

# The Building of Horyu-ji

The Technique and  
Wood that Made It Possible

The Asuka Period and Wood

Cherrywood & Taxe of the Period

Brightly Colored Carpentry & Tools of the Period

Longevity of Cypress

Wood for Construction

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## CHAPTER 1

# The Asuka Period and Wood

by Tsunekazu Nishioka

## 1. My Life as a Hōryū-ji Carpenter

### "The Happiest Man Alive"

In the 1,300 years since the first erection of Hōryū-ji until the Great Shōwa Restoration of 1934–54, there were undoubtedly a prodigious number of woodworkers and craftsmen who were engaged in the building and maintaining of Hōryū-ji. Among all those people, regardless of the era or epoch, I can't help thinking that I am the happiest of them all.

As you may know, Hōryū-ji is often referred to as a virtual treasure house of precious historical artifacts. Based ultimately on the Asuka-period style (c. 538–710), it incorporates the best features of the Nara (710–794), Heian (794–1185), Kamakura (1185–1333), Northern and Southern Courts (1334–92), Muromachi (1337–1573), Momoyama (1337–1573), and Edo (1603–1868) periods. Among its structures, there are 48 that have been designated as National Treasures or Important Cultural Properties, including such as the *agetsuchi-mon* gate, the *ōgaki* fence, and the *tsukigaki* fence. The thoroughgoing restoration and repair of these struc-

tures, a process known as the Great Shōwa Restoration, took more than 20 years to complete, lasting from 1934 to 1954. In this monumental undertaking in the dismantlement and repair of the major buildings, my father, as the last Hōryū-ji master carpenter, served as chief master carpenter, with his younger assistant Kikuzō Yabuuchi, my younger brother Narajirō (who passed away on February 7, 1978), and me acting as master carpenters.

It was during this restoration project that I came to think of myself as the happiest man alive, more so than all the carpenters and woodworkers of all the ages. After all, through this work I was able to see with my own eyes, feel with my own hands, and through actual experience to make my own the technical skills and workmanship that my predecessors in each era had devoted to their work.

I was born and raised a Hōryū-ji carpenter. But whether it be Hōryū-ji or elsewhere, working on-site as a carpenter is the best possible classroom. Words and textbooks are not enough to produce a full-fledged carpenter. It requires the invaluable experience of working on a good site.

In the old days there were stories of people who, in disguise, would apprentice themselves to master carpenters in order to steal their techniques, learning what they wanted little by little on the worksite. Even for a good carpenter, it seems, this type of thing wasn't regarded as unusual in order become a master of the craft.

Unfortunately, it is not possible to have master carpenters and craftsmen come back to life so that we can learn from them. Now the only thing we can do is to study the buildings they have left us and imbibe their secrets.

That is precisely why I felt inexpressibly happy, and still feel indescribably fortunate, in being able to meet up with so many buildings from different eras and take part in their dismantlement and restoration. In the 1,300 year history of Hōryū-ji, our genera-



1. Hōryū-ji worksite during the Great Shōwa Restoration

tion of carpenters was undoubtedly the first that had the pleasure of inspecting with their own hands and eyes the buildings from various ages, and learning the techniques involved from actual physical contact. This is what made me think that I was the happiest man alive.

### The Last Master Carpenter

Still, "the happiest man alive" has had his difficult times in the past, and in fact still has them today.

During the Great Shōwa Restoration of Hōryū-ji, from 1943 onward, just when the Pacific War was at its most intense, work at the temple had, for all intents and purposes, come to a halt. All young people and anyone who could work had been conscripted

into factories and the army. The only ones left were women and children. The fact that I happened to be there, just having returned from the front, was a sort of miracle. In the midst of all this, we continued the work of sending off to safer areas the dismantled parts of the main hall and five-story pagoda, as well as Buddhist statues and other important cultural properties. We also camouflaged the rest of the precinct and dug bomb shelters. We were all dressed in rags, famished, and unsteady on our feet. Looking back, it is a wonder we accomplished what we did.

It was in April of 1945, the last year of the war, that I received another conscription notice from the army, my fifth. The war then came to an end, and in October I returned to Japan from Korea, where I had been stationed.

Still wearing the uniform of a demobilized soldier, I immediately rushed to the Hōryū-ji compound. For me, the pagodas and halls of the temple were my whole world. I half-expected to see my grandfather and father there. I felt my body and soul well up with newfound energy, vanquishing the general postwar stupor. In the following November I became part of the Great Hōryū-ji Restoration project.

Around this time the daily wage for a civilian carpenter was ¥50, but since Hōryū-ji was government work, the fixed rate was ¥5.50. Two liters of rice at the time cost ¥25, so with ¥5.50 you could only buy about 2 deciliters, far from enough to live on. Wages were later raised to ¥8.20, but the poor pay remained basically unchanged until 1949, when the main hall was damaged by fire. However, I was not the only one to suffer from postwar inflation, food shortages, and low pay. Everyone engaged in the Great Restoration—from the painters making reproductions of the damaged murals to scholars and architectural engineers—in fact, all of Japan suffered from the same conditions. Still, one episode from this time stands out clearly in my mind.

An old army buddy told me, "Just take a look at your kids. They're so starved their eyes are practically bugging out." He bought some rubber shoes on the black market and gave them to me. I took Saturdays and Sundays off and went around selling them, just managing to eke out a living.

This unease about making a living, though different in nature, still haunts me today.

A miyadaiku is different from a regular carpenter working in town (a *machiya daiku*) in that if there is no work to be had, the miyadaiku may have nothing to do for three or four years. And even if he manages to get some government work, the pay is poor and the living hard.

In the old days, miyadaiku did a much wider range of work, the pay was better and the living easier. Back then, besides temples and shrines, miyadaiku were asked to work on bridges and the mansions of aristocrats and feudal lords. Now such work is done in reinforced concrete as a matter of course. In those days it was said that a miyadaiku would be punished by heaven if he engaged in the work of a *machiya daiku*. It was considered "dirty" work, below a miyadaiku's dignity. From a modern perspective, it all seems quite unimaginable.

As time passed and my two sons grew up, they decided they didn't want to follow in their father's footsteps to become miyadaiku; they wanted to become white-collar workers. I thought this was only natural, and I didn't try to stop them.

Even though I had been abandoned by my own sons, I was still proud of being a Hōryū-ji carpenter, a master carpenter—proud for my own sake, not because I wanted to flaunt the fact. But even while I considered myself the happiest man alive, somehow I found myself being haunted by the thought that I had become the last of the Hōryū-ji miyadaiku.

Then, in the spring of 1966, just when I found myself sunk in

despair, something happened. One day out of the blue, a high-school student visiting the temple on a school excursion from Tochigi prefecture came up to me and said, "I want to become a miyadaiku and learn how to build a five-story pagoda like the one here."

I practically shouted at him, "What are you talking about? Do you actually think you can make a living as a miyadaiku?"

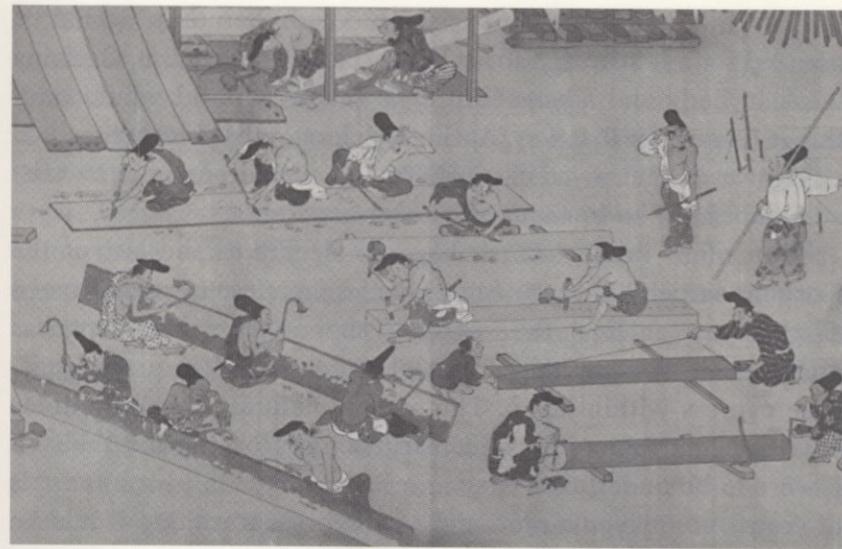
To become a miyadaiku, I told him, first you have to acquire the skills of a *machiya daiku*. Then you have to learn all about the old construction methods and techniques of temple building. On top of that, you have to know the difference between the construction materials.

I tried to get rid of him by raising as many problems as possible, but he didn't give in. I couldn't help but admire his perseverance. Finally I admitted defeat and accepted him as my first live-in apprentice when he graduated from high school at the end of 1967. His name was Mitsuo Ogawa.

If there is one lesson to learn from this, it is simply that human tenacity can produce wonderful results. It usually takes 20 years to become a full-fledged miyadaiku, but Ogawa did it in ten. Needless to say, this was due to his superhuman powers of perseverance and his relentless effort.

I remember an incident that occurred some time after Ogawa started boarding with us. I was taking an afternoon nap when I heard noises from the shed out back. I went to see what it was and was astonished to find Ogawa there. I had told him that he sharpened tools like he had three thumbs, and he felt so exasperated that he had skipped his noon break to practice sharpening. In the end he broke the rule that it took three years to learn how to hone tools properly, and mastered the art in only one, reaching a level on par with my own.

In October of 1973 the reconstruction of the three-story pagoda



2. Illustration of carpenters at work from *Kasuga gongen genki* (Kasuga avatar records), 1309. Photo: Sannomaru-Shozokan (The Museum of the Imperial Collections), Imperial Household Agency

at Hōrin-ji, which had been suspended since 1969, resumed, and Ogawa did a fine job of filling in for me as assistant to the master carpenter.

When the restoration of the west pagoda (*saitō*) at Yakushi-ji began in 1997, I planned to have Ogawa serve as the master carpenter, but he had other ideas. He told me, "First of all, I have to learn how to make a living as a miyadaiku." In May of that year, before the work at Yakushi-ji had even begun, he left my employ and set up shop with two or three friends in the town of Yamato-Koriyama. They made classical furnishings like miniature shrines (*zushi*) and *kasuga-zukue* tables as well as Buddhist appurtenances, while also traveling the country to repair important architectural cultural properties.

If Ogawa and his friends could succeed, then there would be no need for me to worry about being the last miyadaiku. Growing weak in body and advanced in years, how happy I would be if things turned out that way. At the very least, what I had passed on to Ogawa as the miyadaiku of Hōryū-ji would continue to exist and, hopefully, be transmitted to later generations.

One more thing that troubles me deeply as the last of the Hōryū-ji carpenters is the future of the Japanese cypress (*hinoki; Chamaecyparis obtuse*), the wood that supports the oldest Japanese architecture. It is no longer possible to obtain good-quality Japanese cypress within Japan. This is only natural, for all the trees have been cut down. If the reconstruction of Hōryū-ji and Yakushiji were to be undertaken again, we would have to wait hundreds of years—no, maybe a thousand—for cypress trees that would be of any use.

Even the cypress from Taiwan, our last hope, is now said to be bottoming out. Miyadaiku like myself, striving to master the secrets of temple architecture made of cypress, had placed our last hopes on Taiwan, but now it seemed that we miyadaiku and the trees would simply disappear in the passage of time. Our only options, it appears to me, are either to find good-quality wood somewhere in the world that can replace cypress, or to discover some other means of preserving our ancient architecture.

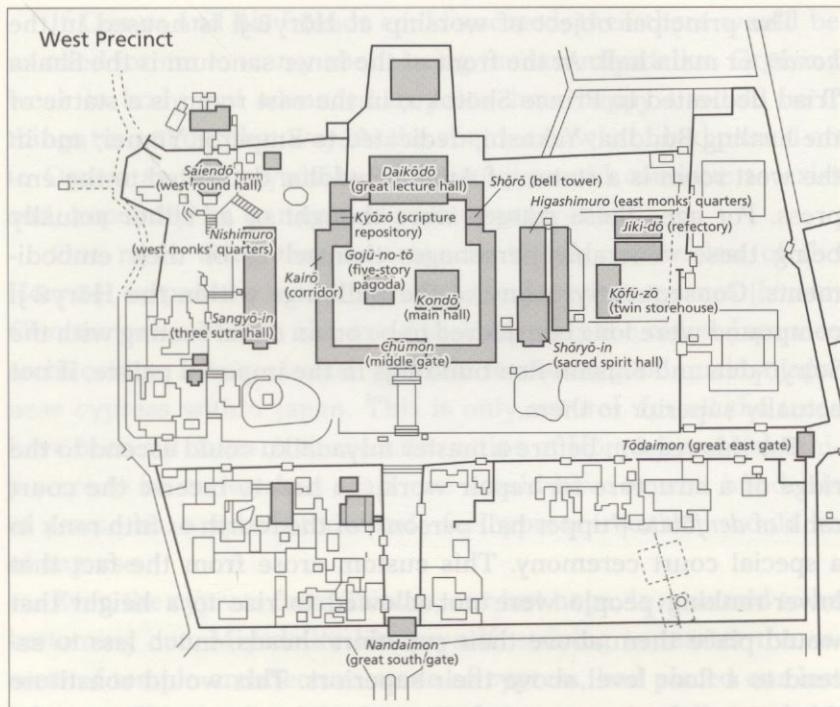
### The Ridgepole-raising Ceremony and the *Denjōbito*

Hōryū-ji was originally the private temple of Prince Shōtoku (574–622) and his family. Thereafter it was supported by the Shōtoku sect, and took on the flavor, I am told, of a temple devoted to the imperial family and the imperial court. This is understandable, since the temple was constructed by Prince Shōtoku and Empress Suiko following the wishes of Emperor Yōmei.

The principal object of worship at Hōryū-ji is housed in the *kondō*, or main hall. At the front of the inner sanctum is the Shaka Triad dedicated to Prince Shōtoku; in the east room is a statue of the healing Buddha, Yakushi, dedicated to Emperor Yōmei; and in the west room is a statue of Amida Buddha, dedicated to the empress. For ages these statues were thought of as either actually being these venerable personages themselves or their embodiments. Consequently, many of the buildings within the Hōryū-ji compound were long considered to be on an equal footing with the Seiryō-den and Shishin-den buildings in the imperial palace, if not actually superior to them.

For this reason, before a master miyadaiku could ascend to the ridge of a structure for repair work, he had to receive the court rank of *denjōbito* ("upper-hall person") of the fourth or fifth rank in a special court ceremony. This custom arose from the fact that lower-ranking people were not allowed to rise to a height that would place them above their superiors' heads, much less to ascend to a floor level above their superiors. This would constitute the most presumptuous and disrespectful behavior imaginable. This custom still continues today, when the master carpenter at Hōryū-ji is designated a *denjōbito* when undertaking work near the ridge of the building.

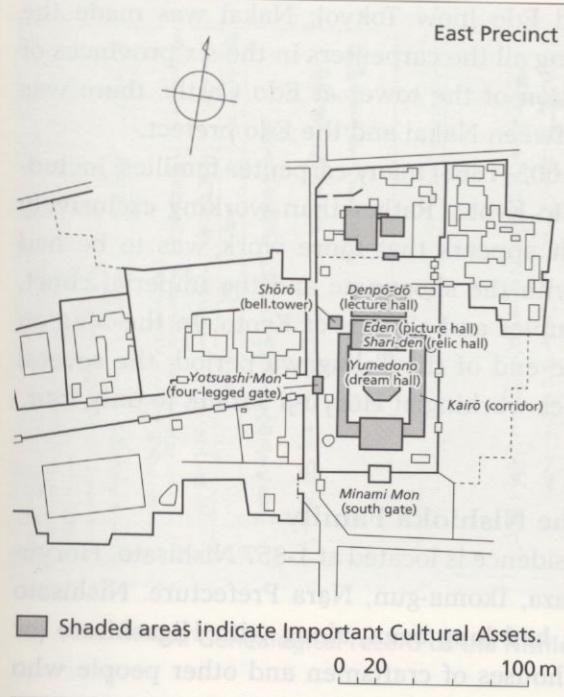
One story has it that the first Hōryū-ji carpenter became a fixture at the temple with the arrival of Buddhism in Japan, but the truth of the matter is unclear. The first indisputable mention of Hōryū-ji carpenters appears in records from the Kamakura period (1185–1333). In the Kōchō era (1261–64) lightning struck the five-story pagoda, and four temple carpenters from a Hōryū-ji subsidiary used their wits in extinguishing the fire, preventing the pagoda from being entirely destroyed. Somewhat earlier, on May 18, 1252, a fire had broken out at the pagoda due to lightning, and people in the neighborhood, including children and the elderly,



3. The Hōryū-ji compound

are said to have answered the peals of a bell to extinguish the flames. Fortunately, no serious damage was done, but the area from the third floor to the central pillar was seared by the flames, and scorch marks were left on the foundation, all of which are still visible today.

In any event, the four temple carpenters were awarded for their heroism by being assigned exclusively to Hōryū-ji, and this is said to mark the beginning of the Hōryū-ji "Four Carpenter" system. Mention of the *denjōbito* ritual in relation to Hōryū-ji first occurs in the Muromachi period (1337–1573). In 1475, on the east side of the hall of dreams (*yumedono*), the Hōryū-ji master carpen-



■ Shaded areas indicate Important Cultural Assets.

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ters constructed the Shūnan-in as a sign of devotion to Prince Shōtoku as the god of architecture. At this time the master carpenters who ascended to the ridgepole were reportedly awarded the rank of *daifu*. *Daifu* was a courtly grade equivalent to the fifth rank—that is, to a *denjōbito*. It is unclear to me whether this title was an award for architectural achievement or a euphemism for

*denjōbito*. The latter would have been a way of avoiding direct reference to the unpardonable act of lower-ranking people rising above their superiors.

As the Hōryū-ji Four Carpenter system that resulted from the pagoda fire gained in organizational strength, it also gained in authority. It appears that the system functioned by selecting four men out of a large number of carpenters. Later, one of these four carpenters, Nakai Hyō, was officially recognized by the shogun Tokugawa Ieyasu and awarded a title. From this period, the Hōryū-ji carpenters were placed under the Tokugawa shogunate's Commissioner of Works. Construction prefects (*daikugashira*) were es-

Established in Kyoto and Edo (now Tokyo); Nakai was made the Kyoto prefect, overseeing all the carpenters in the six provinces of Kinai. In the construction of the tower at Edo Castle, there was intense competition between Nakai and the Edo prefect.

In the Edo period (1603–1868) many carpenter families, including the Nakai, moved to Kyoto. Rather than working exclusively on Hōryū-ji projects, it appears that more work was to be had through connections with the shogunate and the imperial court, not to mention the temples and shrines of Kyoto. In the Man'en era (1860–61), near the end of the Tokugawa period, the several dozen carpenter families working at Hōryū-ji shrank to only four.

# The Genealogy of the Nishioka Family

My present place of residence is located at 1-857 Nishisato, Hōryū-ji Aza, Ikaruga-chō Ōaza, Ikoma-gun, Nara Prefecture. Nishisato (also known as Saigō), had long been, along with Higashisato (or Tōgō), the site of the houses of craftsmen and other people who were connected with Hōryū-ji in some way, such as carpenters, tilers, and plasterers. My house stands on the plot of land vacated by the Okajima family of master carpenters when they left for Kyoto and didn't return.

With the government-mandated separation of Buddhism and Shinto that took place in the Meiji period (1868–1912), and the subsequent movement to abolish Buddhism, the previous carpenter system was destroyed. The decline and fall of the Hōryū-ji master carpenters, who had taken up residence in Kyoto and become part of aristocratic society, and who had forfeited their technical expertise to live by lending their names to genuine temple and shrine carpenters, was swift and devastating. Those who survived the whirlwind of the "abolish Buddhism and destroy Shakyamuni" movement, with its destruction of Buddhist buildings, images, and

#### 4. Genealogical record of the Nishioka family

texts, were not the Kyoto master carpenters but the hired hands who worked under them, living by the sweat of their brows. It was these craftsmen, supporting themselves in part by farming, who carried on the traditional carpentry techniques.

The main line of my family, it seems, were *banjō* (woodworkers) at Hōryū-ji from far back. The family was apparently associated with the Tamon family, one of the four Hōryū-ji master carpenter families. According to the Edo-period encyclopedic account of architecture compiled by the Hasegawa family of master carpenters, *Gushi kenki* (Observations of a fool), as well as other documents, my earliest ancestors can be traced back to the Keichō era (1596–1615). I am the fifth-generation head of the Nishioka family. Near the end of the Edo period in the mid-19<sup>th</sup> century, my forefather Nishioka Ihei broke off from the main line and inherited the

position of *banjō*. The main line turned to farming. Even though my family has been living in Nishisato since the Keichō era, our family temple, An'yō-ji, is in the Koizumi neighborhood of Yamato-Kōriyama. The late head priest of the temple explained the reason for this as follows:

Your forefathers—that is, the main line—were in charge of constructing secret areas in Osaka Castle, and when they finished, they were to be beheaded to protect these secrets. But they were saved by the warlord Katagiri Katsumoto, who concealed them in his domain at Yamato-Koizumi. They stayed there until things settled down, and then returned to Hōryū-ji.

It was at the beginning of the Meiji period in the mid-19<sup>th</sup> century that my grandfather, Tsunekichi, became the first Hōryū-ji master carpenter from the Nishioka family. It seems that in the midst of the anti-Buddhist sentiment, what with woodworkers and master carpenters leaving one after another, only the Nishioka remained in the end to serve as exclusive Hōryū-ji carpenters, shouldering a proud but heavy burden.

In 1897 the Ancient Temples and Shrines Preservation Law was enacted, making government funds available for the repair of Hōryū-ji; dismantling and repair work rose to a high pitch. In the same year the dismantling and repair of the three-story pagoda at Hokki-ji was carried out, followed by the middle gate at Hōryū-ji and the three-story pagoda at Hōrin-ji in 1902–1903. From 1909 to 1922 dismantling and repair were carried out on Hōryū-ji's inner sanctuary (*kami no midō*), the great south gate (*nandaimon*), the western precinct corridor (*saiin kairō*), the scripture repository (*kyōzō*), and the bell tower (*shōrō*). My grandfather Tsunekichi oversaw all of this work as master carpenter, together with his younger brother, Kikuzō Yabuuchi. In the latter half of these proj-

ects, my father Naramitsu also took part as a master carpenter. My grandfather passed away at the age of 81, the year before the Great Shōwa Restoration got underway. My father, who had acted as chief master carpenter, died in 1975 at 91.

During the anti-Buddhist maelstrom that occurred around the beginning of the Meiji period in the mid-19<sup>th</sup> century, it was my grandfather who managed to preserve the traditions of Hōryū-ji carpentry. As far as this tradition concerns my family, I will be the last Hōryū-ji carpenter. Will someone carry on the tradition, or will it disappear when I am gone? This is a cause of concern for many people. My personal hope is that Mitsuo Ogawa, my only live-in apprentice, whom I mentioned earlier, will see that the tradition does not die out.

#### On-site at Four

I was born in 1908, the oldest son of Naramitsu Nishioka. The person who welcomed my birth more than anyone else was my grandfather Tsunekichi. In giving me a name, he took "Tsune" from his own name and added the Chinese character for "one," since I was his first grandson. Whenever I think of the origin of my name, I can't help but recall my grandfather's warmth and love. At the same time, however, there is another aspect of my grandfather's personality that comes strongly to mind.

At the time I was born, Tsunekichi was 55 years old, at the prime of his working life. He had been brought up in the strict craftsman society of the Edo period in the early 19<sup>th</sup> century, survived the antagonism toward Buddhism of early Meiji, and had finally become a master carpenter at Hōryū-ji. In the world in which he was raised, apprenticeship started at the age of eight; anyone who was 10 or 15 was disparagingly referred to as "middle-aged," a *chūnen-mono*. From the day I was born, my grandfa-

ther had apparently decided, "This is my successor. He is the one I am going to teach the Hōryū-ji traditions to."

As a matter of fact, my father had been adopted into the family. Living on a farm until the age of 25, he had not been subjected to the rigors of traditional apprenticeship. The old thinking was still strong then, that one was apprenticed at eight and went to a temple school (*terakoya*) to learn reading and writing until ten, and that an apprentice older than ten would never amount to much. Thus it happened that my grandfather was forever complaining about my father's way of doing things. This frustration mounted and led to his increasing hopes for me, his first grandson. Consequently, my training turned out to be very tough.

My grandfather first took me to a Hōryū-ji construction site when I was four. Modern parents, I suppose, can't imagine giving a third party such a free hand with one of their children, even if the third party is the child's grandfather and it is part of the child's training. Nevertheless, it was true. It may be that since my father was adopted into the family he couldn't speak out plainly to my grandfather, his father-in-law. I can't remember exactly which construction site it was, but it was probably the *kami no midō* or one of the other sites where dismantling and repair had begun in 1909 and would continue until 1922.

My grandfather would say things like, "Pay attention, kid. Watch what Gramps is doing." The tone of his voice was soft, even warm, but to a small child, his eyes seemed to be glittering. Gradually I came to realize that he was determined to make me into a bona-fide Hōryū-ji carpenter, no matter what. This realization, however, came much later, after I had finished agricultural school. Until then, I got terribly tired of hearing him say, "Watch what I'm doing," or "Sit down there and pay attention." Every day I would find myself on the verge of tears. My days in elementary school were particularly hard. During summer vacation my friends would

play catch in an empty lot. I couldn't help fidgeting, wanting to join them, but my fear of Grandfather kept me on the worksite. At that age there was no way I could understand his feelings. I asked myself, "Why was I ever born into a carpenter's family?"

In any case, my chief mentor at Hōryū-ji was my grandfather. The first step in the learning process took place at the worksite, not by touching things or hearing about them, but just by watching.

### Don't Forget the Soil

When I was about to graduate from elementary school, my father proposed that if I was going to become a carpenter, I should be sent to a technological school, but Grandfather rejected the idea in the strongest language, saying, "The best way to learn is by getting your hands dirty at an agricultural school." He went on to add, "And don't go to a five-year school. Three is enough. If you stay longer, you'll want to become a white-collar worker and carry a briefcase. Then you'll never be a carpenter at Hōryū-ji, much less a master carpenter."

So I ended up entering a three-year agricultural school. At the time I tended to agree with my father, but there was no ignoring Grandfather's intensity. For a long time after that I couldn't accept his point of view. I thought, "Why does Grandfather have to force his odd ideas on everyone? Why do I have to carry around a bucket of manure to fertilize eggplants and pumpkins and grow rice?"

Later on, Grandfather's thinking was explained to me as follows: "Human beings are born from the earth and return to the earth. Trees also come from the earth and return to it. Buildings are built on the earth. Without earth, you wouldn't have humans or trees or pagodas. Without knowing the earth, you can't become a real human being or a good carpenter."

As time passed, I got used to the subject matter and the practical training courses and was glad I had come to the school. Studying the soil, I came to understand Grandfather's thinking. In the forestry classes I became interested in how to grow cypress and cryptomeria trees, because of their deep connections with carpentry. What I learned there came in very handy later on. But it was only after I had a few gray hairs on my head that I came to fully appreciate Grandfather's thinking. What I learned at the agricultural school became an essential part of my being, my flesh and bones.

Later, during the restoration project, I saw the individual cypress pillars that have supported Hōryū-ji for 1,300 years, each with its own characteristics, each still a living part of the temple, and I came to appreciate their true nature. I had my agricultural studies and my grandfather's strict training and education to thank for this.

It was when I was working not on Hōryū-ji, but on the reconstruction of Yakushi-ji, that I went to Taiwan to inspect its cypress trees. There, thanks to my agricultural studies, I found I was able to judge the quality of a cypress by the spread of its roots. I saw trees there that were 2,000 or 2,500 years old. Some of them had branches and leaves resembling those of a young tree, but they were almost invariably hollow inside. The trees that had a dignified appearance appropriate to their age, on the other hand, were solid to the very center, from bark to core. It seemed that the old trees that were vibrant with luxurious foliage were hollow because the bark absorbed all the nutrients in producing the showy appearance of a young tree.

### Learning by Doing

Graduating from the agricultural school, I thought that now I was

finally going to become a temple carpenter. Grandfather had made it clear that he wasn't going to treat me as his grandson but as an apprentice, like all the rest. But he had something else in mind, quite contrary to my expectations. One day he told me, "For the next year, I want you to grow rice."

He had a tenanted field of about 1,500 square meters reverted to the temple, and bundled me off to farm it. From plowing to planting seedlings, pulling weeds, and reaping the rice—I did myself everything a farmer would ordinarily do. This was different from doing carpentry work, but it was just as hard. Even though a real farmer would be handling fields five or six times larger, a paddy of this size was all it took to do me in.

Grandfather's aim was apparently to see that I didn't forget what I had learned about agriculture, to make me realize through contact with the earth that hard work was also rewarding, and to bring home to me the value of learning through doing. Naturally, in the intervals of working in the rice field, I also did carpentry work as an apprentice. And while this may seem unrelated to carpentry, I also had proper manners and behavior drummed into me.

If he caught me whistling, he would give me a kick and shout, "Stop it! That's what thieves use as a signal." This may have been a result of the hard times he had lived through, times when everything concerning Buddhism was negated, and he didn't want that forgotten. In any case, Grandfather didn't lead me through the learning process kindly and carefully, like it is done in schools these days; everything had to be learned by doing.

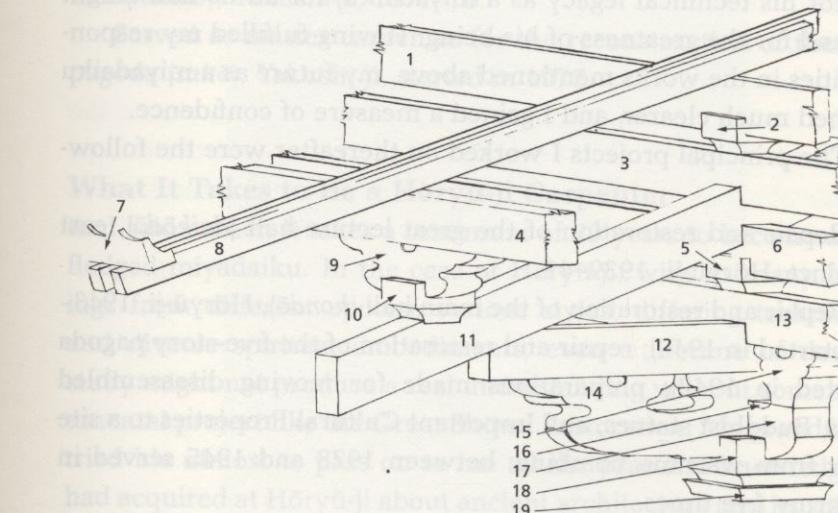
The quality of carpentry depends on the quality of the carpenter's tools, which are his arms and legs. And the sharpness of a tool depends on how it is honed. As I mentioned above about Ogawa, it is commonly said it takes three years to learn to hone tools properly. The first time Grandfather gave me a chisel to sharpen, he just said, "Hone this to a sharp edge." He didn't tell me how to do it.

Whenever I asked something, he would always come back with, "If you don't understand, look at my toolbox," or "Keep at it until you're done." It was the same with sharpening planes and saws.

In between times I was sent around the compound to make copies of the designs and patterns that appeared on brackets and whatnot. Grandfather would say, "Go take a look at the designs on that hall" or "Go make a copy of the frog-leg strut on that gate." When I came back and reported what I had seen, he would say, "No, that's wrong." Even if I showed him a sketch, he would say, "No, all wrong." After this had been repeated several times concerning the frog-leg strut, he finally said, "You're not supposed to copy just the outline of the design, but the marginal areas (*kiamari*) as well, so you get the whole picture." At first I had no idea what he meant, but as I did the same sketch over and over, it finally sank in, reaching every bone in my body.

In learning by doing with one's body, you might think that you wouldn't have to use your head, but that was not the case. Without receiving any specific instructions, whenever I failed in a task, Grandfather would say, "The same thing again? You'll never become a Hōryū-ji carpenter at this rate." The only thing left for me to do was to keep thinking how to do it right, whether it took one week or two weeks, devoting myself to the problem heart and soul. I would attack it with every ounce of energy I had, both mental and physical. This continued for over five years, and then, in 1928, at the age of 19, Grandfather and Father finally recognized me as a regular carpenter (*eizen daiku*).

In 1929 I was drafted and spent a year and a half in the army, producing a gap in my training. After my demobilization in 1930 I completed the repair and restoration of the *kuri* at Jōfuku-ji, a Hōryū-ji subsidiary temple. In 1931 I acted as assistant master carpenter to my father in the construction of the worship hall at



1. Inner purlins (*gawageta*)  
 2. Bearing block (*makito*)  
 3. "Third" bracket tie beam (*mitōri-hijiki*)  
 4. Eave purlin, beam (*nokigeta*)  
 5. Bearing block (*makito*)  
 6. "Second" bracket tie beam (*futatōri-hijiki*)  
 7. Eave support (*kayaoi*)  
 8. Rafter (*taruki*)  
 9. Eave "cloud" bracket arm (*noki kumo-hijiki*)  
 10. Bearing block (*hōto*)  
 11. "Tail" rafter (*odaruki*)  
 12. "Strengthening" bracket arm (*chikara-hijiki*)  
 13. "First" bracket tie beam (*hitotōri-hijiki*)  
 14. "Cloud" bracket arm (*kumo-hijiki*)  
 15. "Cloud" bearing block (*kumoto*)  
 16. Bracket-arm concave curves (*sasaguri*)  
 17. "Frame" bracket arms (*waku-hijiki*)  
 18. Large bearing block (*daito*)  
 19. "Plate" block (*sarato*)

5. Sketch of bracket complex by Tsunekazu Nishioka

Kashihara Shrine. In 1937 I acted as deputy master carpenter in the construction of the front gate (*karamon*) of the Higashi Fushimi family villa. In 1934, the year the Great Hōryū-ji Restoration got underway, I was appointed master carpenter for the first time, for the restoration and repair of the *raido* (worship hall) in the east precinct. I was 27 at the time. Grandfather was no longer with us,

but I was eternally grateful for his philosophy as a master carpenter, for his technical legacy as a miyadaiku, for all he had taught me and for the greatness of his being. Having fulfilled my responsibilities in the works mentioned above, my future as a miyadaiku seemed much clearer, and I gained a measure of confidence.

The principal projects I worked on thereafter were the following:

Repair and restoration of the great lecture hall (*daikōdō*), east precinct, Hōryū-ji, 1939–41.

Repair and restoration of the main hall (*kondō*), Hōryū-ji, 1943–45 (started in 1940); repair and restoration of the five-story pagoda (started in 1942); preparations made for moving disassembled parts, Buddhist statues, and Important Cultural Properties to a site safer from wartime bombing; between 1928 and 1945 served in the army five times.

Restoration of dismantled parts and detailed study of the five-story pagoda, Hōryū-ji; restoration completed in 1942.

Served as master carpenter for repair and restoration of the main hall (*kondō*), Hōryū-ji; in 1950–52 was hospitalized with pulmonary tuberculosis.

Repair and restoration of the east monks' quarters (*higashimuro*), Hōryū-ji, 1957–59.

Repair and restoration of the five-story pagoda, main hall (*hondō*), and others, Kusado Myōō-in, Hiroshima Prefecture, 1964–69.

Creation of restoration models of the morning assembly hall (*higashi chōshū-den*), Heijō Capital; and *shishin-den*, Heian Capital, 1945–49.

Served as master carpenter for the reconstruction of the three-story pagoda, Hōrin-ji, 1967–75.

Model creation of the west pagoda (*saitō*) and main hall (*kondō*), Yakushi-ji, 1968–71.

<sup>no</sup> Served as master carpenter for the reconstruction of the main hall (*kondō*), Yakushi-ji, 1971–76.

<sup>go</sup> Served as master carpenter for the reconstruction of the west pagoda (*saitō*), Yakushi-ji, started in 1977.

### What It Takes to Be a Hōryū-ji Carpenter

As I said earlier, it takes a minimum of 20 years to become a full-fledged miyadaiku. In the case of Hōryū-ji, with its many buildings from different epochs, various styles, differing techniques, and diverse spiritual embodiments, even a lifetime of devoted study might not produce a real understanding without some monumental project like the Great Shōwa Restoration. My grandfather tried his utmost to pass on to me all the practical knowledge he had acquired at Hōryū-ji about ancient architecture and its spiritual meaning. Following the "learn by doing" principle, he never flagged in his efforts.

When Grandfather died, I was 25. Looking at his face in its final repose, it seemed to say, "Everything I wanted to teach you, to pass on to you, I think I have done, down to the very last drop." Twenty-one years had passed since he first took me to a construction site. Aside from the year and a half I had spent in the army, I always felt his eyes intensely on me, whether in elementary school or at the agricultural school, plotting on how to make me a fine Hōryū-ji carpenter, a master carpenter. When it came to sharpening tools or using the adze, both so important in ancient architecture, he kept pounding proper usage into my head. Even when I thought I had become more than proficient at interior fixtures (*zōsaku*), the *kiwari* system for measuring out wooden components, or *kidori* block-cutting, Grandfather would pull me up short with one of his thunderbolts.

Once, when repairing a certain hall at Hōryū-ji, I heard Grand-

father's strident voice shout out: "Listen, you're not working on one hall; you're working on a whole compound." He apparently meant that you shouldn't forget that even a small hall was a living part of the whole precinct.

The task of Hōryū-ji carpenters is to create and repair the abodes of the Buddhas. Prince Shōtoku also assigned the temple the role of a sanctuary for the pursuit of knowledge. I understand that in his last will Prince Shōtoku urged Buddhist monks to master the Lotus, Srimala, and Vimalakirti-nirdesa sutras. My grandfather told me, "You can't emulate everything the monks do, but you can at least read the Lotus Sutra," and he handed me a copy of a Japanese translation. I think it can be understood from this that past Hōryū-ji carpenters and master carpenters did not ignore this area of study.

The words I quoted from my grandfather above, "You're not working on one hall; you're working on a whole compound," are actually part of the oral tradition left us by generations of Hōryū-ji carpenters. To give this thought in full:

Without knowing Buddha's teachings, you must not speak of pagodas and halls.

Without revering the gods of Heaven and Earth, you cannot talk of sacred shrines.

Hōryū-ji carpenters must possess the pride of Prince Shōtoku deep in their hearts.

Here are some other sayings that are part of this tradition:

Building a pagoda (*togumi*) means joining wood (*kigumi*).

Joining wood means matching the wood's traits (*kusegumi*).

Matching the wood's traits means matching human traits (*hitogumi*).

Matching human traits means matching human hearts (*kokorogumi*).



6. Tsunekazu Nishioka during reconstruction of Yakushi-ji main hall

The matching of human hearts refers to the master carpenter's consideration for his workers.

Rather than criticizing the faults of others, consider your own faults first.

Another saying is, "Don't buy a tree; buy a forest," about which I will have more to say later when I talk about the traits of wood.

Here I would like to say something about my father. Father had been adopted into the Nishioka family and was not a born-and-

bred carpenter. Grandfather was not happy with his work, as I mentioned earlier. However, his view of my father was simply due to Grandfather's respect for age-old tradition at Hōryū-ji; the rest of us, myself included, thought him an excellent carpenter and master carpenter, faultless in every way.

When the Great Shōwa Restoration got underway, dozens of hotshot miyadaiku gathered from around the country. As the chief master carpenter at the head of these prima donnas, my father did an outstanding job of repairing the principal buildings. He worked at the construction site set aside for master carpenters within the Hōryū-ji compound, which was located next to the treasure house (*hōmotsu-den*). It wasn't necessarily due to my father's having performed so well during the Great Shōwa Restoration, but the fact is that he enjoyed the great confidence of the then chief priest, the late Jōin Saeki. When the work at Hōryū-ji dwindled and faded, Father looked very sad.

Aside from trivial work like straightening out old nails with a hammer (*kanazuchi*), my father also had to handle various miscellaneous tasks passed down from the temple office. Laughing, he said that this was one of a master carpenter's important jobs in preserving the temple. Unlike the situation of a white-collar worker, however, the position of Hōryū-ji carpenter, even master carpenter, was not a guarantee of permanent employment. If work at Hōryū-ji petered out, so did the carpenters' wages. One option was to work in town as a regular carpenter (*machiya daiku*), but that was out of the question. True, such work was considered "dirty," but that wasn't the only consideration. For carpenters like us, always facing the past, rejecting new architecture and techniques, there was no choice but to live and die with ancient temple architecture.

Among the items presented to Hōryū-ji carpenters by the temple in recognition of their status as a Hōryū-ji carpenter was a copy of the aforementioned *Gushi kenki* (Observations of a fool). Start-

ing in the Keichō era (1596–1615) and extending over a period of several decades, *Gushi kenki* is an extensive account compiled by the Hasegawa family of master carpenters concerning temples and shrines in Nara and Kyoto, centering on Hōryū-ji, and including imperial family commissions.

Someday I would dearly like to write a sequel to this book. It would be based on my experiences and observations, and would hopefully be of some use to later generations.

## 2. Hōryū-ji and Hinoki

### Hōryū-ji's Hinoki

Since around the time of the Kamakura period (1185–1333), some Japanese zelkova (*keyaki*; *Zelkova serrata*) has been used in work on Hōryū-ji, but before that it was exclusively Japanese cypress or hinoki (*Chamaecyparis obtuse*). I have the feeling that Japanese had gained an appreciation of hinoki's good qualities, its strength and ease of use, long before continental architecture technology came to Japan. Among all the different woods available, it was perhaps the natural upheavals indigenous to Japan that led to the long-lasting hinoki for building construction. In addition, the primitive tools of the time were probably a factor in using the straight-grained hinoki. Among the woodworking tools, the frame saw (*oga*), a large two-person rip saw, and the wood-block plane (*daiganna*) didn't begin to be used until much later, in the Muromachi period (1336–1573). Until then, squared timber and boards were made by splitting felled trees with axes and wedges. The final touches were applied with an adze (*chōna*) and a long-bladed plane (*yariganna*). The hard, unevenly grained zelkova was not a favorite material. Cryptomeria (*sugi*), though straight-grained, was too soft, and was much inferior to hinoki in terms of both strength and

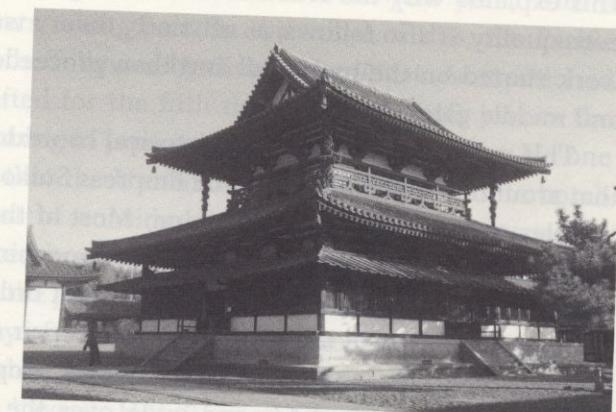
longevity. At least until the Kamakura period, the best and most suitable material was seen to be the hinoki.

According to what we learned from the Great Shōwa Restoration, the thickness, quality, and usage of hinoki trees varied from building to building. Leaving aside the question of whether the present Hōryū-ji is the original or a reconstruction, it appears that the main hall (*kondō*) is the oldest structure, followed by the five-story pagoda. However, it is still not clear where the wood for Hōryū-ji was harvested, how transported to the site, and how employed. Judging from the quality of the wood, my feeling is that it did not originate in Kiso (present-day Nagano Prefecture) or Yoshino (present-day Nara Prefecture), the two main sources of hinoki, or even distant Kantō, Chūgoku, or Shikoku. However, if I had to hazard a guess from similarities in the properties of the wood, I would surmise it was from Yoshino.

The big, long, thick pillars at Hōryū-ji were made from trees over 2,000 years old that had been split into quarters lengthwise down the middle. There is not a single large pillar still containing the pith or core of the tree (*shin*). Pillars retaining their core will later crack and warp, bending the building out of shape or, in the worst cases, destroying it entirely. Since the only tools available were those mentioned above, it is easy to imagine the difficulty of the work. But perhaps even more difficult was the job of transporting these huge trees from the forest where they had been felled to the construction site. The only way of doing this was to make use of slopes and rivers, in addition to sheer manpower. In that day and age there were no strong ropes or any other means of moving the trees. That is why the timber used at Hōryū-ji—and at other temples and shrines, for that matter—had to be gotten at first from nearby locations where trees could be easily accessed and transported. Considering the fact that Hōryū-ji timber shares properties with the hinoki of Yoshino, and given the problem of transporta-



7. Hōryū-ji five-story pagoda



8. Hōryū-ji main hall

tion, there must have been a virgin hinoki forest somewhere nearby where trees could be selected that met the temple's needs.

Comparing the wood used in the *kondō* main hall and the five-story pagoda, there is not much difference between the pillars, purlins, and brackets. However, when it comes to the rafters and other elements supporting the roof, the main hall is in much worse condition than the pagoda. While the pagoda uses split timber, the hall uses a variety of material, from the large to the small, sometimes with the core still intact. From this we can surmise that the construction of the hall preceded that of the pagoda. When it came to constructing the roof, there were no big trees growing in the vicinity of the temple, and those held in reserve had already run out. Consequently, the builders apparently made do with whatever they could get their hands on, regardless of size. I have a strong feeling that this was the case.

By the time of the pagoda, there were probably no big or usable trees left within easy reach. They had to be brought from afar. If this were the case, then it was probably decided to fell, split, and transport the biggest and best-quality trees that could be found. This explains why the wood found in the pagoda is of good and even quality. It also follows, as scholarly theory would have it, that work started on the main hall and then proceeded to the pagoda and middle gate.

This makes perfect sense in historical context. In fact, it is said that around 624, the 32nd year of Empress Suiko's reign, some 46 temples went up in rapid succession. Most of these were built in the Yamato region where Nara is located, meaning that the hinoki in that area would have disappeared in short order.

The wood used in the restoration and repair of Hōryū-ji in the Heian period (794–1185), judging from its properties, was most likely transported from far and wide over the rivers and roads leading to Hōryū-ji, the most distant place being the mountains of

Murō (present-day Nara Prefecture).

### The Wood Used at Hōryū-ji

The principal work of a Hōryū-ji carpenter is restoration and repair. If we take the Asuka-style main hall (*kondō*) as an example, repair work was carried out once in the Heian period (794–1185), once in the Kamakura period (1185–1333), twice in the Northern and Southern Courts period (1334–92), once in the Muromachi period (1337–1573), and twice in the Edo period (1603–1868). Wide-ranging repairs over the entire compound took place in the Heian, Kamakura, Northern and Southern Courts, and Muromachi periods, with the extensive repairs undertaken by Toyotomi Hideyori in the Keichō era (1596–1615) and by the fifth Tokugawa shogun, Tsunayoshi, in the Genroku era (1688–1704) being particularly well known.

As part of the Great Shōwa Restoration of Hōryū-ji, the dismantling and repair of the *kondō* main hall commenced in 1940. The murals were in a dilapidated condition, and work started on their replication in September under a seven-year plan, with a great many painters taking part. In the midst of this, the Pacific War broke out, to be followed by disastrous defeat. As mentioned earlier, I was drafted for the fifth time in April 1945, just as the American firebombing of Japanese cities was intensifying. No one knew at the time that the United States had decided not to bomb Nara or Kyoto out of consideration for the cultural properties there. I was drafted just as work had begun on dismantling the main hall to move the parts to a safer place in the mountains, away from the possibility of destruction by fire. Work had just begun on the upper levels when I was called up.

As luck would have it, Hōryū-ji and I both survived the war. Following in the footsteps of our distant ancestors, my grandfa-

ther, my father, and I considered it our sacred duty to protect the temple from wind, rain, and fire. Unfortunately, we failed. On January 26, 1949, a fire broke out in the main hall, which had miraculously survived the war, severely damaging it. It happened as work was being done on the murals in the hall, much delayed due to the war and the chaos following defeat. The immediate cause was the overheating of an electric cushion used by one of the painters. It occurred early in the morning when I was still having breakfast. Father and I rushed out of the house, but when we arrived at the site from our home in Nishisato, the flames had already reached the protective roof placed over the dismantled upper levels. These same flames were now jumping to the protective roof of the pagoda, which was also in the process of being dismantled. The main hall might be a lost cause, but the pagoda had to be saved. So thinking, Father and I, along with two people from the construction office, attached a hose to a fire hydrant and began directing a stream of water at the pagoda's roof.

Jōin Saeki, the chief priest, was beside himself. Apparently thinking that his life would be a small price to pay for saving the hall, he attempted to plunge into the flames, but my younger brother Narajirō caught him in his arms and managed to hold him back. It was sheer mayhem. As we were running around in the tumult, fire engines arrived and began putting out the fire. Fortunately, the pagoda was saved, but the main hall was a hopeless cause, with the murals under replication in a pathetic state. The upper levels of the hall had already been dismantled and preserved, and the Buddhist statues moved to a safe place, so at least they were kept from harm.

There is no telling what will happen in this world of ours, I reflected at the time. During the postwar chaos, it was hard to say whether the Great Shōwa Restoration of Hōryū-ji was actually moving forward or not. But then, following the fire, things sudden-

ly picked up. Apparently the government had made funding available, and thanks to that our wages suddenly jumped from ¥80 per day to ¥450, much to our surprise. We got a reprieve from our usual hand-to-mouth existence. (Of course, civilian carpenters at that time were getting ¥600 a day.)

The reconstruction of the *kondō* main hall began in earnest in April 1950 and was completed in October 1954. This marked an end to the 20-year-long Great Shōwa Restoration. Further preservation and repair was left in the hands of Nara Prefecture, and the dismantling and repair of the east monks' quarters (*higashimuro*) commenced in 1956. That work proceeded as mentioned earlier.

Looking back, I can say that what I learned from the Great Shōwa Restoration as a miyadaiku became, in effect, my blood and bones. Just as, thanks to the temple's dismantling, scholars were able to study and clarify various aspects of ancient architecture from a variety of angles, I myself was able to learn through practical experience a great deal about the techniques used from the Asuka to Edo periods.

Having learned something about the techniques of the ancients, it occurred to me that I should put this knowledge to fuller use. I began to think—I am not sure when—that it would be a shame if I ended my career as a miyadaiku doing only repairs and restorations. Such thoughts may have come to mind in 1956 when I served as an assistant instructor for the one year that the newly formed Hōryū-ji National Research Institute for Cultural Properties was in existence. It was then that, even though it involved only models one-tenth the size of the originals, I received requests for miniatures of the Fukuyama Kusado Myōō-in in 1961 and the three-story pagoda at Yakushi-ji (presently on the fifth floor of the Kintetsu Nara Station), and I was able to experience the joy of creation. But it didn't stop at models. I was also asked to reconstruct the three-story pagoda at Hōrin-ji and the *kondō* main hall at

Yakushi-ji. I was very grateful for these opportunities.

These projects were not simple replicas of surviving structures. First, from existing documents I drew up reconstruction plans based on what had not been entirely lost. Then the wood had to be selected, carved, joined, and the actual building constructed. I learned that, for a miyadaiku, creating a living thing like this is what brings the greatest sense of joy and satisfaction. Needless to say, in the course of these reconstructions, all that I had learned from my grandfather, all that I had experienced in the Great Shōwa Restoration, came to life in a tangible form.

To return now to Hōryū-ji and the Great Restoration, the government had decreed that all buildings be returned to their original form. Everyone—scholars on the site, engineers, and miyadai-ku—pushed ahead with that in mind. As we went through the various periods and investigated the state of the main hall and the five-story pagoda, which had been repeatedly repaired, we first removed the most recent repair work carried out in the 17<sup>th</sup> century during the Genroku era, then that of the earlier Keichō era, back through the Muromachi, Kamakura, and Heian periods, taking us back to the original Asuka style. This was done for all structures.

By means of this investigative work, we learned when wood other than hinoki had first come to be used. Further, we learned that no matter how tools and technology advanced, hinoki was the material best suited to wooden buildings. Thanks to hinoki, Hōryū-ji is the oldest wooden structure in the world, surviving for 1,300 years and still going strong.

Earlier I said that Hōryū-ji in its original form used only hinoki wood, but I must qualify that statement a bit. In the sheathing (*noji-itai*) over the rafters in the main hall, some cryptomeria (*Cryptomeria japonica*) was used. The sheathing looks solid enough to the naked eye, but when touched, it immediately crumbles. It is



9. Hōrin-ji three-story pagoda

very much like cardboard that has been incinerated but still retains its shape. We can understand from this why the ancients were not fond of cryptomeria, even though it could be split and used very much like hinoki. The lifetime of cryptomeria as a building material—the heartwood—can be as long as 700 or 800 years, making it the longest-lived wood after hinoki. Still, it was not up to the task of bearing the weight of Hōryū-ji for 1,300 years.

The fact that zelkova (*Zelkova serrata*) began to be gradually used from around the Kamakura period has already been mentioned. In the extensive restoration carried out by Toyotomi Hideyori in the Keichō era, pine (*matsu*) and cryptomeria (*sugi*) were widely used, but in the Great Shōwa Restoration these were all replaced with hinoki. Hideyori's usage of pine and cryptomeria was a means of foiling the efforts of his mortal rival, Tokugawa

Ieyasu, to weaken his financial position. Ieyasu hoped to force Hideyori to expend some of his considerable fortune at Osaka Castle on the repair of temples and shrines before the two met on the battlefield. By this time, hinoki had become a scarce commodity, and larger timber could only be had by going far afield. It could be a very expensive undertaking. For that reason, the relatively near-at-hand and inexpensive pine and cryptomeria were used. The person in charge of repairs for Hideyori was the aforementioned warlord Katagiri Katsumoto, who saved my ancestors from certain death.

Concerning longevity—aside from cryptomeria, discussed above—pine and zelkova have lifespans of about 400 years. When I examined the original pieces that had survived until the Shōwa Restoration, they presented a pathetic sight. In places where there had been rain leakage, wood rot had set in, sometimes causing the pieces to snap in two.

In the Edo period (1603–1868) the southern Japanese hemlock (*Tsuga sieboldii*; called *tsuga* in Japanese) also came into use. This wood, which has a life span of 300 to 400 years, is very strange. It is hard on the surface, but sooner or later the insides rot away, and it becomes hollow like a chimney. In a square pillar about 18 centimeters in diameter, the first 3 centimeters are firm and solid, but the rest is perfectly hollow. I may be repeating myself, but judging from Hōryū-ji, the hinoki is the most suitable material for projects of more than a thousand years.

**The Asuka Insight**  
The hinoki is well-known for its straight grain, fineness, and strength, as well as its resistance to insect infestation and its imperviousness to rain and humidity. The fact that it was exclusively used at Hōryū-ji is one reason that the temple has been able to

THE HÖRYÜ-JI MIDDLE GATE



10. Pillars and foundation stones of Hōryū-ji middle gate (above) and post-in-ground pillar at excavation of Heijō capital (below: ©The Nara National Research Institute for Cultural Properties)

survive for over 1,300 years. Even the scraps left over from cutting and finishing with an adze and long-bladed plane are not thrown away; they are used as laths (*komai*) in wall frameworks and elsewhere.

There are some who attribute the longevity of Hōryū-ji to its frequent repair work and replacement of parts. But this is not the case. In the main hall and pagoda, the principal supporting members, including the crossbeams and purlins, are all in the hinoki from the original structures.

But—and I would like to stress that word—no matter how lavishly hinoki was used at Hōryū-ji, without the insight and tenacity of the carpenters of the Asuka period there would be no ancient architecture such as we see today. This all harks back to the fact that the Asuka period switched from post-in-ground construction, in which pillars are embedded directly into the ground, to foundation-stone construction, in which pillars are placed on base stones. How did this come about, and who was responsible for the fact that after using the post-in-ground system for hundreds of years, it was suddenly changed to a foundation-stone system at Hōryū-ji? Was it due to Prince Shōtoku's infinite wisdom? Was it due to the skills possessed by carpenters coming to Japan from the Korean kingdoms of Baekji and Silla? Or was there some other reason? I am not sure. I am simply amazed that such a shift should be contemplated and carried out.

If you bury pillars in the ground, the area of the pillars at ground level will soon rot. And if the pillars rot, the ancients knew as well as we that the structure would likely collapse. But they also knew that post-in-ground was highly resistant to earthquakes and typhoons, and that's why, I think, they clung to that form of construction. It took courage to switch to the placing of the pillars on foundation stones in an attempt to make the structure last longer. To my mind, this courage might have originated in a certain won-

derful insight.

The attachment to the post-in-ground system is still apparent in the excavated site of Heijō-kyō, the Nara-period capital, 100 years after the erection of Hōryū-ji. As a matter of fact, even today the post-in-ground system can still be seen in fishing villages in the San'in region. I get a lump in my throat when I think of the tribulations that Asuka carpenters experienced in their attempt to build a temple of everlasting value.

Recently, in connection with the construction of modern buildings, there has been considerable talk about the destruction of the environment and the right to sunlight. Judging from what we know today, the ancients made an effort to have temple buildings blend in with surrounding mountains, rivers, and even the movement of clouds. In deciding the height of buildings, attention was paid to the height of mountains in the background. Izumo Grand Shrine, for instance, is only half the height of the hill seen behind it, Mt. Yakumo.

Again, the only bracket complex at Hōryū-ji with a carved pictorial design shows an exact depiction of the clouds that often appear above nearby Mt. Nijō. I was amazed when one scholar produced the theory that this "cloud bracket" was a formalized depiction of the ripples in a pond, showing a complete misunderstanding of ancient thinking.

Looking at each building individually, we can see the care taken to ensure that one building did not fall into the shadow of another, the care exercised in working out the arrangement of buildings within the compound, their size, height, and intervening spaces. The ancients knew that creating shadows meant producing humidity, preventing drying, and encouraging rot. This goes beyond the right to sunlight; it is an inviolable rule known by any carpenter who cares about the life of a building.

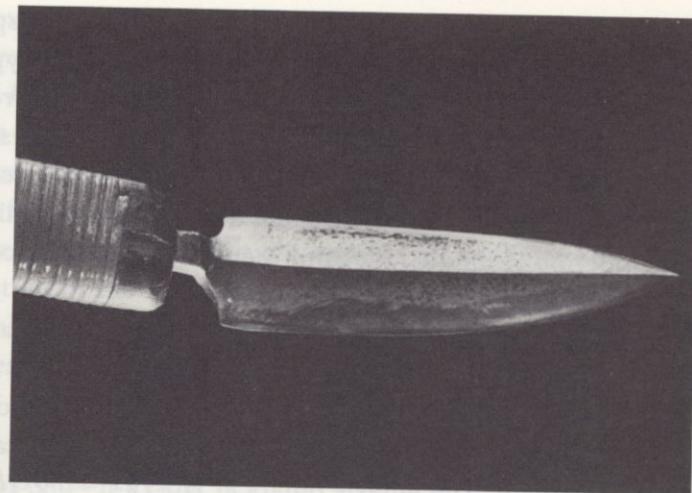
### Castles and Whetstones

I have already spoken of how my grandfather drilled into me the importance of sharpening one's tools. What is needed to create sharp tools is a whetstone (*toishi*). From olden times it has been said, "Wherever you find a mighty lord's castle, you will find good whetstones." This simply means that you couldn't create a castle without good whetstones, and that a whetstone quarry would invariably be found wherever there was a castle.

In fact, I believe that a good carpenter spends 60 percent of his workday on actual work and 40 percent on sharpening. As I mentioned earlier, it takes at least three years to learn to sharpen properly. If you can sharpen, then you can quickly learn to plane and carve. The way to learn sharpening is by sharpening. This means you continue sharpening when there is no longer anyplace to sharpen. In that way, you can create a chisel or a plane that is keener than a razor.

If a piece of paper should waft through the air and settle on the edge of that tool, it would immediately be cut into two. When you shave wood with a tool this sharp, the fiber of the wood is not damaged, and you get the feeling you are shaving off individual layers of cells. Even when it rains, the water doesn't sink in because there is no break in the layers of cells, and the rain runs off. With a dull tool, the surface of the wood becomes "fluffy" and irregular, doesn't repel water well, permits the water to penetrate the wood, and shortens the wood's lifespan, eventually destroying it. Thus what is required for a long-lasting building is a proper consideration of place, arrangement, construction, and materials, and after that come the carpenter's tools. And with the carpenter's tools comes the whetstone. Needless to say, the number of used whetstones accumulates rather rapidly.

Formerly, Nara and Kyoto were blessed with good sources of whetstones, as suited a region boasting many mighty edifices. Now



11. Long-bladed plane (©Kōchi Prefecture, Ishimoto Yasuhiro Photo Center)

these sites have been almost entirely quarried, producing nothing like what they did in the past.

### Long-bladed Planes

It may seem strange to take up the long-bladed plane (*yariganna*) second to the whetstone, since in fact this tool was one of the most important in the construction of ancient architecture. In the Asuka period (c. 538–710), it was the long-bladed plane that produced the carvings on the "cloud" bracket complexes, the curves on the "cloud" bracket arms, and the entasis on pillars.

In particular, what can't be overlooked is the fact that the entasis pillars at Hōryū-ji are made of hinoki. These pillars could not have been made with rock or steel. Hinoki is the only possibility. Only hinoki could produce the mellow, serene, warm mood that is so suitable to temple architecture.

What brought out the special qualities of hinoki was the spear-shaped long-bladed plane (*yariganna*). If you tried to do this type of finishing work with a wood-block plane (*daiganna*), the result would most likely be hard and cold, as seen in the temples and shrines of the Edo period (1603–1868). For better or worse, the admittedly convenient wood-block plane did not appear until the Muromachi period (1337–1573). Until then, the finishing work of shaving and planing was done by the *yariganna*.

Compared to the wood-block plane, the long-bladed plane is very inefficient, requiring twice the effort and time to do the same work. However, if you look closely at the smoothly finished surface, you will see that it is a series of delicate curves, as if carved out with a fine spoon. The entasis pillars at Hōryū-ji—big, round, with a slight indentation in the center—are also a series of curves. It almost seems that the *yariganna* came into being for this type of work. With the wood-block plane, no matter how smooth the finished surface seems to be, it is in fact a succession of straight or flat planes. There is a huge difference between the two.

With the appearance of the wood-block plane, the *yariganna* disappeared into the mists of history. The only surviving example was found in the Shōsō-in treasure house, though it is smaller than the originals. When the lower level of the main hall at Hōryū-ji was damaged by fire during the Great Shōwa Restoration, there was an urgent need to recreate its entasis pillars, "cloud" bracket complexes, and "cloud" bracket arms. At the behest of the Ministry of Education, we contrived to replicate the *yariganna* after a good deal of hard work.

What we produced look like the real thing, but in testing it, we found it unusable. No matter how much we sharpened it, it wouldn't cut properly. After looking very carefully into the matter, we discovered that modern steel was the problem. Modern steel was too hard and unsuitable to hinoki. So we found some old nails

left over from the Asuka period, melted them down, and by mixing this with iron sand steel from Japanese razors, managed to produce five *yariganna*. These were specially made by Masanori Mizuno, a swordsmith in the city of Sakai in Osaka Prefecture. The blades made with the old nails were strong and flexible. They were a perfect match for hinoki and cut well. We used these *yariganna* in the restoration of Hōryō-ji's main hall and later on in the reconstruction of the main hall at Yakushi-ji, where they again proved useful. However, it took us almost three years to master Mizuno's blades.

### 3. About Trees

#### Tree Lifespan

The average lifespan of a Japanese these days is nearing 80. As a result, we often hear people of 55 or 60, who have reached retirement age, speak of how they will spend the waning years of their life. In the past, this simply meant that they intended to enjoy the last few years of their existence. But now, I am told, it indicates an intention to live a second span of time as long as the first—in fact, a second life. When I first heard this, I couldn't help but feel that something similar was true of all living things.

I have lived out my years on this planet together with the 1,300 year-old buildings at Hōryū-ji and the ancient pillars that bear the temple's weight. It is my hope that the wooden members that I feel so much affection for will continue on into the future. I hope they will still be around when I have gone to my maker.

My grandfather, my father, and I myself believe that trees live twice. And this belief may not be restricted to us alone. All Japanese may have felt this way since the age of the gods. When beginning work on a temple or shrine, we customarily recite a prayer to

the Shinto gods, which goes something like this:

We have taken the lives of these trees, growing in the earth and flourishing in the mountains, and transported them to this spot. We fervently pray that these trees will continue to live, will find a second life, in the buildings to be erected here.

Thus, we believe that trees growing in the forest for 2,000 years will find a second life, of similar or greater length, in their role as the props and pillars of temples and shrines.

Almost all of the buildings at Hōryū-ji are constructed with hinoki, and all the principal parts consist of trees over 1,000 years old. These trees, now in place for 1,300 years, are as steady as ever. Some of the pillars and other members have weathered and turned gray, showing some decay, but if you shave off two or three millimeters with a plane, you are met, amazingly, with the delicate fragrance characteristic of hinoki. The shaving further reveals that the wood is a pinkish brown, similar to the hinoki found in Yoshino. The hinoki at Hōryū-ji, having found a second home 1,300 years ago, is now in what in human terms would be called the prime of life.

In connection with the lifespan of the hinoki, something interesting happened when we were repairing the *kondō* main hall and the five-story pagoda during the Great Shōwa Restoration. The corner rafters, tail rafters, and other elements of the bracket system supporting the eaves were sagging down from the weight of the roof. But what happened when we removed the heavy tiles and roof soil? In two or three days the rafters had returned to their original shape. The wood was still alive.

When I mentioned this to Professor Jirō Kohara, who studies the aging of wood, I was told, "That's only natural." Professor Kohara will have more to say about this later in the book.

Furthermore, it is said that the strength of the old hinoki is about the same as new wood. If that is true, then the old wood should have life for another 1,000 years. It seems we were right in assuming that a 2,000 year-old tree would have a second life of another 2,000 years. Nothing could make me happier.

What, then, about the zelkova and pine, with their lifespans of 300 to 400 years, or even the cryptomeria with its 800? When used below a tiled roof in the heat and humidity, or placed where they are exposed to rain, these woods find their lives shortened. When used in airy places unexposed to the rain, they can expect a longer life. It is much like the human world, where some people find their lives curtailed by circumstance.

### Don't Buy a Tree, Buy a Forest

As I mentioned earlier, "Don't buy a tree, buy a forest" is one of those sayings that has been passed down among Hōryū-ji carpenters. A proverb somewhat similar to this is, "Can't see the mountain (forest) for the trees." This means that we shouldn't be so taken up with looking at each individual tree that we fail to see the forest or mountain as a whole. Among other similar proverbs of Hōryū-ji carpenters is "Don't build a hall, build a compound," urging us to keep in mind the arrangement and harmony of the compound as a whole. In other words, when carrying out the repair or reconstruction of a single building, you shouldn't go off on a personal tangent and forget overall balance.

"Don't buy a tree, buy a forest" is similar to these other proverbs, but there are slight differences. Here I will give my own interpretation. In building a large hall or pagoda, there is a need for a great deal of timber. You might think that, in order to eliminate the appearance of warping and distortions after the building has gone up, the best thing to do would be to choose trees with identi-

cal properties, with a straight grain and no outstanding peculiarities, but that is not necessarily the case. The fact is, there are many conditions and forces involved, with many permutations, such as places that get a lot of sunlight or don't, places where there is a lot of humidity or isn't, places where the wind is strong or isn't, and places that are bearing a lot of weight or aren't.

If, in order to satisfy these conditions and forces, we went looking for individual trees one at a time, it would take several years simply to gather the needed timber, and in the meantime we might find ourselves mentally exhausted and unable to build a decent structure in the end. That would not do. This proverb teaches us to find a forest whose trees meet the conditions of our building and buy that whole forest, selecting from it the trees we need.

Trees are living things. They may be growing in a forest, they may be reborn as part of a building, but in either case they are living things. Just as each human being has a different personality, each tree has its own properties, its own character. Broadly speaking, the difference lies in regional variation.

Yoshino hinoki in Nara Prefecture is oily and resilient. Water that hits its planed surface slides smoothly off. But even in Yoshino, there are differences according to the mountain, according to the valley. Furthermore, naturally grown trees are supple and pliant, but artificially forested trees are thick and fat, lacking strength and resilience.

Kiso hinoki from Nagano Prefecture (also known as Bishū hinoki) is soft and its planed surface quite beautiful, but on the other hand it is poor in oil, absorbs water and thus weathers easily, and is not very pliable. The Taiwanese hinoki used in the three-story pagoda at Hōrin-ji and in the rebuilding of Yakushi-ji is hard and contains more oil than the Yoshino variety, but also has a tendency to break.



12. The reconstructed Yakushi-ji main hall

As a consequence, rather than going from one place to another in search of the right trees, you can get the relatively uniform quality timber you want by finding a good forest and buying it whole. Still, the quality will be different according to whether the trees are on a mountain range or in a valley, in the sunshine or in the shade, facing strong winds or weak. I will say more about this in the section on tree traits, but most of these differences can be resolved by using the right timber in the right place. That depends entirely on the skill and ability of the miyadaiku.

Now I will return to the miyadaiku proverbs mentioned above: Building a pagoda (*togumi*) means joining wood (*kigumi*). Joining wood means matching the wood's traits (*kusegumi*). Matching the wood's traits means matching human traits (*hitogumi*).

Matching human traits means matching human hearts (*kokorogumi*).

Even assuming you have managed to come by the timber required by the design of a hall or pagoda, a lot of hard work still awaits you. Before trying to match the traits of the wood, you have to ensure that human traits and human hearts come together to produce a group of people who can work well as a team.

If you measure the entasis pillars at Hōryū-ji, you will find that they are not all the same. Since the logs have been split with axes and wedges, and then carved and planed with adzes and long-bladed planes, it is only natural that there should be places where the work has been done to excess. On close examination, this type of mismatching can be seen almost everywhere, especially with the likes of brackets and so on. In the curves of the bearing blocks (*masu*), there is not one block that is the same. They are all different. The thickness of the rafters is also different. To bring all these mismatched parts together as a whole was a task of huge proportions. But it was done. When viewed in its entirety, the temple is balanced and consistent, strong and sturdy, but at the same time it has something soft and gentle about it. This is no mean accomplishment; it could not have been done unless all the carpenters were working as one. The fact that the old Hōryū-ji carpenters were able to do this is probably due not only to the leadership qualities of the master carpenters, but to all the carpenters having a strong, shared religious belief.

### Tree Traits

I think it is clear from the above that Hōryū-ji was not built by a strict adherence to measurement. Most importantly, the carpenters had to work together as one, and from the very beginning they

had to possess a clear image of the finished structure in their minds. If individual parts were slightly different in length or thickness, the carpenters weren't overly concerned. They believed that eventually the structure they aimed for would come into being. Sharing the same goal, what concerned them most was their knowledge of the traits of the wood, its peculiarities, and how these could be combined in the final structure.

Trees growing in the mountains, whether they be on flat land or on slopes, first send up their shoots perpendicular to the ground. These shoots then grow vertically up toward the sky. The inclination of the land is not a factor. Thus the part of the tree trunk near the roots may curve and bend; this part is called the *ate*. Since the *ate* supports the weight of the soaring tree, and resists the movement of the tree as it is blown by the wind, it is the hardest part of the trunk and has a special quality. The fiber is full of life, much like bamboo.

When preparing for the reconstruction of the three-story pagoda at Hōrin-ji and the main hall at Yakushi-ji, I went to Taiwan to take a look at its hinoki, which were over 2,000 years old. The trees were growing on precipitous slopes and had *ate* over 4 meters long.

Whatever the tree, in order to get rid of peculiarities in form, it is necessary to let the timber "sleep" for three to ten years after the tree is felled. This period may seem excessively long and a waste of good wood, but in the old days there were many cases in which it took three to five years to transport the felled logs to the site of the planned temple or shrine. During this time the timber was exposed to the natural forces of rain, wind, snow, heat, and cold, and transformed from natural wood to wood suitable for construction.

The sap that is so important to a tree in the forest is no longer needed in wood used as building material. I am not exactly sure

what sap consists of, but it is not good when it remains in timber being readied for construction. Generally speaking, such wood is said to have not dried or "withered" properly. If it is used, it will split or produce aberrations later on, causing structural havoc. It also produces stains in the wood and is a cause of rot.

To prevent this, it is necessary to remove the sap from the trees. In the olden days, carpenters waited patiently for this process to reach completion. Yet they didn't wait idly, but rather utilized this time to transport the trees out of the mountains. If sap still remained, they would then soak the timber in ponds or streams, where water permeated the wood and forced out the sap. Timber that had been cleansed in this way to its very core would float to the surface. Once the sap had been removed, the passage of water in the wood would improve and drying would gain momentum. This is what is meant by a tree drying or "withering."

At this stage, the 2,000 year-old trees will have fulfilled the conditions for living another 2,000 years as part of a building. From the trees' point of view, you might say they have completed their religious training of three to ten years in order to begin a second life. But is that realistic in modern times? In our busy day and age it seems quite impossible, and that the old ways must be abandoned.

For the pillars of the Hōrin-ji three-story pagoda and the Yakushi-ji main hall, natural drying was employed, but for the main hall at Hōryū-ji a much faster method called high-frequency drying was used for the principal pillars. Rather than removing the sap by natural methods, heat was applied to dry out the wood. This undoubtedly shortens the life of the tree. When high-frequency drying didn't work, the core was removed and the tree radiated with high-frequency waves, a fairly radical procedure. As a result, particularly big timber often split down the center. There is also the danger of a tree splitting into multiple sections. In the next

round of repair work, it may happen that split sections will have to be bound by steel bands. This is very upsetting. If nature's laws are ignored because there isn't enough time, or there isn't enough money, who knows what will happen next?

In any case, it is only when a log is dry to the core that it reveals its special traits (*kuse*), its particularities. Whether twisted or bent, no tree is exactly the same. With experience, however, one can "read" the traits of wood with 80 percent accuracy even before it is fully dry. The remaining 20 percent can only be determined after drying.

When it comes to the *ate*, however, mentioned earlier, there is no rhyme or reason to how its traits will appear, even after the passage of five or ten years. If the *ate* could be properly used, there would be nothing stronger, but they have traditionally been considered risky as a building material and therefore been given a wide berth. The *ate* of the Taiwanese hinoki I saw were all thick, long, and rather magnificent, but for the reasons just mentioned, they were tossed aside and left in the mountains. After the *ate* were cut off, we could then set to reading the trees' traits and decide what to use where.

The two principal peculiarities or traits of a tree are its twists and turns and its curvature. The fact is, you get a variety of timber quality, including curvature and hardness or softness, even within the same species, depending on whether a given tree grew on a mountaintop or halfway up a mountain, in a valley, on a slope situated at a certain angle, on the west, north, south, or east sides; as well as on the strength of the prevailing wind and the density of the surrounding vegetation. If you combine trees that curve to the left with trees that curve to the right, the forces in effect from left to right are balanced, and the resulting structure doesn't become distorted and lean to one side. This is the fundamental principle behind wood joinery (*kigumi*).

For areas bearing a great deal of weight, or for principal members, twisted trees with a lot of knots are used. Such trees are found on the south and east sides of mountaintops where they are subject to strong winds. Trees growing on the north and west sides of mountains or along the sides of valleys are quiet and well-mannered, soft in quality. They lack strength and are not long-lasting. It is almost as if they had been brought up in a hothouse. They are not suitable for weight-bearing members, but can be used for interior decorations and fixtures.

Trees growing on the north and west sides of a mountain have the same thickness from top to bottom. Such trees provide good timber of a considerable size. Trees growing on the south and east sides, however, are often thick at the base but taper toward the top.

The properties of individual trees exhibit the differences mentioned above, depending on whether they are facing toward the north or south, with their core as the dividing line. Since there are many branches on the south and east sides, there are also many knots. As a result, if you split a tree through its core into four sections, you use the two facing south and east as pillars. Then, after examining the other two closely, you decide whether to use them as pillars or for interior fixtures. If you decide to use all four as pillars, the knotty sections that faced south and east will be used in the south and east sides of the building, and the two soft sections that faced north and west have to be used in the north and west sides of the building. This is because, even after becoming part of a building, the wood will retain the characteristics of the site where it grew. If this is not done, the traits of the trees will clash and distort the building. I will treat this in greater detail in the sections dealing with the "sunny side" and the "shady side."

In ancient architecture, the main entrance is on the south side. Ordinarily this is where you would want to use straight-grained

trees that had grown on the north and west sides of a mountain. But what we find on the south entrance side at Hōryū-ji, even at the *kondō* main hall, are knotty, rough-textured trees that came from the southeast sides of a mountain. This is another example of the practical perspicacity of the original carpenters, who did not oppose nature but with full awareness made the most of the living tree.

This applies not only to temple architecture but to ordinary homes as well. If this principle were followed, you could prevent the cracks in walls and the misalignment in interior fixtures that come from the trees' natural curvature. Now, however, you are unable to read these particularities. Before the trees' traits have appeared, the timber is measured and boards and pillars cut; the carpenter is prevented from reading the tree even if he wants to. In the past the usage of a tree was only decided after splitting, so that even with a newly felled tree, you could tell which way it was going to bend or curve.

### The Right Wood in the Right Place

Curvature is not the only tree trait to be considered. In wooden temple architecture, with its multiple layers of tile and numerous walls, pagodas, for example, have to bear up under a tremendous load. The weight of the five-story pagoda at Hōryū-ji is some 1.2 million kilograms. In some way or other, this load has to be supported by the wood structure. The timber that can do this comes from the sturdy trees growing on the south side of mountains, where they have weathered the natural elements throughout the year. The wood from these trees has a fine, clear grain, and the knots are "living knots" (*ikibushi*) replete with oil. It is extremely important in temple architecture to know these traits, and to use the right wood in the right place.

In the case of rafters, in order to prevent them from sagging under the weight of the roof, the core side of the butt end (*koguchi* or *kiguchi*) is placed so that it is facing down. Rafters with a core tend to bend with the core facing outward, and so any sagging is offset by this placement. In the case of Hōryū-ji's five-story pagoda, each story displays a slight difference in the positioning of its rafters, giving the impression of warping. This is not the result of miscalculation, however, but rather the result of cleverly offsetting the tendency to warp to the right or left and the tendency to curve or sag.

When logs are split to make boards, the side near the core is convex, like a plump stomach, and the side near the bark is concave. It is important to understand this and balance these curvatures. For example, purlins are placed so that they curve outward. The purlin corner area is where the purlins are joined together, and where, after the creation of a cutout called an *ochigakari*, the corner rafters fall into place. With the joining of these three elements, the cross-section of the structural members is reduced by a third.

Without taking this kind of care in balancing structural members, their outermost ends are likely to suffer in an earthquake. The trick is to pull in the force of the convex rafters. If this is done, the structure will be able to withstand the strongest earthquake. The important thing is the reading of the wood's traits.

Each tree has a sunny side and a shady side. The sunny side is the half of the tree facing south as seen from the tree's core. It has many "living knots" and its grain is sturdy and strong. A living knot is still a virile part of the surrounding forest. On the other hand, a "dead knot," or *shinibushi*, is not a living entity, and when it dries, the branches drop off. Trees with dead knots are weak. The shady side of a tree is on the opposite side of the sunny side; it has few living knots, and although it has a fine grain, it is not

strong. Timber from the sunny side can be used for structural members like pillars, while wood from the shady side can be relegated to interior ornamentation and fixtures where appearance is important. When an entire tree is used as a pillar, it should be placed so that the sunny side is facing south. The cells of a tree on the sunny side are accustomed to the sunlight, but those on the shady side are not, which means that cracking and weathering will rapidly occur when they are exposed to the sun.

Among the Taiwanese hinoki used in the main hall at Yakushiji, there were some that were 2.5 meters in diameter. We split these into four sections to make round pillars with diameters of 70 centimeters. Those from the sunny side were used in the south-facing main entrance, and those from the shady side were used in the rear of the building. This meant that trees with many unsightly knots were placed at the front entrance, but on the other hand, they were also placed in their most natural environment, the environment they had enjoyed in nature. This is important for the trees' longevity and for the survival of the temple structure itself.

One thing I learned in the restoration of Hōryū-ji is that, during the many previous restorations that had taken place since the temple's erection, the largest surviving structural members had followed the principle of the right wood in the right place. The sunny-side trees with many living knots were particularly strong.

### The Death of a Tree

When working on the restoration of Hōryū-ji, I was struck by the living dignity of the 2,000 year-old trees that had supported the temple for 1,300 years and still support it today, each playing its role. To me, these trees seemed almost divine.

It was the same in Taiwan when I saw 2,000 year-old hinoki in their natural habitat. Although the passage of time and weathering

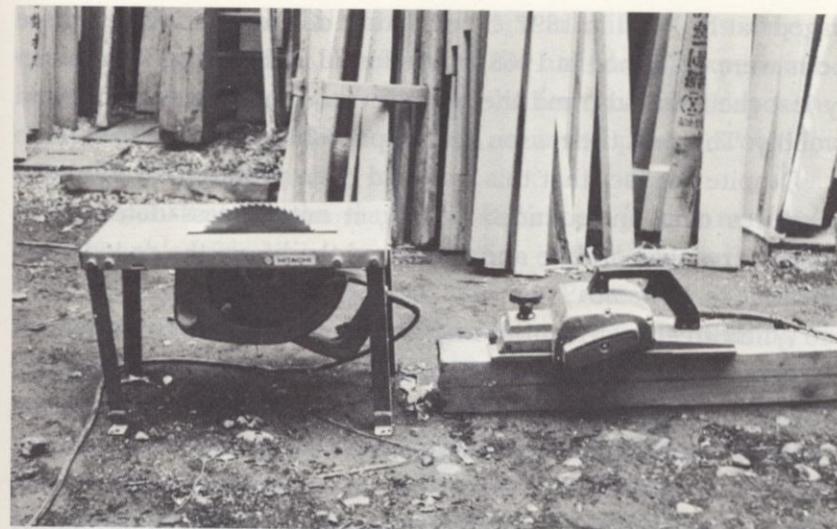
had affected their coloration, they still exuded a strong sense of presence and gravitas from their very branches and leaves. When I see such trees, my heart is filled with a feeling of reverence. That is why, before setting to work with chisel and plane, I pledge to myself, "As a miyadaiku, I promise not to wantonly kill these living things."

With trees, as with human beings, there is death by natural causes and there is death by accident. It is always my hope that, aside from natural disasters, trees will live out their allotted lifespan. At the very least, as someone who ministers to the needs of trees, I vow never to be the cause of the early death of a tree or its demise by accident.

Trees have a quiet, warm presence, with a much longer life than that of any other construction material, and are expected to live even longer. Recently, however, these precious trees are meeting more and more untimely deaths in building construction and in our daily lives. High-frequency drying is one example of this. My frank opinion is that such woodworking equipment and electric tools are unneeded and unwanted. Rather, I would prefer to use the inconvenient tools of the Asuka period, which would not cause the destruction of wood resources we are witnessing today, not only in Japan but around the world.

For someone like me, who is in the last stages of life and always looking toward the historical past, it is difficult to keep up with new technology. Still, I want to raise a voice of protest. Why is it that trees that could last 1,000 or 2,000 years are used in such a way that their life comes to an end in 20 or 30 years, not to mention 100? At a minimum, I would like to see the reconstruction and repair of precious cultural properties carried out in a way that is consistent with the lifespan of the trees.

I have already mentioned the inadvisability of cutting timber without reading the tree's traits. Electrical tools and electric planes



13. Electric saw (left) and electric plane (right)

can't match a long-bladed plane (*yariganna*). Wood planed with an electric tool may look smooth on the surface, but in fact the fiber has been damaged. When it rains, the water will penetrate the wood, which will turn dark and rot rapidly.

One of wood's mortal enemies is iron. The original Asuka-period carpenters used an absolute minimum of iron nails; those that they did use were repeatedly forged so that they consisted of multiple thin layers. Thus, even if the surface should rust, removing the top layer would reveal an unrustled one below. That is why, even today after 1,300 years, some nails at Hōryū-ji are still performing their original function. In contrast, the iron cleats used in the extensive restoration carried out in the Keichō era (1596–1615) have now turned into clumps of useless rust after the passage of 370 years, and have completely lost any function they originally had.

When my grandfather dismantled and repaired the three-story

pagoda at Hokki-ji in 1897, he made use of iron bolts. When these bolts were examined in 1968, it was found that they had completely lost their threads, and the holes they occupied were loose and wobbly. This was the reason for the pagoda's distortion in form.

Despite the fact that this iron had been produced at low temperatures over an extended period, it nonetheless deteriorated with the passage of time and shortened the life of the pagoda as a result.

When steel is driven into a wooden member, the rust causes the surrounding wood to rot. The hole created by a bolt expands to twice its normal size due to the rust, and results in damage to the wood. As a consequence, when repair work is carried out, not only the steel but the wood itself must be replaced. Steel appears to be strong and durable, but its life expectancy compared to that of wood is very short. Sadly, when wood is combined with steel, a building that could stand for more than 1,000 years if made of hinoki alone is forced into a kind of suicide pact.

How about combining wood with reinforced concrete, you may ask. Again, I cannot agree with this approach. It is true, however, that when the main hall at Yakushi-ji was reconstructed, a ferroconcrete depository was created within the hall to protect the Buddhist statues designated Important Cultural Properties from fire and earthquakes. This was a hybrid product of "flexible" ancient Japanese architecture and modern "hard" architecture from the West.

Ancient Japanese architecture dispels and disperses the forces of earthquakes, typhoons, and other cataclysms through its flexible construction. The joinery is soft and pliable, functioning much like joints in the human body. In order for this construction to move like a living thing, the framework has to be solid. In the case of Yakushi-ji's main hall, however, since there is the ferroconcrete depository in the hall's innards, the crossbeams could not span the

width of the building. In human terms, it is as if the ribs were not connected to the spine. Therefore, if the hall should experience a severe shock of some kind, causing the ferroconcrete depository and the wooden members to clash, it is the pliable wood that would be damaged.

In reconstructing the main hall at Yakushi-ji, one reason we were not able to do a rigorous re-creation of the hall was the Building Standards Law and the Law for the Protection of Cultural Properties. These laws prevented us not only from fulfilling our wishes, but also from making use of our experience, something which was very exasperating.

I have no intention of denigrating modern Western architecture. But the Japanese way of building, of knowing trees and using wood, is still alive and well after 1,300 years of history. The most we can do is to learn from this building technology; it is impossible to surpass it. It is my job, I believe, to pass on this knowledge and expertise to future generations.

### The Heart Pillar

Since the distant past, there has been the saying, "Towering trees are strong in the wind." These words remain deeply engraved in my mind. Even in a fierce typhoon, a heroic tree soaring up to the heavens is flexible and fearless, fending off disaster. But is the tree heroic because it is able to fend off disaster, or is it able to fend off disaster because it is heroic? That depends on your point of view, I suppose.

The carpenters of the Asuka period who built Hōryū-ji must often have stood in awe of the giant trees they saw in primeval forests, weathering wind, rain, and earthquakes. They must have lived their daily lives surrounded by such trees.

Earlier I praised Asuka-period carpenters for moving from

post-in-ground construction to foundation-stone construction at Hōryū-ji, regardless of what their reasons were for doing so. I referred to this as the "Asuka insight."

The same kind of insight is in evidence at Hōryū-ji's five-story pagoda, perhaps even more so. Even greater thought and effort were expended on its construction, I believe. A temple hall might resemble to some extent a family home or a local shrine, but the tall, slender pagoda was something entirely different. Asuka carpenters must have agonized over how to construct such an edifice. The driving force that led them to delve deeper and deeper into the problem, the force that rescued them from confusion and united them, was undoubtedly nothing other than the religious sect devoted to Prince Shōtoku. It was this motivating force that produced the amazing Asuka insight for the construction of the five-story pagoda. This is what I believe.

This amazing insight undoubtedly evolved from seeing huge nearby trees being pushed by the wind and then returning to their original position. In form, a pagoda is much like a huge tree with branches and leaves. As long as a tree has its roots firmly planted in the ground, it may lose some leaves and branches in a typhoon but it will never fall. From top to bottom, a tree is comprised of tens of thousands or even hundreds of thousands of cells, linked flexibly together. Barring insect infestation or physical injury, the trunks of trees are never broken by the wind.

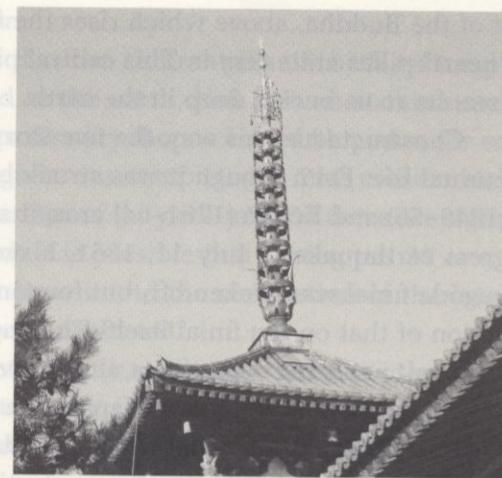
Asuka carpenters, after having bravely moved from post-in-ground to foundation-stone construction, seem to have taken a step backward with their usage of a "heart" or central pillar, which is embedded in the ground. But this is not the case. If we think of a pagoda as a tree with leaves and branches spreading out in all directions, then the central pillar is the trunk, and the trunk must be held firmly in place by its roots in the soil. Fortunately, around this time a new way of building a podium made its way to Japan.

According to this method, called *hanchiku* in Japanese, the ground on which the pagoda will stand is dug down to the bedrock. Then a layer of good-quality clay (about 3 cm) is laid down, packed and hardened. Above that is placed a layer of gravel, and then another of clay, which is packed and hardened. This is repeated until the podium on which the pagoda will stand is created.

In the case of Hōryū-ji's five-story pagoda, the podium rises about 1.5 meters above the ground line and extends about the same distance below it to the bedrock. On this powerful bedrock and layers of clay was placed a "heart" foundation stone (*shinbashi-raishi* or *shinso*) of some 2.4 meters in diameter, in which a cavity was hewn for the relics of the Buddha. The central pillar rests on this foundation stone.

From the top of the "heart" stone to the top of the podium, thick hinoki planks measuring 2.4 meters in length, 6 centimeters in diameter, and 30 centimeters in width were wrapped in layers around the central pillar to protect it from rot and decay.

At the bottom of the pillar is a relic depository (30 cm across), and in that repository is a depression that is 18 centimeters wide and 36 centimeters deep, which houses a silver openwork lidded box in a Sahari urn. In the Sahari urn is a lapis-lazuli crock, and in that crock are the Buddha's relics (*shari*). These represent the spir-



14. Finial of Hōryū-ji five-story pagoda

it of the Buddha, above which rises the five-story pagoda with the "heart" pillar at its center. This central pillar is the trunk of a huge tree, its roots buried deep in the earth.

Constructed in this way, the five-story pagoda seems to possess eternal life. Even though it was struck by lightning in the Kenchō (1249–56) and Kōchō (1261–64) eras, it survived unscathed. In the great earthquake of July 11, 1361, historical records say that the pagoda finial was broken off, but for some reason there is no indication of that on the finial itself. The pagoda was undamaged. According to existing documents, there have been more than 40 large earthquakes in south central Japan, the Kinki or Kansai region in which Hōryū-ji is located, but the pagoda survived them all. While this may indeed be due to the protection of the Buddha, at the same time we must acknowledge the wisdom of the Asuka carpenters who conceived the stone-foundation construction method and saw it through to the end.

The Hōryū-ji five-story pagoda is the oldest of the buildings in the precinct. At the very latest, it was firmly in place by the year 711—1,270 years ago.

During the Great Shōwa Restoration of Hōryū-ji, after the base of the original central pillar had been secured on the podium's foundation stone, one area of the lower part of the podium was cut out. "Cut out" might not be the right expression, since it had rotted out and become hollow. This is what is sometimes referred to as the pagoda's "cave" (*horaana*).

The base of the central pillar, which I have likened to a huge tree, was some 90 centimeters in diameter. The restoration of the five-story pagoda began on January 8, 1942, and ended on May 17, 1952. It is already public knowledge that in 1926, well before the start of restoration work, the Buddha relics had been studied in detail under conditions of the greatest secrecy. In any case, the cavern that had developed in the lower podium was large enough

for a human being to enter.

It was amazing to me that the central pillar, which was supposed to be safely secured in the earth, had arrived at this state, and that the pagoda had survived typhoons and earthquakes for so long. In fact, when the pagoda was completed in 711, erosion had already appeared on the surface of the podium, and there are signs of its having been repaired. It is possible that during the 30 or so years from the start of construction to the completion of the interior fixtures, the building was neglected.

While the pagoda's central pillar can be said to follow the post-in-ground method of construction, it was different from what had come before. For one thing, the podium was made of clay and gravel, and at the pillar's base was a large foundation stone. It can be called a combination of post-in-ground and foundation-stone construction. The Asuka carpenters were confident, I think, that rot and decay could be prevented at the base of the pillar, and so it must have come as a great shock when they discovered erosion on the surface of the podium. They removed the erosion and replaced it with a number of foundation stones. In this way they adhered unwaveringly to their original idea that likened the central pillar to a large tree.

Or, on the other hand, it may be that the central pillar's decay from the podium to areas deeper inside was due to a miscalculation on the part of the Asuka carpenters. But even after they realized their error, they didn't abandon their principal approach or their method of construction. A truly admirable achievement. This was made possible because they knew the quality of the wood they were working with and had absolute confidence in it.

At the time the Great Shōwa Restoration got underway, the central pillar was in terrible shape—not only where it was buried in the earth, but on the fifth floor as well, from rain leakage and the lightning strikes mentioned earlier. Still, I was deeply im-

pressed by the fact that this pillar had successfully fulfilled its role as the heart of the oldest wooden structure in the world. I felt that I wanted to comfort and console it.

Of course, a pagoda is not supported solely by the central pillar. From its podium to its finial, Hōryū-ji's five-story pagoda is more than 32 meters high and weighs over 1.2 million kilograms. It is amazing that a structure this tall and this heavy should stand on an area that at ground level is only 6.416 square meters, with most of its weight borne by 12 "perimeter pillars" (*gawabashira*) and the "Four Devas pillars" (*shitenbashira*), and that it should come down to us intact some 1,270 years later.

During the Shōwa Restoration it became clear that the pagoda's fifth story had been dismantled and repaired in the Keichō (1596–1615) and Genroku (1688–1704) eras, but not the stories below; these were in their original condition. The most surprising discovery, according to the report issued by the committee for the preservation of National Treasures at Hōryū-ji, was that there was no discernible difference in the differential settlement of the perimeter and the Four Devas pillars. Even assuming that the ground at the site was very solid, it is hard to believe that it could withstand 1,300 years of use without differential settlement, especially in the absence of concrete and steel reinforcement.

This makes me think. Could it be, whether in earthquake or typhoon, that the *hanchiku* podium construction method introduced from China and the qualities of Japanese hinoki produced a fortuitous pliability, allowing both to meet in mutual accord without detrimental clashes? By way of contrast, this reminds me of a recent incident in which the flexible plate on a heavy oil storage tank at the Mizushima oil refinery in Okayama Prefecture cracked, releasing oil into the sea. As I understand it, this tank represented the height of modern Japanese technology. However, within a year of its installation, differential settlement had set in, leading to the

rupture of the powerful plate. As a result, the fishing industry in the Seto Inland Sea suffered immense damage.

I am saddened by the present-day faith in the short-term strength of steel and cement, and the new technology based on these materials, which in effect leads people to forget the longevity of trees. The Mizushima accident should serve as a warning against blind faith in new technology and materials.

by Jirō Kohara

## 1. Evaluating Trees

In chapter 1 Tunekazu Nishioka spoke of the trees and wood that have supported Hōryū-ji for 1,300 years. Immediately below I would like to summarize what he said.

i. The appeal of trees. Trees and wood are living things. Each has its own individual traits. Each speaks to us in a different way. To utilize a tree fully we have to know its heart and soul, to be able to read its individual characteristics. To do this is analogous to conducting a project in which many different types of people have come together to accomplish a particular goal. In order to create a structure that will withstand the wind and rain of a thousand years, it is first necessary to join the separate pieces of wood with their individual traits, to join the hearts of the carpenters who will do the work. (This matter is dealt with in this chapter, "The Appeal of Trees," as well as in chapter 3, "Rich in Wood, Poor in Trees.")

ii. Wood is alive. When a tree is cut down, it ends the first stage of its life, but when it is used as a building material, it enters a second stage, its second life. The long first stage may last for over