## 2.Ingenious Ideas Seen in Ancient Japanese Homes

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(English translation by Eri Ichikawa)

Modern Japanese houses are quite comfortable with effective air-conditioning in summer as well as in winter. In exchange, however, energy consumption in day-to-day lives has risen and no space is wasted in order to achieve efficient air conditioning. As a result, it seems more houses are functional but without any superfluous space. The Japanese tradition has been to live in harmony with nature and not waste energy in attempting to resist or overcome natural forces. This time-honored culture is fading out at least from Japanese houses.

The house where I was born and lived until I finished graduate school is located in Habikino-city, Osaka (Photo 1). Renovated about 120 years ago, it is a traditional Japanese house reminiscent of a more relaxed age. Four rooms, forming a two-by-two matrix is at the center of the building. The four rooms (two rooms are 6 tatami mat size rooms and two are 8 tatami mat size rooms) are separated with “fusuma (a type of sliding door made of wooden frame and paper)” or “itado (wooden sliding door) ”. These doors can be removed, making it possible to alter the size of the space as necessary. This is an idea often used in traditional village headman’s houses (Photo 2)

Photo 1: An Overall View of the Hatada-Family House

where rooms can be used as a living space or meeting halls. Rooms can be expanded by removing the “fusuma” to accommodate the number of people invited. In fact, by using the sun-room, which was added to the house around 1955, meetings for up to eighty people are possible (Photo 3). Due to the high ceiling and the good flow of air from the two-by-two matrix through the “agarikamachi” (foyer) to the “doma” (earthen-floored area), the house is not claustrophobic. Eighty people can enjoy the warm atmosphere created by wood and tatami mats. Acoustics are excellent, probably because of the air flow, as well as the effects of the old tatami mats and ancient wood which have hardened with the passage of time as the intermoleculer forces of cellulose molecules have strengthened. Delicates tones of instruments such as the guitar, music box and Irish harp resonate well, making it an excellent place to enjoy music.

The air flow in this house was better when the “kamado (cooking stove)” was functioning and the “kemuridashi (Japanese style chimney)” above the stove was in

Photo 4: Sudare shoji

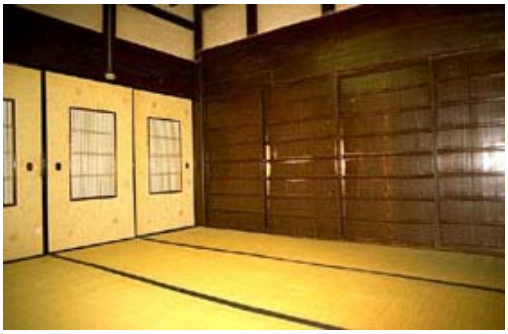

Photo 2: The sitting room (one of the 8 tatami mat size room in the matrix)

Photo 3: Hatada juku (The Hatada Academy)

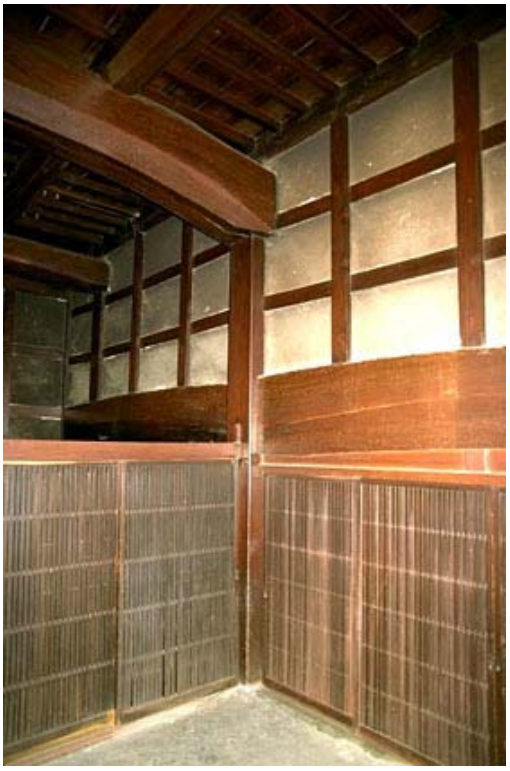

Photo 5: Massive structure of the beams above the “doma (earthen-floored area)”

place. The smoke from the cooking stove would seep around the house acting as fumigation against insects before being discharged from the “kemuridashi.” The “kemuridashi” would also prevent poisonous gases from filling the house in case of fire.

In summer, “akari shoji (paper screen)” and “fusuma” are replaced with “sudare shoji” (or “yoshi shoji”) which are screens woven with narrow slats of bamboo or reed stems (Photo 4). These screens allow more air to circulate and block heat radiated from outdoors, enhancing the cooling effect of breezes. It is a type of natural air conditioning. People who are familiar with “sudare shoji” may find modern air conditioning to be extremely wasteful. Other practical ideas to keep the house cool during summer include designing the layout of the rooms to bring summer breezes inside and long eaves to shade the rooms from the strong summer sun. Tatami mats made of straw also regulate humidity.

Photo 6: “Ohdo (the door for residential use)” and “doma”

Photo 7: Latticed window of the “tomo beya”

On the other hand, there is a “sudo” (Photo 5) between the “doma” next to the “ohdo (door for residential use)” (Photo 6) and connecting “doma” or the “naya”(shed and workshop). “Sudo” acts as a security gate as it is possible to look out from inside but not from outside. The narrow latticed window of the “tomo beya (room for the attendant of the guest)” next to the “nagayamon (row house gate)” also serves this purpose (Photo 7). There is a narrow groove on the top of the “nageshi (the horizontal beam connecting pillars)” in the“zashiki (reception room).” It is said that small swords, spears and rocks were stored here to arm against sudden intruders.

Storage space for various purposes is necessary in any house. There is a space about

Photo 8: The base of the pillar in the sitting room(Photo was taken during the earthquake-proof renovation)

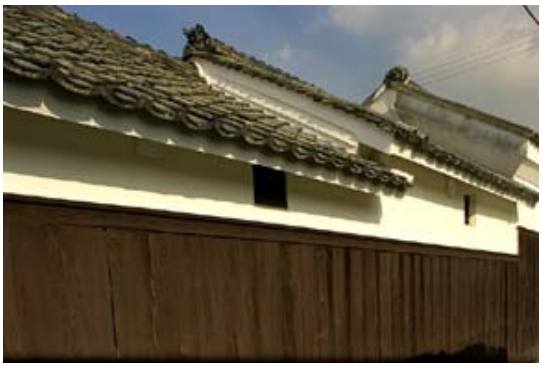

Photo 9 The east, central and west storehouse

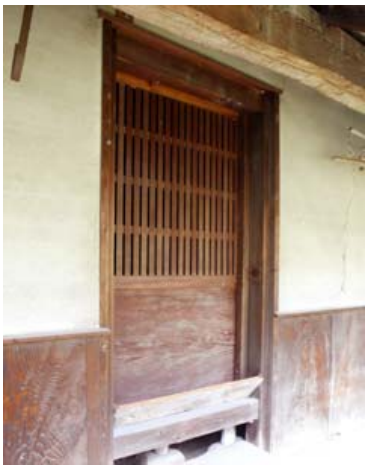

Photo 10: Sudo of the storehouse

60 centimeters high beneath the floor which is used to store potatoes and miso(soybean paste) as the temperature is relatively stable throughout the year. Bamboo and wooden poles used in farming as well as building material is stored here. Lumber left over from the renovation done 120 years ago is stored here and used for repairs. By crawling under the floor, we can see that pillars are not joined to the foundations. It is believed that this type of building method with its floating structure (Photo 8) is resistant to earthquakes with linear motions.

The storehouse building is divided into three sections; the east, central and west storehouse (Photo 9). The central storehouse is used for rice and its wooden walls and floors are of sound structure. The west storehouse is used for miscellaneous goods while the ground floor of the east storehouse is used to store “sudare shoji,” “fusuma” and measuring devices such as scales and large measuring boxes. The upper floor of the east storehouse is ventilated using a small single window. A year’s supply of “kaki mochi (dried rice cake)” is dried and stored here along with some household utensils. All the storehouses have double doors and the inner door is “sudo” (Photo 10) to allow light to

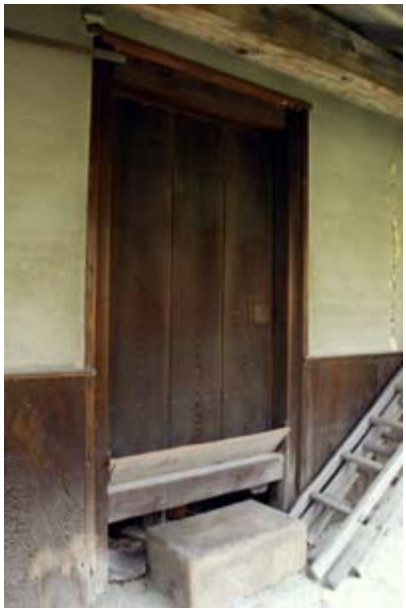

Photo 11: Door and Nezumi gaeshi (mice barriers) of the storehouse

filter in when working inside and to prevent rodents from entering. There are also “Nezumi gaeshi(mice barriers)” about 20 centimeters high outside every threshold (Photo 11). The eaves of the ground floor ceiling of “taka kura” (raised storage) in Amami Islands are also a type of mice barrier.

Photo12: Barns

There are two barns (used for farm work and storing goods, Photo 12) connected to the storehouse. Each barn has a mezzanine which is used to store goods made of straw such as baskets, mats and rainwear which must be kept dry. In the barn next to the “doma” of the main house, part of the ceiling is used as an entrance to the “tsushi” (loft) and another part is used as a mezzanine that served as maid’s quarters (Photo 13). Small spaces throughout the house are cleverly used for storage such as under the eaves for storing long poles [some are used to fly koi-nobori(koi-carp streamers)], Photo 14) as well as the aforementioned spaces under the floor and “nageshi” in the reception room.

Photo 13: Ladder going up into the “tsushi”

There are two latticed windows each on opposite walls in the “tsushi (Photo 15),” the loft in the main house. With good ventilation, the loft is used to dry and store firewood throughout the year. It is believed that the structure of the loft, which allows winds to blow through, reduces the impact of cross winds of typhoons. Based on Bernoullian principle, air pressure above the roof is lower than its surroundings during typhoons. The roofs of Japanese houses are designed to mitigate typhoon hazard by using this effect and prevent the roof tiles from being blown off. The heavy roof tiles also weigh down and stabilize the house and act as insulation to regulate internal temperature.

Photo 14: Poles for flying koi-carp streamers

The kitchen connected to the “doma” beyond the “ohdo” (door for residential use) is not by any means

functional. However, there are some useful ideas such as the rings for the three-burner cooking stove(Photo 16). These rings come in various sizes and can be combined so that pots and pans of different sizes can be used on the range. The cooking stove is fueled by firewood. Left over embers are placed inside a lidded container “hikeshi tsubo (shown in photo 16, right-hand side of the stove)” where it is extinguished by cutting off the air supply. The resulting “karakeshi” is similar to porous charcoal and very flammable. It is used as fuel in the “shichrin (small cooking stove)” for quick cooking or to light the charcoal in “hibachi (charcoal brazier).”

Photo 15: “Tsushi (loft of the main house)”

Photo 16: “kamado (cooking stove)”

The “hikeshi tsubo” is an example of a lifestyle based on the spirit of “mottainai ”(never wasting something that can be used). The spirit of “mottainai” is a core philosophy of the traditional Japanese lifestyle. For example, Japanese roof tiles are effective insulators, cooling the house in summer and warming it in winter. However, one of its drawbacks is that they tend to chip or become loose with age, resulting in leakage or being blown-off during typhoons. Therefore, it is necessary to repair the roof every 30 to 40 years. In old days, it was common practice to remove the old tiles, repair the roof and then retile the roof using old tiles. In the process, any cracked or damaged tiles had to be replaced. A supply of some several hundred tiles were kept for this purpose whenever a roof was made with new tiles because it is difficult to make exactly the same type of tiles. If new tiles were used for the replacing, they would not fit completely and were likely to cause leaks or to be blown off during typhoons. By keeping a supply of spare tiles, the same roof tiles could be used for more than one hundred years. At my house, we ultimately used new tiles as we ran out of replacement tiles when the roof had to be repaired in its 110th year. However, nowadays roof tiles

Photo17: Spare tiles (Okinawa)

roughly thirty-years old are been discarded without second thought. What a waste! It is also destructive to the environment. As the island of Okinawa is frequented by typhoons, more buildings are constructed of reinforced concrete in recent years. However, there are still many wooden homes with roof tiles. Since the roof tiles in Okinawa are cemented with plaster to secure them against typhoons, it is necessary to carefully wash away the plaster to retile the roof by the aforementioned resource-saving / environmental friendly method. This is a labor intensive process, but the traditional method is still being conducted and roof tiles are being stored for this purpose (Photo 17).

The Construction Material Recycling Act which came into force in May 2002 aims to recycle construction waste materials and to prevent environmental pollution caused by them. When houses are dismantled by the so-called “minced meat scrapping” method in which the house is taken down by heavy machinery, all building material including roof tiles turn into waste. It is a terrible waste of valuable resources. The frame of traditional Japanese houses is built using joints called “shiguchi” and “tsugite.” Therefore, it is possible to reuse almost all of the material if the house is disassembled carefully. Professor Toshio Ojima of Waseda University is conducting the following continuous experiment in the campus of Toyama International College of Crafts & Arts. A two-story wooden house with nine rooms covering 254.5 square meters in total is constructed using traditional Japanese methods. After using the house as a residence for several years, the house is dismantled and reassembled in a different location then used once again. It is reported that 95 percent of the building material including the plaster used for the walls could be reused. This experiment proves the superiority of traditional Japanese building methods.

Photo 18: Vase made from a cartridge

Photo 19: *Go* game board made from a sluice material discarded from Sayama pond

In addition to the method for retiling the roof, there are many ideas to conserve energy based on the spirit of “mottainai.” One example is placing the bathroom and lavatory next to each other and creating an opening in the wall between the two rooms. A light bulb is placed in the opening and a glass pane is installed on the bathroom side. The

light illuminates both rooms.

Recycling is also a daily activity based on the spirit of "mottainai" as well as a mean to pass on the history associated with the product. Examples of such recycled goods that pass on historical events including those experienced by my ancestors are a vase (Photo 18) made from a cartridge used in cannons during the Russo-Japanese War and a *go* game board (Photo 19) made from a discarded sluice material presented to my grandfather who served as the village head when Sayama pond was restored.

Photo 20: Andon

There were also many interesting things for children. Because of drafts, open flames tend to flicker and die in traditional Japanese houses. Therefore, people used a clever device called "andon" which is a lamp with a paper shade. The "andon" remaining at my house has a wooden frame covered with paper (Photo 20). Inside, there is a Japanese candle above a saucer of oil with a wick. There are two identical sets of frames so that "andon" can be used when one of the frames is being repapered. Although this is not necessary an innovative idea, it is only possible when people are free from stress. Another clever device is the "gando."(Photo 21) This is a handheld lantern with a candle that uses the mechanism of the "daruma doll." Used like a modern day flashlight, the candle never goes out no matter at what angle it is held. A weighted candle is placed inside a bell-shaped copper or tin frame. Light can be directed in any direction, just like a flashlight. As a child, it was always fun to light the "gando" and wander in the dark. It was also impressive to be able to use candles as flashlights during the resource scarce postwar period.

Photo 21 "Gando-(handheld lantern with a candle"

Photo 22: "Hasami (device used to retrieve things dropped into the well)"

Well water felt very cool in summer and was used as a refrigerator to chill watermelons and somen (fine Japanese noodles) during my childhood. When the rope broke for anything that was suspended into the well to be chilled, a device called the "hasami" (Photo 22) was handy. Pulling a rope connected to one

handle would open the prongs while pulling another rope connected to the other handle would close them. With practice, most things could be retrieved. Seeing my father expertly retrieve things, I longed to be able to do the same myself. Looking back, there were other instruments that were practical applications of the principles learned in senior high school physics such as the foot operated pestle for hulling rice (Photo 23), stone mill (using this was hard work, Photo 24) and beam balance (Photo 25). For example, the “Principle of the Lever” is easily understood by anyone who has used a foot operated pestle or beam balance.

Photo 23: Pestle for hulling rice

In old Japanese houses, there are many spaces and tools for which their purpose or method of use is unclear. They spark a child’s imagination by getting them to muse: “How was this enclosed corner of this room used?” “Why is this window placed here?” and “What was this tool used for and how was it used?” The house invites children to play hide-and-seek.

In my opinion, the time children spend experiencing and imagining past people’s lives in a house will foster creativity over time and it will eventually lead to the creation of culture. Recently, I discovered that the size of the stone terrace under the roof of the “nagayamon” (Photo 26) is exactly the same as a 6-tatami mat room. Imagination expands as “How was this space used?” or “Was it used as a stage in a certain occasion?” I remember that gazing at the high wooden ceiling in the dim light when I was ill with a cold, I was never bored because of the grains in the wood panels would turn into various shapes and figures; surf lapped beach, human faces, dogs, cats, fish, even a fearful demon’s face. In sharp focus the figures would be two dimensional, but in soft focus, they would become three

Photo 24: Stone mill

Photo 25: Beam balance

dimensional. I believe children were happier when there was no television. Perhaps, this is because those who can leisurely enjoy a secretive and imaginative world, a dream world unshared by others, can move onto a unique original and creative world that can be shared with others as they grow older. Spaces and things that are dismissed by modern people as “useless” may pass on history and enrich culture. In an extreme sense, the dust in the nooks and crannies and on the beams are a collection of molecules from the past reflecting the characteristics of the age. If the analysis of very small amount of molecules becomes more readily available, such dust could become precious historical relics. This is one reason that old houses should be preserved

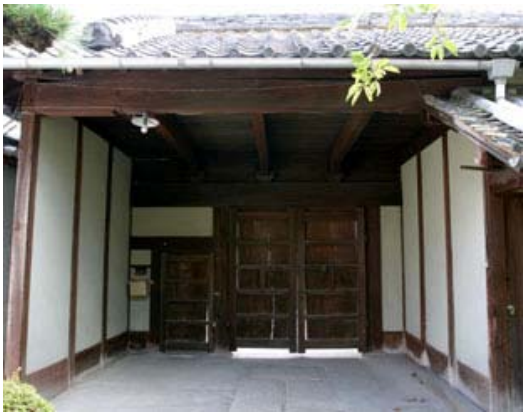

Photo 26 Stone terrace under the roof of the “nagayamon”(6 tatami mat size)

Modern Japanese houses are functional and do not have any unexplained nooks. Every part of the house is visible and there is no place to play hide-and-seek. In other words, there are no inessential elements. A relaxed and comfortable society is difficult to achieve from a house with no inessential elements. A relaxed style of education with latitude is difficult to achieve from a stressed society. It is difficult to nurture and develop new culture including education in a stressed society. Old Japanese houses not only carry on traditional Japanese culture but also act as a location to generate new culture. The concept is clearly outlined in the aim of the Law for the Protection of Cultural Properties as “preservation and utilization of cultural properties in order to promote the cultural well-being of the Japanese people as well as the global development of culture.”

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