of the universe (Fig. 3.1, 3.2).

![Fig. 3.1: Oneness of universe, concept of the world according to the Taoism.](image)
3.1 Tea ceremony and teahouse architecture

One of the cultural practices informed by the idea of Yin and Yang was the tea ceremony - Cha-no-yu, and to this purpose designed teahouse - Chashitsu. That tradition was brought to Japan during the height of cultural contact with the Tang dynasty in China in the early 9th century and developed its aesthetics according to Japanese cultural preferences. Under the influence of the artist Rikyu (1522 - 1591), tea ceremony, Chado - in Japanese, experienced its prime time during the 16th century. It provided a venue and practice for recognizing the beauty of ordinary life and Nature. The aesthetic character of the ceremony was defined as wabi that “includes the feeling of quietness, solitude and simplicity.”

The tea ceremony, tea garden and teahouse are all a representation of the universe and its elements, and the “relationship between the teahouse and the setting is very important, for it adds to the spirit of serenity and naturalness which Cha-no-yu tries to create.” Elements of nature are always represented there: the fire in the form of a stone or iron lantern, earth in the form of stone, and water, air, plant, and animal life in their true forms.

An ideal tearoom should be built according to the prescriptions of the geomantic philosophy of Yin and Yang, with a tokonoma (an alcove) in the north and a nijiri guchi (a crawling entrance) in the south. The honourable guest should sit facing towards the South, with the host facing north. This is because guests are "yin" so they sit in a yang place while the host is "yang" therefore he/she sits in an yin place. Since a four-tatami mat room is square, it can be shown with the Eight Trigrams (See also Appendix 1), which has a centre as shown below. (Fig. 3.3)

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8 Munsterberg, H.; op.cit., p. 161
9 Munsterberg, H.; op.cit., p. 161
Chapter 4

Climate as an influential force

Many ideas arriving from abroad, mostly involved with the aesthetics of architecture and the arts, changed their characteristics by adapting to the local preferences, tastes, traditions and available materials. In the case of architecture, climate and geophysical circumstances were significant. The ascending curves of Chinese roofs (Fig. 4.1), for instance, were replaced with the more subtle curvature of hinoki (Fig. 4.2), the thatched roof of a farm house (Fig. 4.3), or even with slightly convex engawa roofs (Fig. 4.4), protecting verandas in a more suitable fashion for rainy Japan. 11

4.1. Precipitation, heat and humidity

Precipitation was one of the main elements that influenced built form of Japanese house. It averages between 1000 and 2000 millimetres, and concentrates in the period between June and September, it increases from 800 mm in the north to 2400 – 3200 mm per year in the south. In fact, 70 to 80 percent of the annual precipitation falls during summer, in June and July (Fig. 4.6). Two main rain seasons occur, as well as five or six typhoons that pass over or near Japan every year from early August to early September.

Average temperature ranges in summer months between 20 and 28 degrees centigrade, and in winter between 5 and 10 (Fig. 4.5). While temperature levels of Japan could be compared with those of Athens, air humidity in summer is similar to the conditions of the north-western European maritime countries such as Denmark (Fig. 4.7) and its quite stable through out the year - 60 and 80 %.

Fig. 4.5 Temperature of Kyoto, Athens and Kobenhavn.

Fig. 4.6 Precipitation, in Kyoto much higher then in Kobenhavn, Denmark or Greece.
Relative Humidity

Global Radiation

Diffuse Radiation

Sunshine Hours

Fig. 4.7 Relative humidity, in summer conditions in Denmark and Japan are similar.

Fig. 4.8 Global radiation is highest in Athens during the whole year, while in Denmark and Japan it lies on the same level during summer months.

Fig. 4.9 Diffuse radiation is strongest in Japan.

Fig. 4.10 Because of the characteristic overcast sky Japan has less sunshine hours in summer time even then Denmark.
Chapter 5

Daylight strategies of the Shokintei teahouse

The climate of Japan has influenced the development of the country’s architecture and contributed to its character. Tanizaki described the relation between climate, built form, and light of the Japanese interior, as follows: “A light room would no doubt have been more convenient for us… The quality that we call beauty, however, must always grow from the realities of life”, “in making for ourselves a place to live, we first spread a parasol to throw a shadow on the earth, and in the pale light of shadow we put together a house”\(^\text{12}\). With the weather in mind the typical Japanese house has a low roof that keeps off the driving wind and rain and protects its dwellers from the strong sunlight and, on overcast days, the strong skylight at this latitude. “Forced to live in dark rooms, our ancestors cut of the brightness on the land from above (...) and came to discover the beauty of shadows”\(^\text{13}\). This chapter will look at the daylight strategies that shape the visual environment of the Japanese tearoom.

\(^\text{12}\) Tanizaki, J., op. cit. p. 18

\(^\text{13}\) Tanizaki, J., op. cit. p. 33

Fig. 5.1: Shokintei Teahouse, north-eastern view – from point A on the plan p.11. The main entrance to the tearoom marked with a white circle is only two and a half feet square, therefore all quests have to bound and crawl through it.

Fig. 5.2 Entrance to the Shokintei, (close up)
5.1 Orientation and layout

The Japanese master carpenter was both an architect and a builder; and in the case of the teahouse buildings he was often a master of the tea ceremony. The building process always "began with site selection and application of geometric criteria to the orientation of the building." The construction process began with the placement of a pole, the hashira (Fig. 5.3), in teahouses called naka-bashira, from which all plans for the construction of the house originated. It should be mentioned that naka-bashira, was not an element of the house's construction, rather it symbolised a centre around which the building was created.

The orientation of the Shokintei teahouse does not follow the prescription of an ideal tearoom developed according to the geomantic philosophy of Yin and Yang. Taking account of the site and relating to its surroundings, it faces Shoin the main building of Katsura Rikyu in north-west. Shokintei is oriented on a southeast - northwest axis with an entrance - a nijiri guchi - placed at the north-eastern aspect (Fig. 5.2).

The nijiri guchi leads to the main tearoom built in soan style that faces north and northeast. Adjacent to this, one may enter the shoin-zukuri style entertainment room Ni-no-ma , at which point the whole of the interior as well as the outside landscape can be appreciated. The Ichi-no-ma and Ni-no-ma spaces are placed on the western and north-western sides of the building and view the garden and the pond. The kitchen and pantry face south, protecting the interior not only from the strong summer light, but also from the summer winds that blow from the southeast during typhoon months. The little courtyard in the middle of the house illuminates the area of the first tearoom and other north-oriented rooms (Fig. 5.6).

Fig. 5.5: Shokintei teahouse - plan. The main tearoom - Hasse-no-ma faces north and northeast, while entertainment rooms Ichi-no-ma and Ni-no-ma are placed on the western and north-western sides of the building. Stone bridge leads to the Shokintei from the north-east directly to the nijiri guchi – a crawling entrance (point C).

Fig. 5.6 Courtyard illuminated by direct sunrays on in summer and by skylight at other times of the year. Axonometric drawing, view from southwest.
5.2 Construction

The Shokintei is a typical example of the beam and post structure. Natural trees retaining their bark are used for supports (Fig. 5.7). Just like other teahouses of Katsura Rikyu, it is very plain and simple. The construction material is probably hinoki (Japanese cypress), which changes its colour from a brilliant golden, thorough dark gold to grey.

In the daylight strategies employed here the roof plays a very important role. It is large and heavy with deep overhangs that prevent sunlight penetration in the summer (Fig. 5.8) and provide greater solar gains in the winter months (Fig. 5.9). Tanizaki states: “we extend the eves or build on a veranda, putting the sunlight at still greater a remove.”

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Fig. 5.7 The Shokintei teahouse, view from the north-west, from point B on plan p.11. Natural trees used as a structural elements.

Fig. 5.8 In summer direct sunrays enter teahouse only in the evening. View from north-west.

Fig. 5.9 In winter - direct sunray angle is even lower, light can penetrate across the building.

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16 Tanizaki, J., op. cit. p. 18
5.3 Openings and Interior Materials

The post and beam structure leaves walls as elements without any structural function. They can be very easy perforated, and adapted to the needs of their users. By choosing style and form of the opening ancient architects consciously shaped lighting qualities of a tearoom. It changes according to the phases of the tea ceremony as well to the time of the day and year when they take place (Appendix 2). Lighting of the tea ceremony varies: it should be subdued in the first half, but during the latter half should be bright. In the midnight gatherings the best light is the full moon, but if it is not enough, lamps are provided.¹⁷

Windows play a leading role in the control of the amount of daylight entering the room. In the main tearoom Hasso-no-ma (Eight Window Room), they are small and placed at different heights determined by the lighting requirements during the tea ceremony. Shitaji mado – unframed latticework, and Renji mado, with two papered sliding doors and a bamboo latticework frame on the outside, are placed close to the guest mats (the room’s northern corner). The window near the host of the ceremony is placed low above the floor to allow diffuse light from the courtyard to fall directly on the utensils used in the gathering (Fig. 5.11).

¹⁷Torniainen, Minna; From Auster wabi to Golden wabi, Philosophical and Aesthetic Aspects of wabi in the Way of Tea, The Finish Oriental Society, Helsinki, 2000, p.180
The skylight *tsuki-age-modo* above the host area is mostly used for midnight ceremonies, during snowy nights of winter and at dawn (Fig. 5.11). The diffuse light falling directly on the *tatami* mat creates a mysterious and unique atmosphere. A small stick or length of bamboo is used to rise and hold the trap open.\(^\text{18}\)

By opening or closing screens and windows the character of the light can be regulated and acoustic contact provided with the outside world.

The windows of two entertainment rooms have *shoji* – sliding screens that are the size of the whole wall and, when opened, give the best views of the garden as well as allowing ground reflected light from the outside to illuminate the interior. Because of the properties of the translucent rice paper, they allow only diffuse, soft light into the rooms when closed (Fig. 5.14).

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\(^{18}\) Castile, R., op.cit., p. 176
Fig. 5.12 Windows of the *Ha-se-no-ma* (Eight-Window Room) facing north-east, open windows and the entrance doors in the lower left hand corner.

Fig. 5.13 *Ni-no-ma* and *Ich-no-ma* rooms seen from the outside, *shoji* windows are wide open. View from the west.

Fig. 5.14 *Shoji*, sliding windows on both sides of the opening, view from the inside towards the pond in the west.
Materials used in Shokintei are chosen to strengthen the feeling of dimness or subtle darkness. They can be arranged in two groups according to their optical properties: reflecting and absorbing light. Almost none of the materials used have the qualities of specular reflectance; the only elements of which this could be said are the golden and silver flecks on the white cabinets which “in the dim rooms, must have served the function of a reflector (...) Its reflective properties were put to use as a source of illumination”19 These mirroring flecks are somewhat less distracting on a white field, they therefore only subtly animate the visual field of the interior (Fig. 5.15 element A). Other materials are of mid or low reflectance and scatter incident light diffusely. “In the narrow confines of a tea hut, anything strongly reflecting light would cause discomfort.”20 “Japanese have long stressed the lower areas of dwellings, rather than the upper. Little attention was given to the illumination of the upper reaches of a room.”21 The most common explanation for this was the concentration of activities at floor level, in Japanese house one “sits on the room not in the room.”22 Therefore floors at their finish were always very important. They are covered with tatami mats made of reed straw. Their level of reflectance is low enough to prevent glare from incoming early morning and evening direct sunlight that forms sun patches on the floor (Fig. 5.15 element C). In a teahouse they also create contrasting background for tea ceremony utensils.

19 Tanizaki, J., op. cit. p. 23
20 Castile, R. op.cit., p.140
21 Castile, R., op.cit., p. 133
22 Castile, R., op.cit., p. 132

Fig. 5.15 Elements A, B, C. The futsuma - sliding wall separates Hasso-no-ma tearoom from other rooms of the house. It is covered with chequered white and blue paper.
The walls are made of a mixture of clay with rust and added grass or straw (Fig. 5.16). The famous clay from the Kyoto area has a red-ochre colour; it is matt, and absorbs most of the light falling on it. The plastered wall in the Haso-no-ma is painted with ultramarine blue, but interestingly, the lowest parts of the other walls are covered in a light-coloured paper. “The little sunlight from the garden that manages to make its way beneath the eves (…) has by then lost its power to illuminate, seems drained (…). It can do no more than accentuate the whiteness of the paper.”23 It should be recalled that Japanese ‘white’ paper lacks the brilliance of modern European white paper; it is softer and more absorbent of light. In spite of that, placed closed to the floor level its relative brightness gives visual emphasis to the lower part of the room, and helps to ensure that the tatami mats, on which all activities take place, are sufficiently well lit.

The futsuma – sliding wall separates the Haso-no-ma tearoom from the other rooms of the house. It is covered with chequered white and dark blue paper (Fig. 5.15). Contrasting colours of the fusuma create a bold and vivid effect alternately absorbing and reflecting light.

23 Tanizaki, J., op. cit. p. 21
5.4 External strategies

The relationship between inside and outside is transformed by three elements: the pond, the stepping-stones and the wooden veranda. They are used as devices for transporting light inside the building and relate first of all to the entertainment rooms. Owing to the deep overhangs of the roof, sun-, sky- and moon-light reflected from the surfaces outside the teahouse provide most of the illumination of its interior. The character of the externally reflecting surfaces, their reflectance level and apparent brightness help to create a comfortable illumination within.

The pond because of the reflective properties of water has different qualities according to the seasons. Water reflectance depends on the sun inclination angle, therefore sunrays during hot summers are reflected directly back to the sky (sun inclination angle in June at noon is 73°). While during winter, when sun inclination angle is low (in December at noon - 35°), sunrays are redirected into the building, providing both light and heat.
The intensely white colour of the stone pavement under the eaves as well as the garden stones, steppingstones, and pebbles of the pavement and bridge are made of granite that makes them gleam in moonlight and when they are wet with rain. The ‘white dog effect’ is the name given to the fact that surfaces that are white remain visible for longer as light levels are lowered, they almost to ‘glow’ in low light. The specularity of a surface tends to become more apparent in low light (Fig. 5.20 and 5.21).

The wooden veranda – *engawa*, situated on the north-western site of the Shokintei, acts as a transition space from inside to outside the house. It has a relatively dark yet shiny surface whose specularity ensures that light can be redirected into the lower area of the interior – particularly light that arrives at an oblique angle of incidence (shiny surfaces are generally more specularly reflective at oblique angles of incidence) – such as morning or evening sunlight, or the light from a rising or setting moon (Fig. 5.22).

![Fig. 5.18 Skylight reflected in steppingstones and water, view from the northeast.](image)

![Fig. 5.19 Sunrays reflected in the pond, as a diffuse light illuminate enter Shokintei.](image)
Fig. 5.20 The monolithic bridge leads to the teahouse.

Fig. 5.21 Steppingstones outside the teahouse.

Fig. 5.22 Shiny wood of the veranda.
The chill calmness of a Japanese room fascinates in its beauty, it offers spectrum of visual and spiritual experiences as well as a protection from the outside conditions. A house that was put together "in the pale light of shadow"\textsuperscript{24} offers relief from brightness of sky and protects from passing rains, it creates ideal living space for a human in hot, humid climate of Japanese Islands. It never misses contact with own surroundings. Being "wholly part of its environment"\textsuperscript{25} relates to it incessantly visually or aurally.

Here texture of surfaces and thus subtlety of shadows, rather than saturation of colour, adds interest; this subtle lighting strategy slowly becoming more apparent as eyes adjust to the lower light levels within the tearoom. The flickering gold leaf on the white cabinet matches the bamboo leaves shaken by the breeze, only heard but not seen.

\textsuperscript{24} Tanizaki, J., op. cit. p. 21
\textsuperscript{25} Castile, Rand; The Way of Tea, Weatherhill, New York & Tokyo, 1971, p. 134
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