National Committee

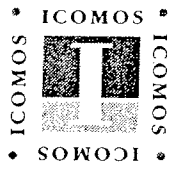
MONUMENTS AND SITES
JAPAN

ICOMOS

CONSEJO INTERNACIONAL DE LOS MONUMENTOS Y SITIOS
CONSEIL INTERNATIONAL DES MONUMENTS ET DES SITES
INTERNATIONAL COUNCIL ON MONUMENTS AND SITES

National Committee
11th General Assembly

MONUMENTS AND SITES
JAPAN



Consejo Internacional de los Monumentos y Sitios
Conseil International des Monuments et des Sites
International Council on Monuments and Sites

This is one of a new series of ICOMOS
Scientific Publications released on the occasion
of its 11th General Assembly in Sofia, Bulgaria,
5-10 October 1996, sponsored by the Central Cultural Fund
and Sri Lanka National Committee of ICOMOS

The other volumes in the series are:
○ Australia ○ Bolivia
○ Bulgaria ○ Canada ○ Cuba
○ Cyprus ○ Czech Republic
○ Dominican Republic ○ Egypt
○ Hungary ○ India ○ Israel
○ Jamaica ○ Russia ○ South Africa
○ Sri Lanka ○ Zimbabwe

First published in 1996 by the Sri Lanka
National Committee of ICOMOS - for the
International Council on Monuments and Sites,
with the financial assistance of
the Central Cultural Fund of the Government of Sri Lanka and UNESCO.

Sri Lanka ICOMOS Publications Committee:
Chairman; Roland Silva
Lakshman Alwis, H.D.S. Hettipathirana
Sita Pieris, P. L. Prematilleke
Nimal de Silva, H.J. Wahalawatta
Gamini Wijesuriya

Editor-in-Chief: Sita Pieris
Project Coordinator: Hiroshi Rathnaweera
French Translations: Catherine Steinbach
Typesetting: ICOMOS Japan, Alliance Francais.
Institute of Computer Technology,
State Printing Corporation.

ICOMOS National Committee: Japan
Editor : Akira Ishii

Printed in Sri Lanka by the State Printing Corporation,
Panaluwa, Padukka

ISBN 955 - 613 - 095 - 0

Central Cultural Fund Publication No. 207
Central Cultural Fund, 212/1, Bauddhaloka Mawatha,
Colombo 7. Sri Lanka, Telefax 94-1-500731

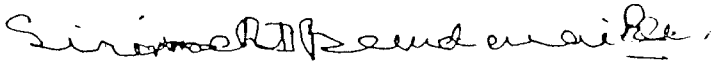
Cover and Frontispiece: Kondo of Horyu-ji Temple - Horyu-ji is the oldest Japanese Buddhist temple, whose major wooden structures including Kondo, dating back to the late seventh century.

Foreword

Monuments and Sites of Mankind are but the memory of Man. These stand testimony to the life and style of the people through many generations. Sri Lanka is no exception to this characteristic of human nature, as our Monuments and Sites record a continuous history of a people from the 5th Century B.C. to the present day. We are proud that six of our sites have qualified to be among the three hundred and thirty cultural items listed by UNESCO to be World Heritage Monuments.

As chairperson of the Central Cultural Fund which is looking after such a rich heritage of world stature, we are proud to note that the Central Cultural Fund has been able to sponsor the publication of 20 volumes covering the Monuments and Sites of 20 different countries in the five continents of the globe. We believe that by the dissemination of the knowledge concerning the heritage of different peoples, the world will be richer in sharing such experiences that have so far been confined to each nation.

We take this opportunity to congratulate the 6,000 or more members of the International Council of Monuments and Sites (ICOMOS) for their dedicated service to the world and for providing professional guidance to each nation to safeguard their monumental heritage for the sake of generations to come. We also wish the 84 Member States of ICOMOS, every success in their deliberations at the 11th General Assembly of ICOMOS in Sofia, Bulgaria to be held later this year, for which occasion these volumes are being published.



Prime Minister's Office,
Sir Ernest de Silva Mawatha,
Colombo 3, Sri Lanka.

Sirimavo Dias Bandaranaike
Prime Minister
Sri Lanka

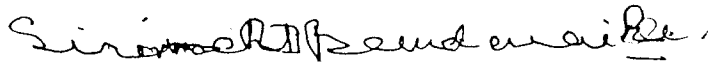
17th April, 1996

Avant-propos

Les Monuments et les Sites historiques ont représenté, au cours de l'histoire de l'humanité, la mémoire de l'homme. Ils témoignent de l'existence et du style de vie des peuples à travers les générations. Le Sri Lanka ne fait pas exception à cette caractéristique du genre humain puisque nos monuments et nos sites racontent l'histoire de notre peuple depuis le 5ème siècle av J.-C. jusqu'à nos jours. Nous sommes fiers que 6 de nos sites aient été sélectionnés parmi les 330 articles culturels listés par l'UNESCO comme Monuments du Patrimoine mondial.

En tant que Président du Central Cultural Fund ayant à coeur l'intérêt d'un tel héritage d'importance mondiale, je suis heureuse de savoir qu'il a été possible de patronner la publication de 20 volumes se rapportant aux Monuments et aux Sites de 20 pays différents des 5 continents du globe. Je suis convaincue que c'est grâce à la diffusion des connaissances concernant les héritages culturels des différents peuples que le monde pourra s'enrichir du partage de telles expériences jusqu'alors confinées à chaque pays.

Je saisis cette opportunité pour féliciter les quelque 6 000 membres du Comité International des Monuments et des Sites (ICOMOS) pour leur service dévoué au monde et pour l'assistance professionnelle apportée à chaque nation en vue de la sauvegarde de leurs monuments dans l'intérêt des générations à venir. Je souhaite également aux 84 états membres d'ICOMOS tous les succès dans leurs délibérations lors de la 11ème Assemblée Générale d'ICOMOS à Sofia, Bulgarie, qui se déroulera à la fin de cette année et à l'occasion de laquelle ces livres ont été publiés.



Sirimavo Dias Bandaranaike
Premier Ministre
Sri Lanka

Bureau du Premier Ministre,
Sir Ernest de Silva Mawatha,
Colombo 3, Sri Lanka

17 avril 1996

Preface

Although ICOMOS had its birth in Europe over thirty years ago, it is only now that it has spread to the ends of Africa, America and Asia/Oceania. It has now a membership in 84 countries, and more nations are fast appreciating the professional value of this International Body.

The steadfast effort of ICOMOS is to see that the highest principles of conservation are applied to the Monuments and Sites of the World. It is precisely for this reason that ICOMOS has been able to interest twenty countries in the five continents of the world to record their efforts so that the rest of the world could share their rich experience in the science of conservation.

The organizers of the twenty publications take this opportunity to thank the Editors of these volumes for giving generously of their time and for collaborating in this major exchange of knowledge.

Prof. Lakshman Alwis
President
ICOMOS, Sri Lanka

Ms. Sita Pieris
Editor-in-Chief
ICOMOS, Sri Lanka

Dr. Roland Silva
President
ICOMOS

Colombo, 17 April 1996

Préface

Bien qu'ICOMOS soit né en Europe il y a un peu plus de 30 ans, c'est seulement maintenant que son action a pu s'étendre aux frontières de l'Afrique, de l'Amérique et de l'Asie/Océanie. Il possède aujourd'hui 84 pays membres et un nombre rapidement croissant de nations rendent hommage à la valeur professionnelle de ce corps international.

Le constant effort soutenu par ICOMOS est celui de veiller au respect des grands principes de conservation des Monuments et des Sites historiques mondiaux. C'est pour cette raison précise qu'ICOMOS a su intéresser 20 pays des 5 continents du globe à prendre notes de leurs efforts pour que le reste du monde puisse partager leurs riches expériences dans le domaine de la science de la conservation.

Les organisateurs des 20 publications saisissent cette opportunité pour remercier les éditeurs des 20 volumes qui ont si généreusement donné de leur temps pour cet échange majeur de connaissances.

Prof. Lakshman Alwis
Président
ICOMOS, Sri Lanka

Mme Sita Pieris
Rédacteur en chef
ICOMOS, Sri Lanka

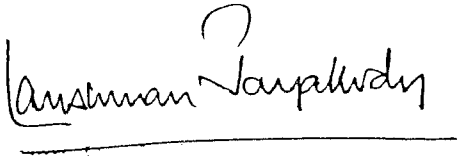
Dr. Roland Silva
Président
ICOMOS

Message

The story of conservation is as old as the civilization of the human race. If ICOMOS has in recent years collated ideologies and codified precepts, it is the research and experiences of man that they have sensitively brought together.

The ancient chronicles of Sri Lanka like the Dipavamsa and the Mahawamsa as well as technical texts like Manjusri's Vastuvidya Sastra are attempts to record unending tales of scientific experience that have enriched the sum and substance of its human tradition. The data of unwritten experience is yet another source that the professionals of today should attempt to glean from traditional craftsman and village elders. These researches would extend from city planning to monastic layouts, to monuments and interiors, to furniture and even to items of regal wear as crowns and the setting of the gems upon such jewellery. These texts and traditions are valuable not only for creation but also for the conservation and safeguarding of their quality through time.

I wish the work of the world body in the conservation of Monuments and Sites every success and congratulate them for this attempt to collate such information from the different ends of the earth.



Lakshman Jayakody
Minister of Cultural and Religious Affairs,

Ministry of Cultural and
Religious Affairs, Sethsiripaya,
Battaramulla, Sri Lanka.

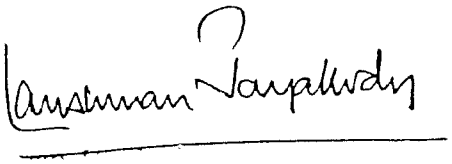
3rd May 1996

Message

Les origines de la conservation sont aussi anciennes que celles de la civilisation humaine. ICOMOS a depuis de récentes années regroupé des théories et codifié des règles de conduite permettant ainsi une approche intelligente des recherches sur l'homme et de ses expériences.

Les anciennes chroniques du Sri Lanka comme celles de Dipavamsa et Mahavamsa ainsi que les textes techniques comme le Vastuvidya Sastra de Manjusri sont des tentatives de récits scientifiques impérissables qui ont enrichi l'ensemble et l'essence même des traditions humaines du pays. Les faits provenant d'histoires qui n'ont pas été écrites forment une autre source d'information que les professionnels d'aujourd'hui devraient essayer de recueillir auprès des artisans traditionnels et des anciens du village. Les recherches s'étendent des plans de villes aux conceptions monastiques, des monuments et intérieurs au mobilier et même aux accessoires vestimentaires comme les couronnes et la disposition des pierres précieuses les ornant. Ces textes et ces traditions sont de grande valeur non seulement pour notre histoire mais aussi pour la conservation et la protection de leurs qualités à travers le temps.

Je tiens à souhaiter aux membres du corps mondial de la conservation des Monuments et des Sites tous les succès dans leurs travaux et je tiens également à les féliciter pour leur effort de collection d'informations en provenance des quatre coins du monde.



Lakshman Jayakody
Ministre des Affaires Culturelles et Religieuses, Sri Lanka

Ministère des Affaires Culturelles
et Religieuses
Sethsiripaya, Battaramulla
Sri Lanka

3 mai 1996

ICOMOS National Committee - Japan

Japan's present administrative framework for historic conservation is based on a comprehensive law named Cultural Properties Protection Act, which was established in 1950 to supersede most of previous relevant laws and amended several times during the past five decades.

Up to August 1995, as to monuments and sites, the central government has designated 2,125 historic buildings (3,540 individual structures), 1,339 historic or archaeological sites, and 260 places of scenic beauty as Cultural Properties of National Importance. In addition, the local authorities on both prefectural and municipal-provincial levels also have designated approximately eight thousand historic buildings, 14 thousand historic or archaeological sites, and one thousand places of scenic beauty, together with 40 districts of collective traditional buildings, as Cultural Properties of Local Importance according to their own ordinances within the above-mentioned framework.

This publication, one of the Twenty Books commemorating the 11th ICOMOS General Assembly, consists of two parts. The first part describes an outline of the Japanese historic conservation system with emphasis on the background of its evolution and current legislation. The second part contains twelve scientific papers, which deal with varied issues, such as particular characters of Japanese wooden buildings, techniques in restoration work, training of conservation specialists, rescue excavation of threatened archaeological sites, and so forth, together with an introductory bibliography on historic gardens. These articles written by leading experts, will be surely informative for our ICOMOS colleagues who are interested in Japanese conservation practice.

Besides the articles, some photo-illustrations of historic buildings and gardens selected from the World Heritage Sites are on the preliminary pages. Because Japan became a State Party to the Convention as late as in 1992, only 2 Natural and 4 Cultural Heritage Sites so far have been inscribed on the List, and several others are still nominated.

I would like to express my gratitude to the authors for their consent to publish the articles in this format, as well as to Mr. K. Masuda, Mr. Y. Yamada and Ms. A. Agatsuma for their assistance in providing the camera-ready pages.

Akira Ishii
President,
ICOMOS *National Committee*

Comité national d'ICOMOS - Japon

La structure administrative actuelle du Japon en ce qui concerne la conservation historique est basée sur une loi détaillée appelée Loi de Protection des Propriétés Culturelles, établie en 1950 dans le but de remplacer les lois précédentes qui avaient été amendées plusieurs fois au cours des 5 dernières décennies.

Jusqu'en août 1995, pour ce qui est des monuments et des sites, le gouvernement central a désigné 2,125 constructions historiques (3,540 structures individuelles), 1,339 sites historiques ou archéologiques, et 260 lieux de beauté naturelle, comme Propriétés Culturelles d'Importance Nationale. De plus, les autorités locales au niveau préfectoral et municipal-provincial, ont aussi désigné approximativement 8,000 constructions historiques, 14,000 sites archéologiques ou historiques, et 1,000 lieux de beauté naturelle, ainsi que 40 districts à constructions traditionnelles comme Propriétés Culturelles d'Importance Locale d'après les ordonnances de la structure administrative mentionnée plus haut.

Cette publication, une parmi les 20 livres célébrant la 11ème Générale Assemblée de l'ICOMOS, consiste en 2 parties. La première partie s'intéresse au profil du système de conservation historique japonais avec un accent mis sur son évolution et sur la législation actuelle. La deuxième partie contient douze articles scientifiques s'intéressant à plusieurs problèmes comme le caractère particulier des constructions japonaises en bois, les techniques de restauration, la formation des spécialistes de la conservation, les opérations de sauvetage des sites archéologiques menacés, et bien d'autres, ainsi qu'une bibliographie introductrice sur les jardins historiques. Ces articles, écrits par d'éminents experts, sera sûrement une source importante d'informations pour nos collègues de l'ICOMOS, intéressés par l'exercice de la conservation à la façon japonaise.

En plus de ces articles, des illustrations-photos de constructions et de jardins historiques sélectionnés d'après les Sites du Patrimoine Mondial ont été insérées au niveau des pages préliminaires. Parce que le Japon n'est devenu un Parti d'Etat pour la Convention qu'en 1992, seulement 2 Sites du Patrimoine Naturel et 4 Sites du Patrimoine Culturel ont été inscrits sur la Liste, et bien d'autres sont encore en cours de nomination.

J'aimerais exprimer ma gratitude aux auteurs pour avoir accepté de publier les articles dans ce format, ainsi qu'à M. K. Masuda, M. Y. Yamada et Mme A. Agatsuma pour leur aide dans l'apport de pages-photos.

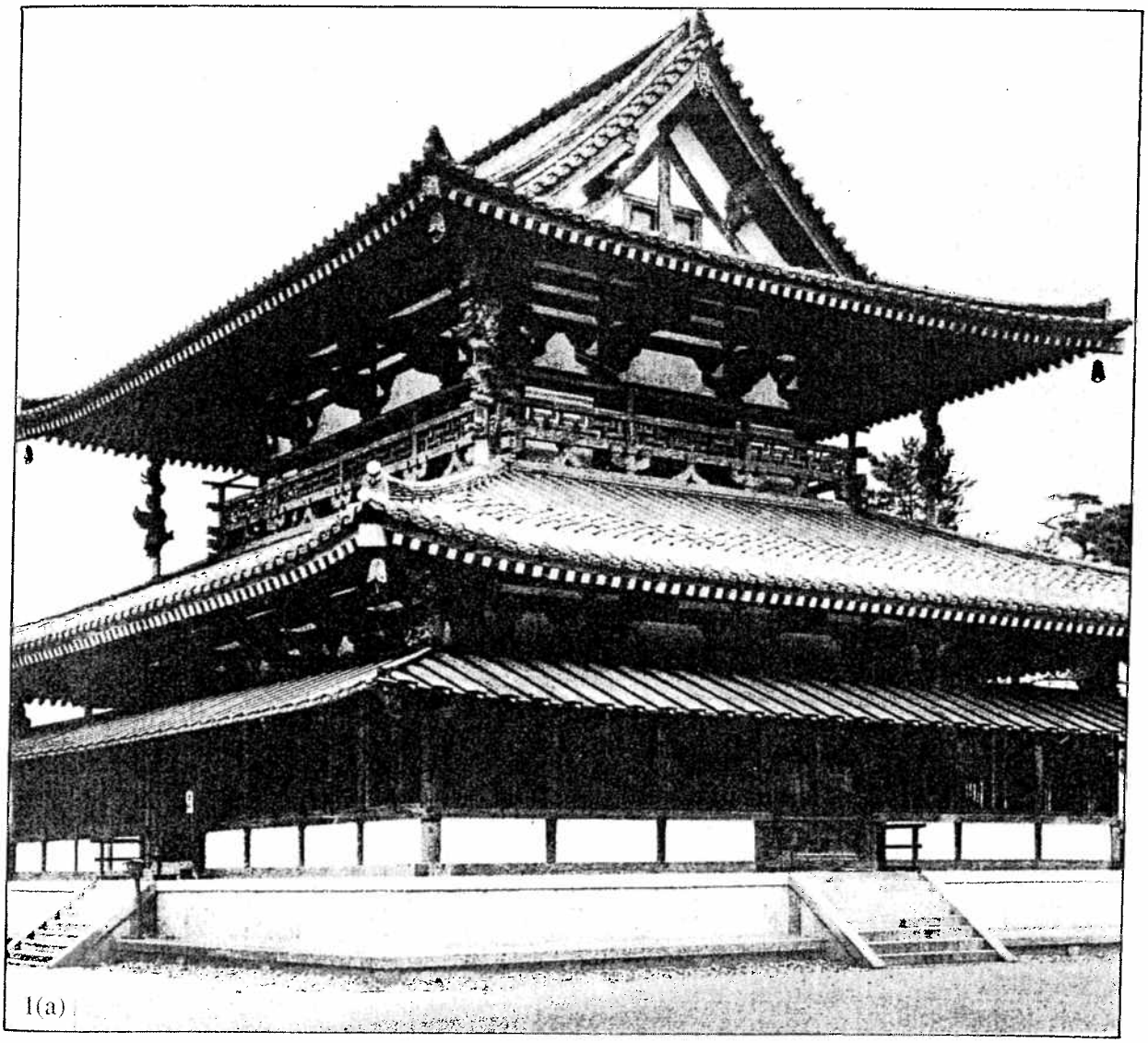
Akira Ishii,
Président,
Comité National d'ICOMOS - Japon

Contents

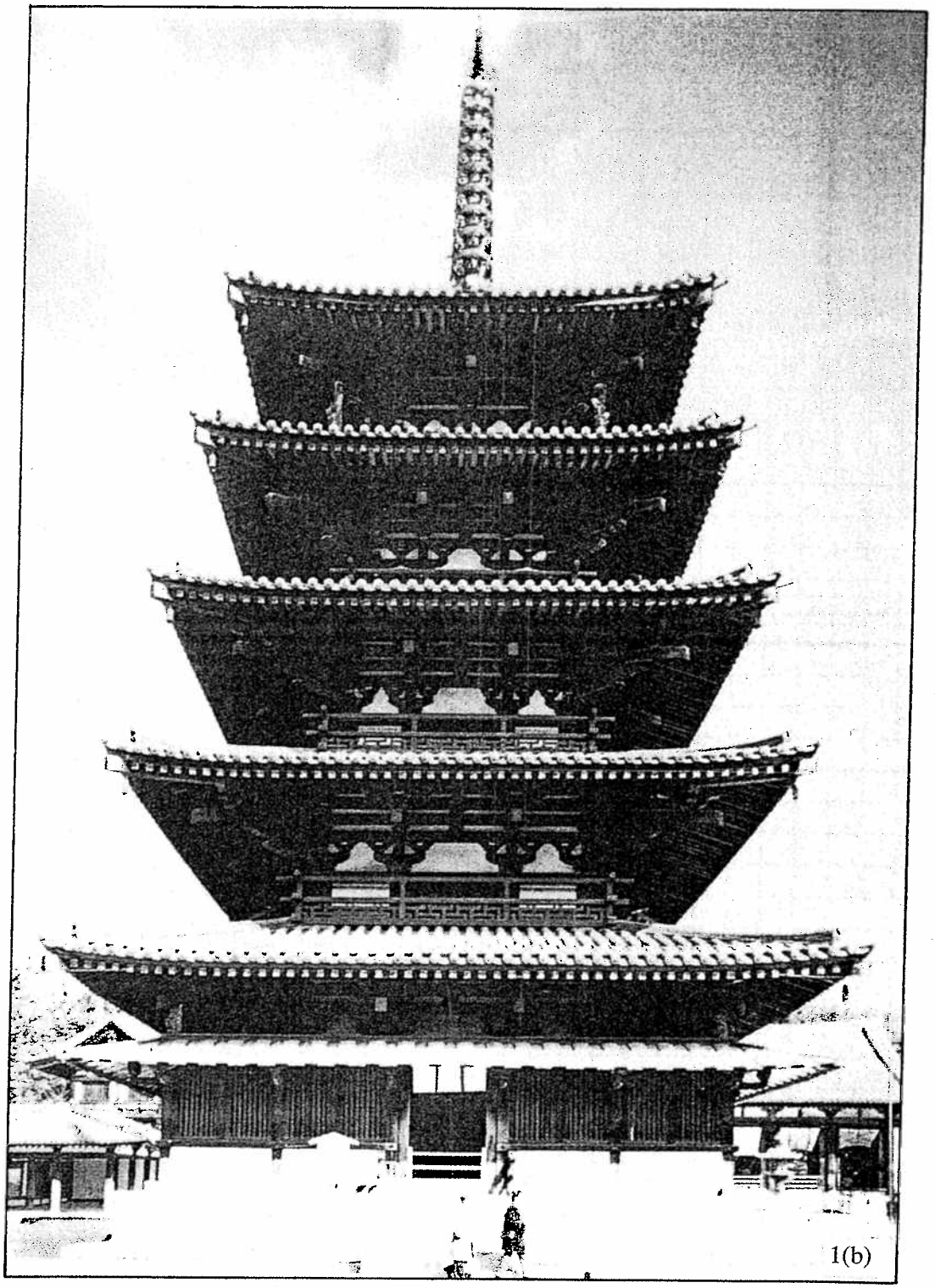
Historic Buildings and Gardens in the World Heritage Sites

Historic Buildings and Gardens in the World Heritage Sites

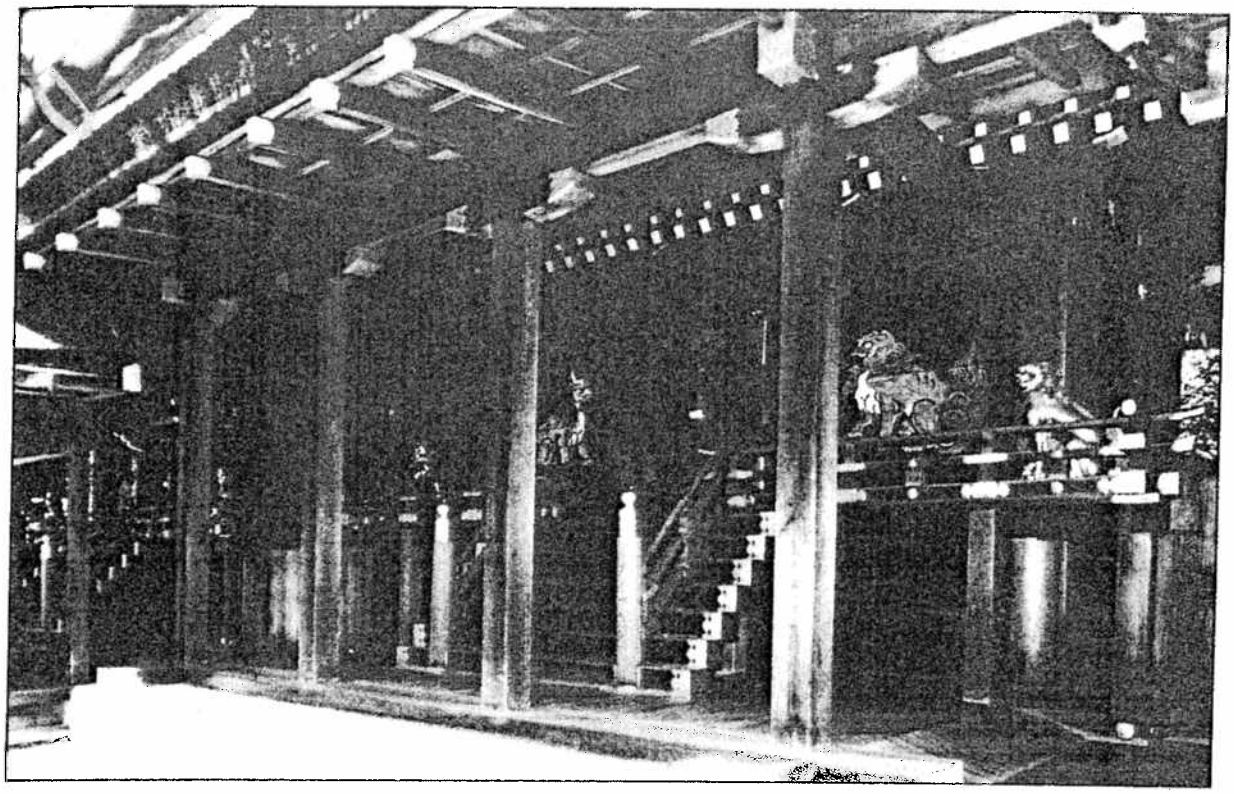
Buddhist Monuments in the Horyuji Area
Historic Monuments of Ancient Kyoto
Himeji-jo
Historic Villages of Shirakawa-go and Gokayama



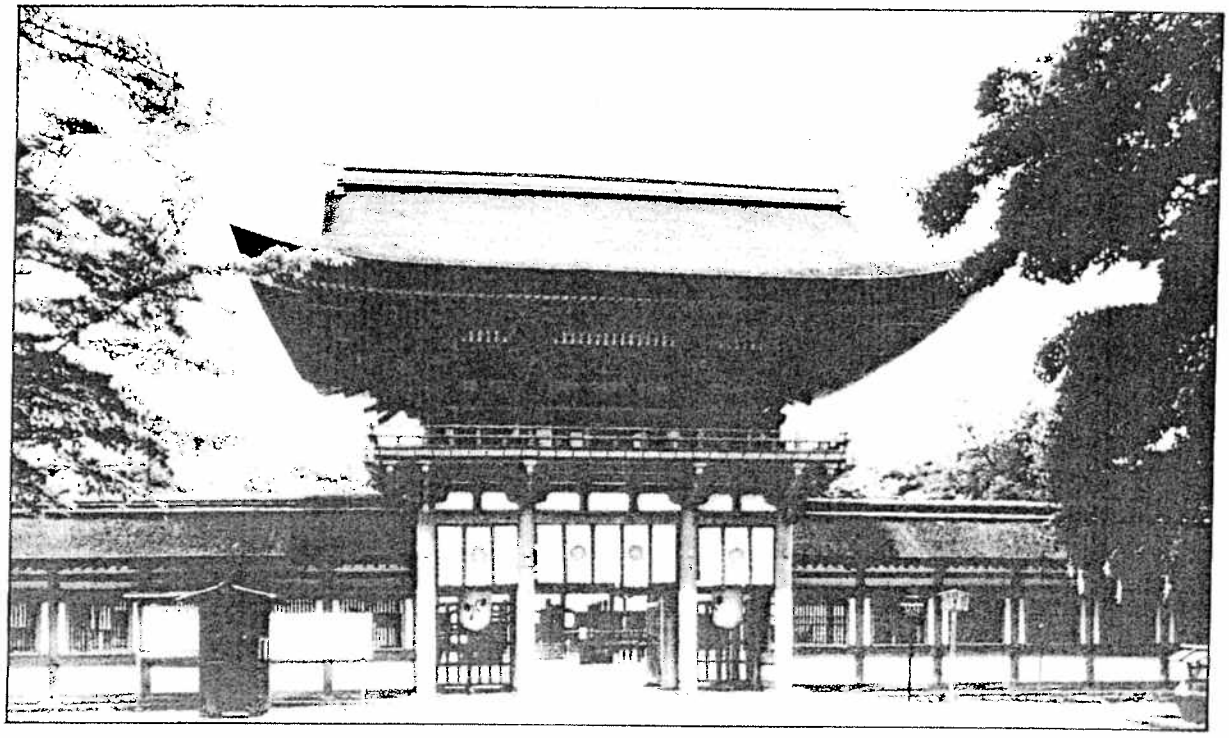
1(a)



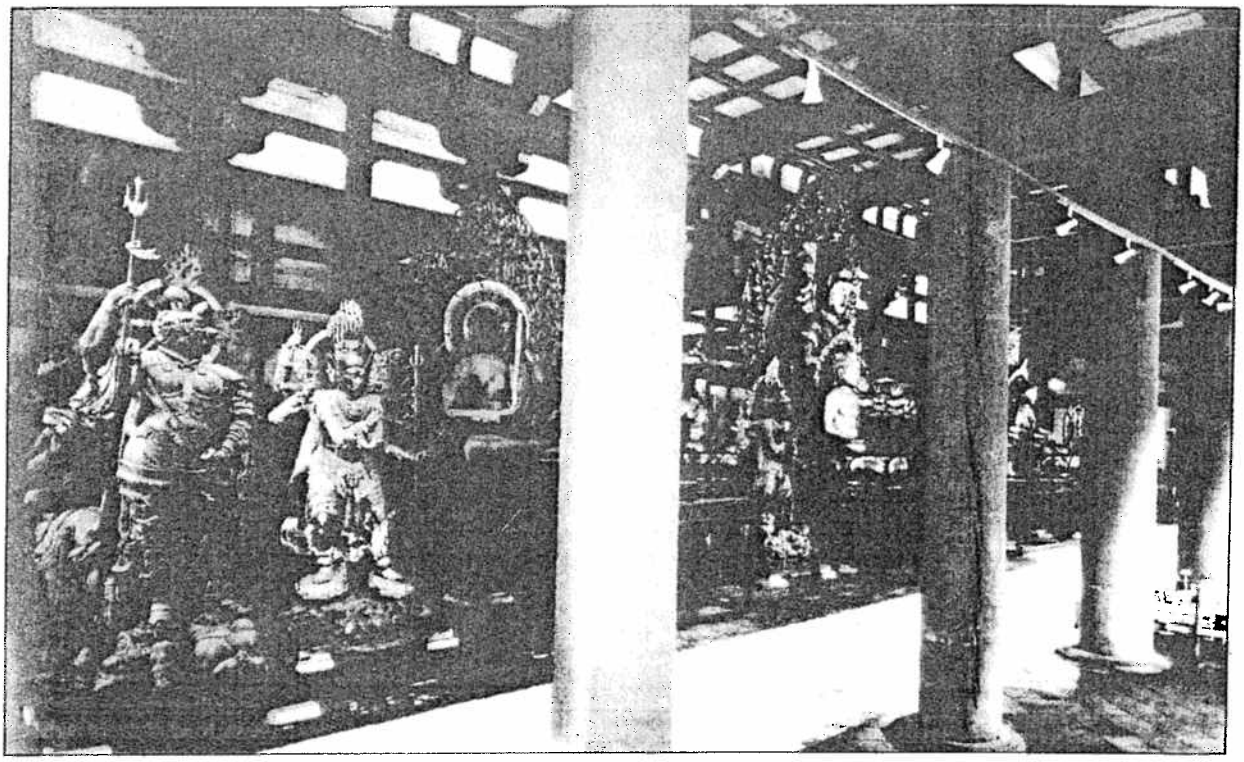
1. (a)HORYU-JI KONDO, (b) HORYU-JI GOJUNOTO, both built in 7th century, the oldest wooden existing structures in the world.



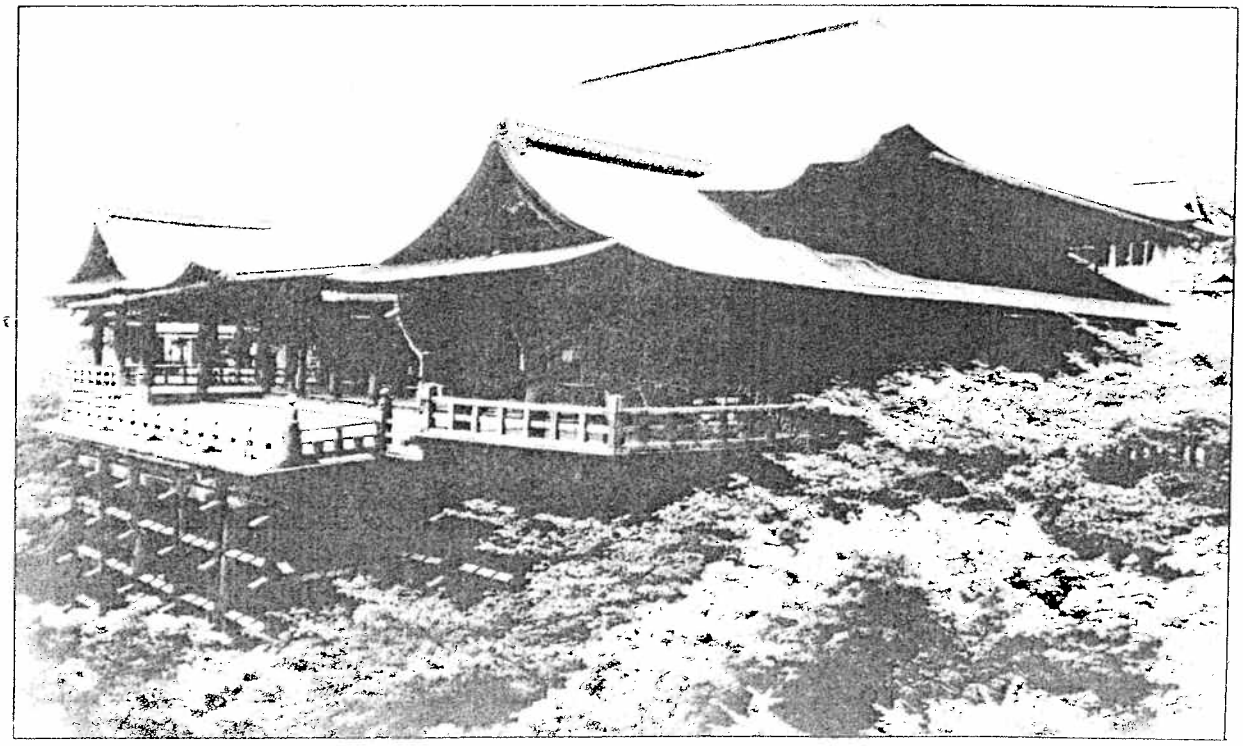
2. KAMOWAKEIKAZUCHI-JINJA HONDEN, originally built in 8th century, but reconstructed in 1628.



3. KAMOMIOYA-JINJA ROMON, originally built in 9th century, rebuilt in 1628.

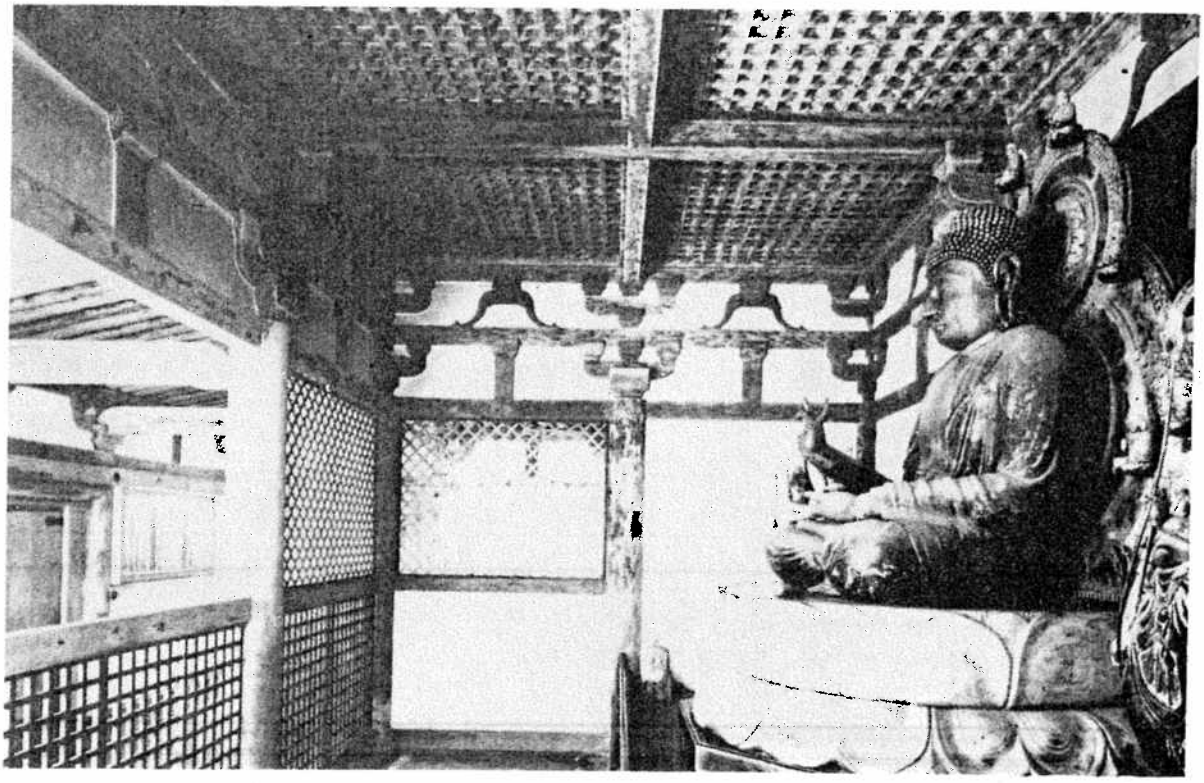


4. KYOOUGOKOKU-JI KODO, contains 9th century original Buddhist images, but the hall was rebuilt in 1491.

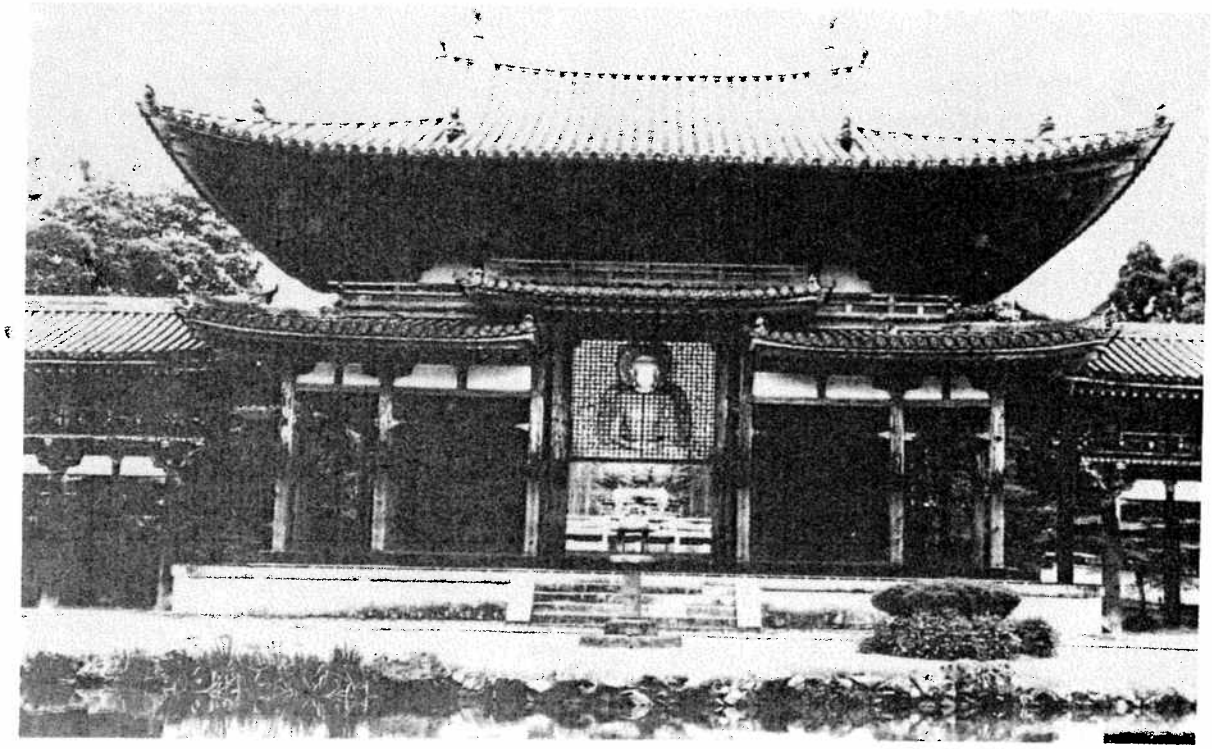


5. KIYOMIZU-DERA HONDO, originally built in 9th century, rebuilt in 1633.

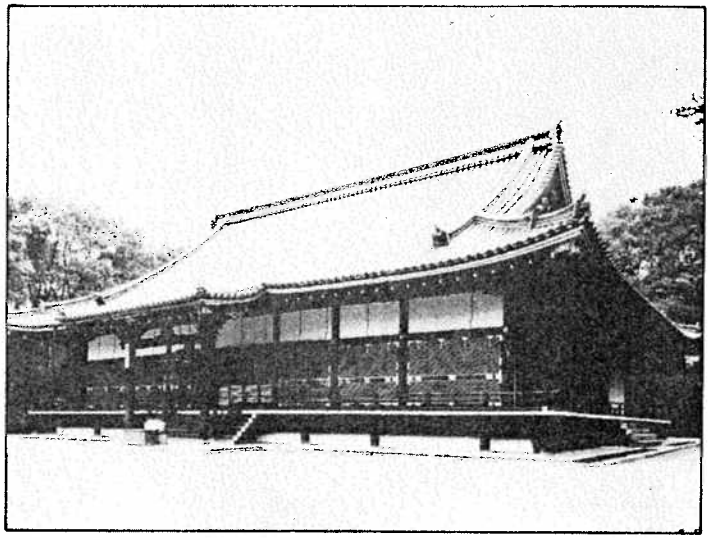
6. ENRYAKU-JI KONPONTYUDO, originally built in 9th century, rebuilt in 1640.



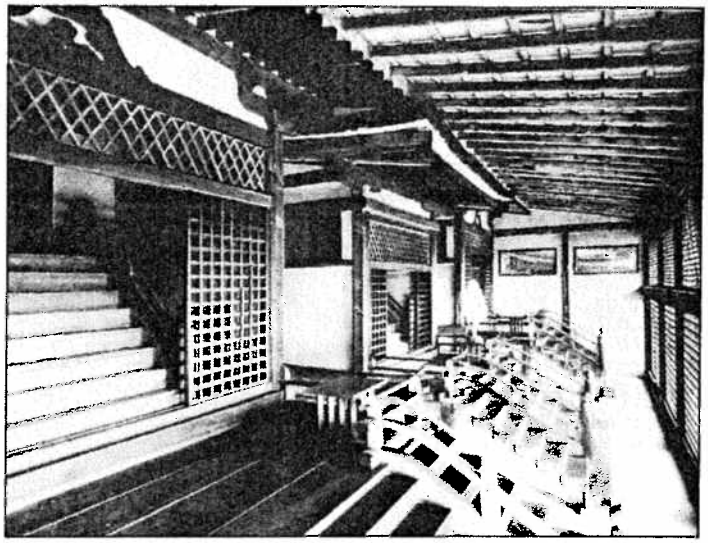
7. DAIGO-JI YAKUSHI-DO, built in 1121 to house a image of Healing Buddha.



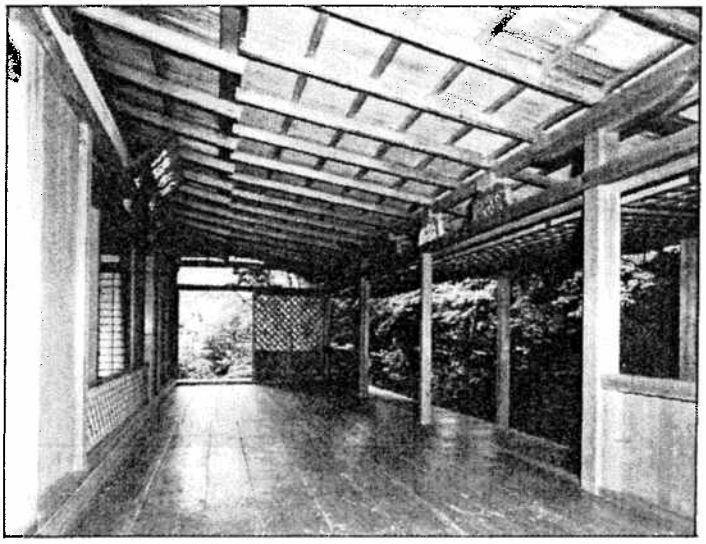
8. BYODO-IN HOUOU-DO, built in 1053 to depict the paradise of Amitabha.



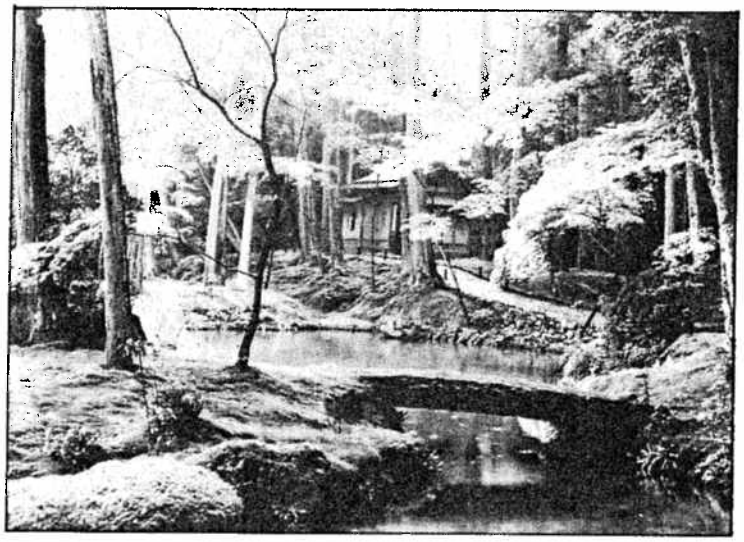
9. NINNA-JI KONDO, founded in 889, rebuilt in 1643 reusing an emperor's former palace hall of 1613.



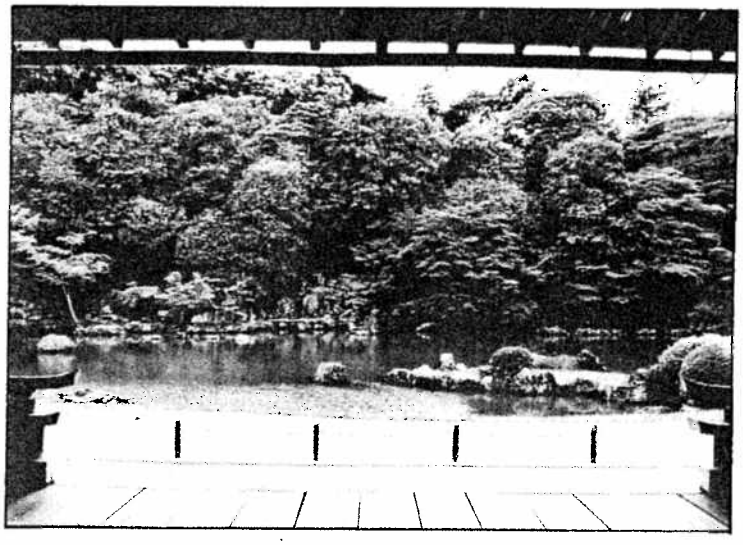
10. UJIGAMI-JINJA HONDEN, built in 11th century as to house female guardians for the Byodo-in. This is the oldest existing structure of Shinto shrine.



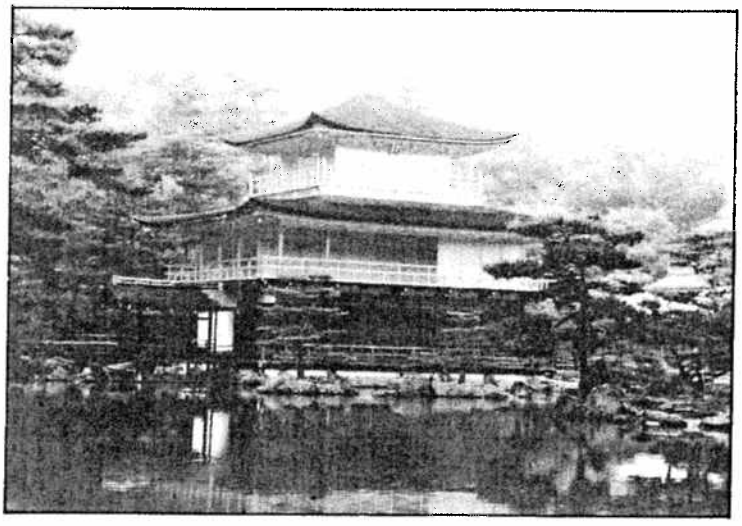
11. KOZAN-JI SEKISUI-IN, built in 13th century as a monastery for an aristocratic priest.



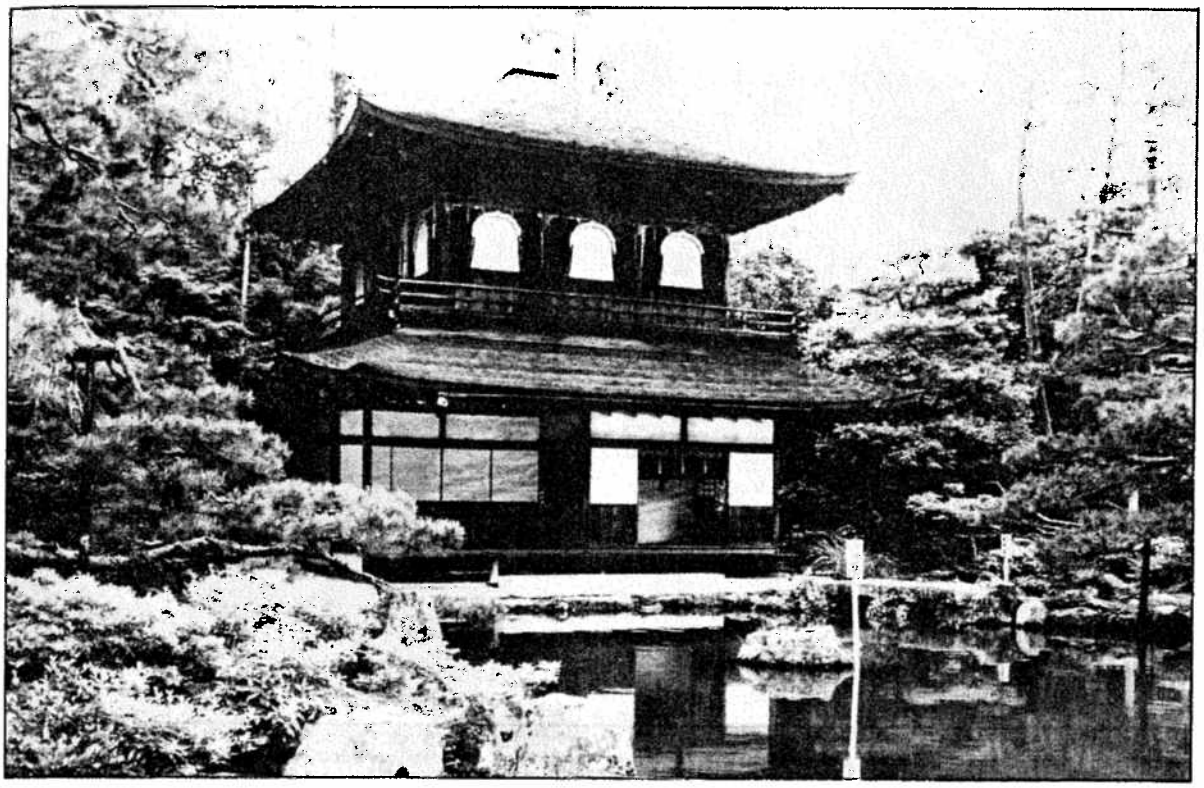
12. SAIHO-JI GARDEN, originally founded in 731, revived as a Zen temple in 1339, ruined after 1469 civil war, and sustained as a moss garden.



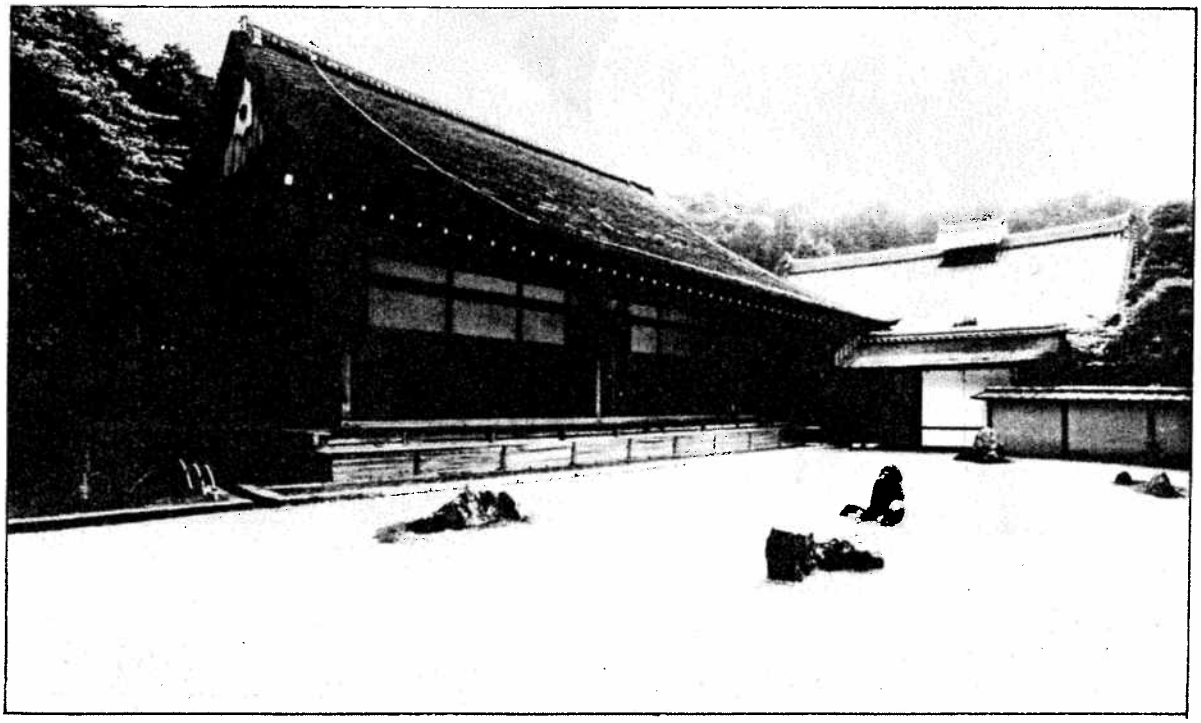
13. TENRYU-JI GARDEN, originally founded as a palace in 1255, turned into a Zen temple in 1339.



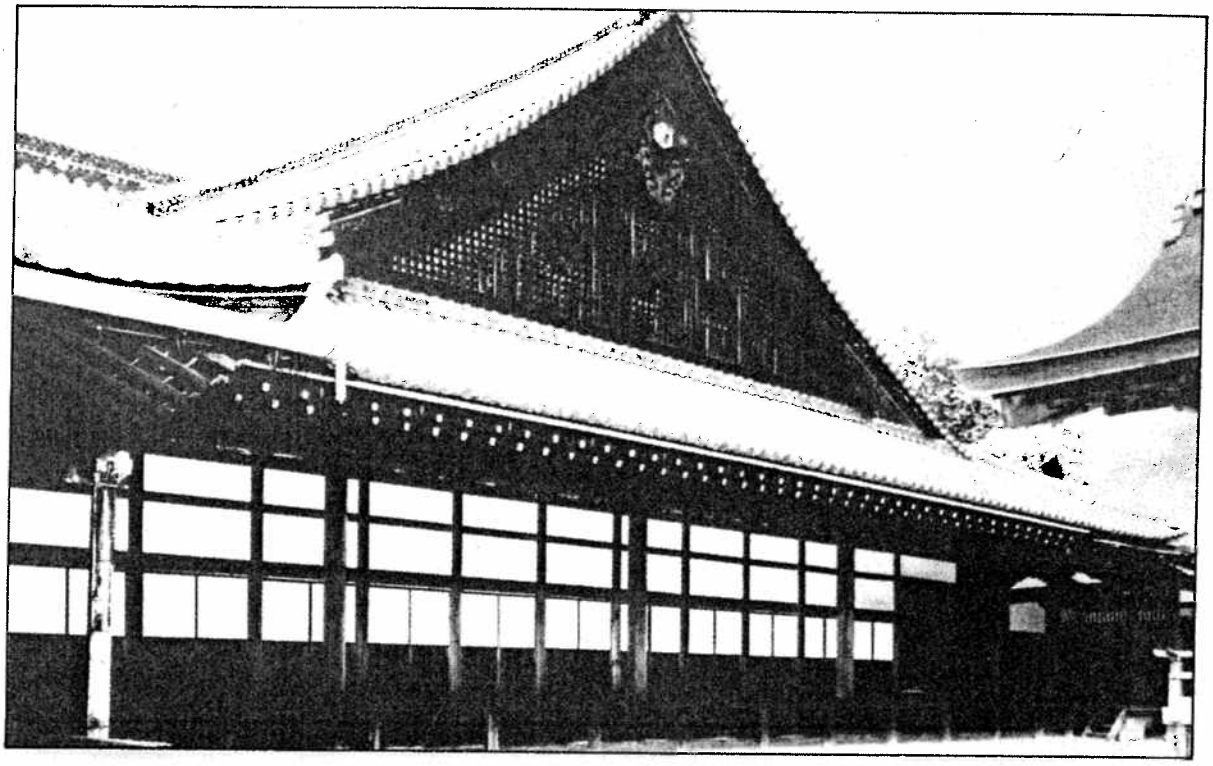
14. ROKUON-JI GARDEN, originally built as an aristocrat's villa, renovated as a Shogun's villa in 1397, then turned into a Zen temple. The golden pavilion was rebuilt after the fire of 1950.



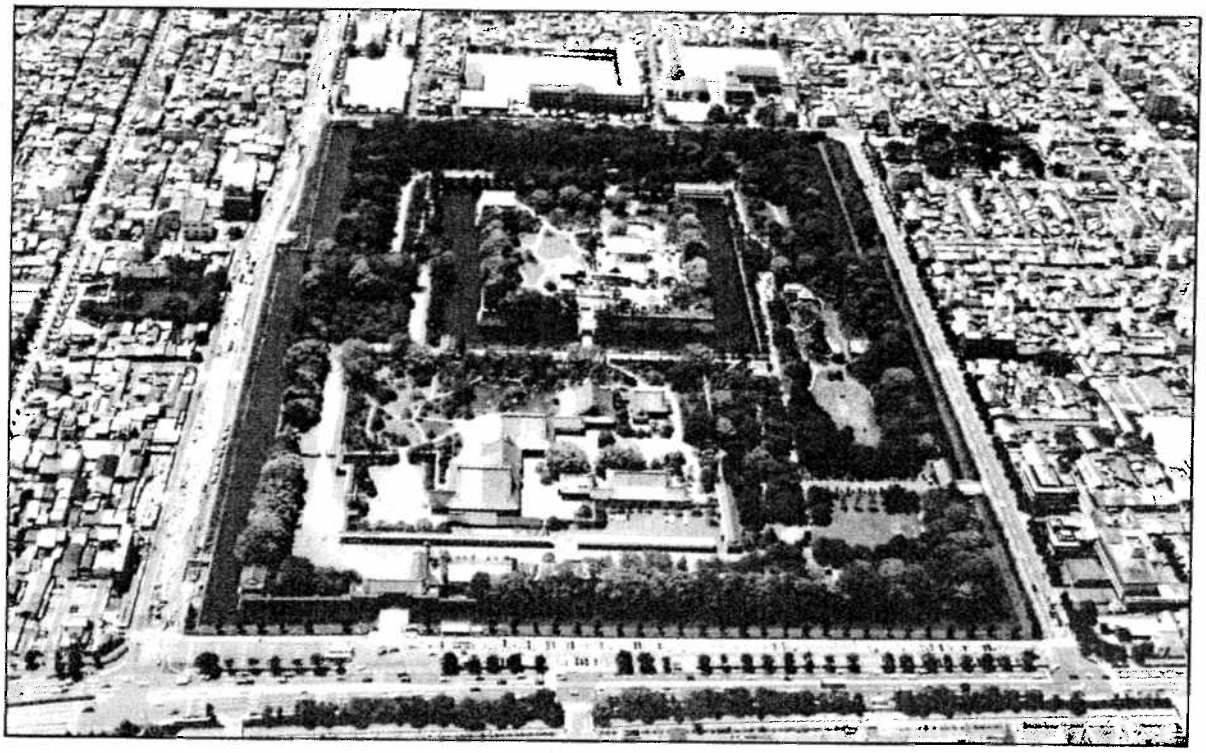
15. JISYO-JI GINKAKU AND THE GARDEN, originally built in 1482 as a villa of a Shogun, grand-son of the above Shogun, turned into a Zen temple afterwards



16. RYOAN-JI GARDEN AND HONDO, originally an aristocratic villa, turned into a Zen temple in 1488. Hondo was rebuilt in 1797 reusing another temple's structure of 1606.

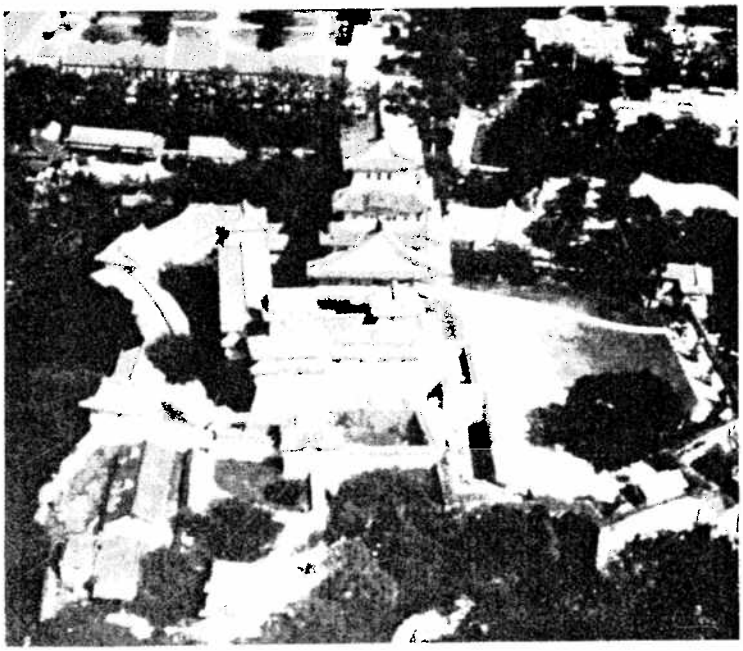


17. HONGAN-JI SHOIN. After the temple was transferred here in 1591, this Shoin was built in 1618.



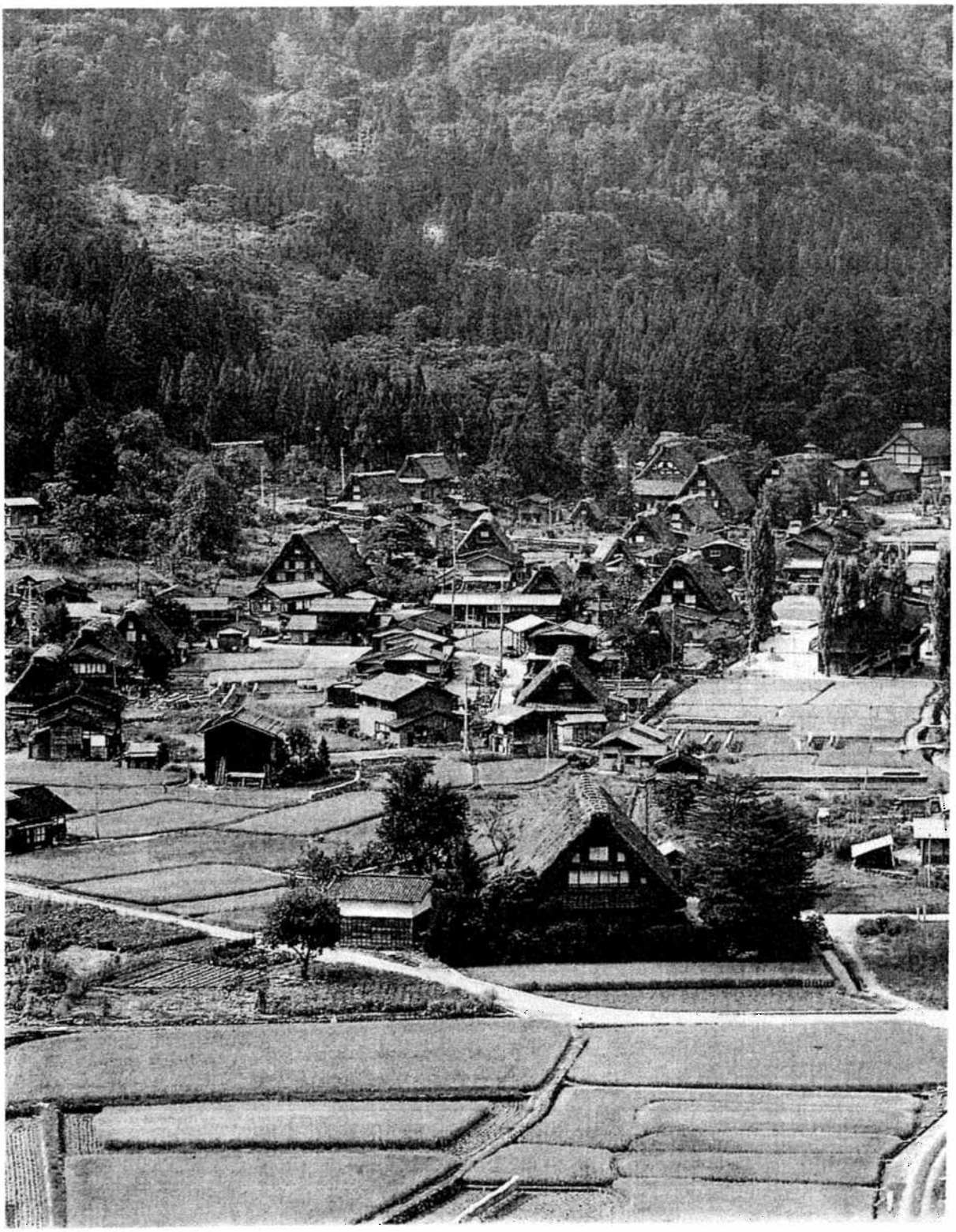
18. NIJO-JO CASTLE, founded in 1603 by Tokugawa Shogun, now surrounded by a modern cityscape. This is the latest to be identified among the World Heritage monuments of Kyoto.

19(a)



19(b)

19.(a) HIMEJI-JO DAI-TENSHU, (b)TOTAL VIEW, located in the center of Himeji city, the castle was completed in 1608. Dai-tenshu means a great donjon.



20. THE HISTORIC VILLAGES OF SHIRAKAWA-GO AND GOKAYAMA. One of the Villages, Ogimachi, located in the mountain district, keeps its traditional thatched roof houses since 18th century amid rice fields.

PART I - INTRODUCTION

Outline of Japanese Historic Sites and Monuments: Its Past and Present

Yukio Nishimura

1. Brief History of Conservation Legislation

In Japan the legislation for the protection of historic structures had already begun in early 1870's by the central government.

In 1871, the Cabinet decreed the first executive order for protection, 'Protection of Antiquities Order', where 31 objects were itemized for protection and registration. However, no immovable properties were mentioned in the Order; therefore no attention was paid to the authenticity of the monuments and historic sites at this point.

In 1880, the Meiji government issued a by-law formulating criteria of grant-in-aid for old shrines and temples in order to launch a preservation program for the first time in modern Japanese history. The by-law introduced two types of what it called 'maintenance': direct and indirect, where the latter meant a contribution for religious activities, the former indicated actual expenses for restoration as well as a contribution for the preservation fund.

Until the fiscal year 1894 when this preservation program was repealed, 539 shrines and temples received the grant for 'maintenance'. More then 80% of the grant went to the preservation fund for each shrine or temple for maintaining its activities. The grant continued to play a considerable role in supporting the function of shrines and temples.

In 1897, the first legislation concerning the historic preservation, the Old Shrines and Temples Protection Act was enacted. The 1897 Act was the first act tailored to protect not merely antiquities and Buddhist utensils but buildings and structures of shrines and temples.

In 1929, the newly-introduced National Treasures Protection Act superseded the 1897 Act and combined movable and immovable properties together into a single category: National Treasures.

The first legislation to protect historic sites was the Historic Sites, Areas of Scenic Beauty and Natural Monuments Protection Act of 1919. The act originated in the civil movement to protect *tennenkinenbutsu*, Natural Monuments, (translation of German term - Naturdenkmal).

In the Historic Sites, Areas of Scenic Beauty and Natural Monuments Protection Act of 1919, the concept of *Meishou*, literally a renowned site, Area of Scenic Beauty was introduced, for

the first time in the legislative framework in Japan. However, meishou included not only scenic spots but sites associated with popular poems or typical scenes depicted in pictures. *Meishou* can be said to be an early and typical Japanese perception of cultural landscape.

In 1950, new legislative framework for historic preservation was launched by the enactment of the Cultural Properties Protection Act, which superseded both the National Treasures Protection Act of 1929 and the Historic Sites, Scenic Beauty Areas and Natural Monuments Protection Act of 1919. A new criterion of 'Cultural Properties' was created and combined all the concepts such as historic buildings, sites, monuments, and objects.

The Cultural Properties Protection Act has a broader perspective than previous legislations, because it includes new categories like Site of Archaeological Interest and Intangible Cultural Properties into the concept of cultural properties.

The 1950 Act was amended in 1975 to include conservation areas and building sites into the concept of cultural properties. The latter indicates that the setting of the historic buildings is regarded as being of equal importance as the individual historic buildings.

2. Categories of Cultural Properties

Today, Cultural Properties, the new concept created by the 1950 Act, are classified into seven categories, according to the categories shown below:

Tangible Cultural Property; architectural structures, fine and applied arts such as pictures, sculptures, books, archaeological specimens, historical materials, etc. Tangible Cultural Property of national importance is designated as Important Tangible Cultural Property by the central government and most important ones as National Treasures.

Intangible Cultural Property; theatrical performances, music, craft techniques, etc. Intangible Cultural property of national importance is designated as Important Intangible Cultural Property by the central government.

Folk-cultural Property; food, clothing and housing, religion, manners and customs relating to annual events, and other tangible properties and clothes, implements, and furniture used in connection with intangible folk-cultural properties. Folk-cultural Property of national importance is designated as Important Intangible Folk-cultural Property or Important Tangible Folk-cultural Property.

Monuments which are divided into three categories i.e. Historic Sites, Places of Scenic Beauty and Natural Monuments.

a) Historic Sites; Shell mounds, tombs, castle remains, old houses, etc.
b) Places of Scenic Beauty; gardens, bridges, ravines, seashores, mountain, etc.
c) Natural Monuments; animals, plants, and minerals.

Monuments of national importance are designated as Special Historic Sites, Special Places of Scenic Beauty or Special Natural Monuments.

Groups of Historic Buildings;

post towns, castle towns, farming and fishing villages, etc. Groups of Historic Buildings are demarcated by municipal governments as Preservation Districts for Groups of Historic Buildings out of which national government selects Important Preservation District for Groups of Historic Buildings.

Cultural Properties Conservation Technology; techniques for repair, restoration, as well as production of materials for preservation of cultural properties, some of which are selected by the national government as Designated Conservation Technology.

Buried Cultural Properties; archaeological sites which have not yet been excavated, status of a certain cultural properties being buried in the earth.

Table 1 gives an overview of the number of items selected and/or designated as cultural properties by the national government as of August 1, 1995. This number has been steadily increasing to reflect advances in scholarly research, new archeological discoveries, and the changing cultural milieu.

The national government has devised a variety of measures necessary for the preservation and use of nationally selected or designated cultural properties including regulations, such as prohibitions on any alterations to their existing state, and the provision of subsidies from the national treasury for their preservation or repair.

The selection and designation of cultural properties is made by the Minister of Education based on the findings of the Council for the Protection of Cultural Properties.

3. Protection of Buildings, Group of Buildings and Historic Sites

Buildings

As of August 1, 1995, the national government has designated 3,540 buildings as either Important Cultural Properties or National Treasures.

About 90 percent of the designated buildings are made of wood and require major or minor repairs or restorations from time to time. Most conservation projects, except for minor repairs, are carried out by the building's owner or the organization entrusted with its safekeeping using subsidies granted by the national government. Because almost all the historic buildings in Japan are made of wood and in many cases have roofs of thatch, cypress bark, or other plant matter, they are extremely vulnerable to fire. For this reason, the Agency for Cultural Affairs provides the necessary subsidies to install fire alarms and other fire-fighting equipment and takes other measures required for their protection.

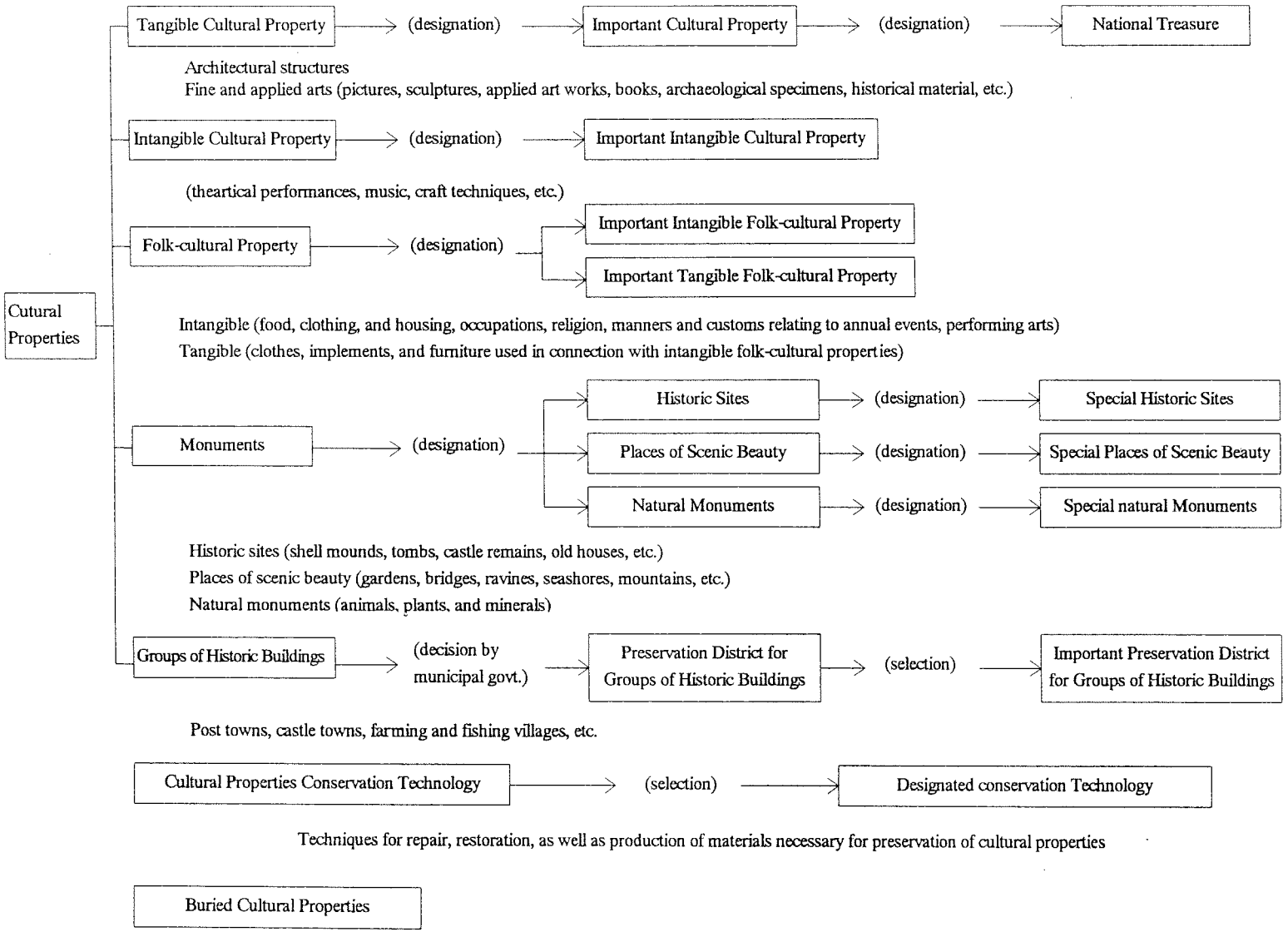
In addition to the types of buildings just listed, architectural structures related to industry, transportation, and public works which played a major role in Japan's modernization process are being torn down as a result of technological innovations and changes in industrial structure. The Agency for Cultural Affairs is studying ways to give special status to these structures that were once the backbone of Japanese modernization and are now in the process of being lost and by preserving them as "monuments of the Japanese modernization period" with the idea

Table 1. Number of Cultural Properties Designated by the Japanese Government (as of August 1, 1995)

Designation	Important cultural properties	11,907	National treasures	1,042
	Fine and applied arts	9,782	Fine and applied arts	835
	Buildings	2,125	Buildings	207
	Historic sites, places of scenic beauty and/or natural monuments	2,514	Special historic sites, places of scenic beauty and/or natural monuments	157
	Historic sites	1,339	Special historic sites	57
	Places of scenic beauty	260	Special places of scenic beauty	28
	Natural monuments	915	Special natural monuments	72
	Important tangible folk-cultural properties	185		
	Important intangible folk-cultural properties	162		
	Important intagnible cultural properties	(individuals)	(groups)	
	Performing arts	28 specific skills	40 individuals	11 (collective recognition)
	Craft techniques	29 specific skills	40 individuals	13 (group recognition)
Selection	Important Preservation districts for groups of historic buildings	40		
	Selected Conservation Technologies	31 specific skills	34 individuals	15 groups

Note: A given place may fall into more than one of the three categories of historic site, place of scenic beauty, and natural monument. To avoid repetition, any such place is only counted in one category.

Table 2 System for the Protection of Cultural Properties



of eventually designating some of them as cultural properties. As of now, three such structures, the Fujikura reservoir and aqueduct in Akita Prefecture, the railway through Usui Pass in Gunma Prefecture, and the Yomikaki power plant in Nagano Prefecture, have been designated as Important Cultural Properties.

Monuments

"Monuments" is the collective term given to the following types of cultural properties by the 1950 act.

1. Historic Sites: Shell mounds, ancient tombs, the sites of palaces, castles, and monumental dwelling houses, and other sites which possess a high historical or scholarly value for this country.
2. Places of Scenic Beauty: Gardens, bridges, ravines, beaches, mountains, and other places of scenic beauty which possess a high artistic or aesthetic value for this country.
3. Natural Monuments: Animals, plants and geological features and minerals that possess a high scientific value for this country.

The national government designates notable items in these three categories and seeks to preserve them. Those which are of particularly high significance are designated as "special historic sites," "special places of scenic beauty," and "special natural monuments," respectively.

Under the terms of the Law for the Protection of Cultural Properties, any alterations to the existing state of an area designated as a historic site, or any activities that will affect its preservation require authorization from the Commissioner for Cultural Affairs. The national government is required to indemnify owners and others for any loss to property rights which exceeds a specified limit that results from such restrictions. As a rule, however, it seeks to compensate owners by providing subsidies from the national treasury for the purchase of such sites by the local government. To ensure that historic sites are widely used, the national government also provides subsidies for their upkeep and repair.

Group of Buildings

A 1975 revision to the Law for the Protection of Cultural Properties launched a system to extend protection to groups of traditional buildings, castle towns, post-station towns, towns built around shrines and temples, and other areas of historical importance throughout Japan. Cities, towns, and villages designate certain areas as Preservation Districts for Groups of Historic Buildings based on municipal ordinances; the national government then selects those of high value for protection as Important Preservation Districts for Groups of Historic Buildings and provides financial support and technical assistance for municipal preservation projects.

Municipalities formulate policies to protect Preservation Districts for Groups of Historic Buildings, such as regulating activities that might alter their existing state, based on ordinances. The Commissioner for Cultural Affairs or the prefectural board of education provides the municipalities with guidance and

advice on the preservation of these districts and also grants subsidies for their custody and repair as well as for improvements to buildings other than those officially designated to bring them into harmony with the surrounding historical atmosphere.

As of August 1, 1995, 40 districts in 35 cities, towns, and villages have been selected as Important Preservation Districts for Groups of Historic Buildings for a total of nearly 1,943 hectares. Nearly 5,840 individual buildings have received special designation as Historic Buildings.

Cultural Properties of Local Importance

Besides the cultural properties of national importance, every Prefectural and local government designates the cultural properties of Prefectural importance by its own ordinance. Consequently, Japan has three-tier designation system for protection of cultural properties.

As of 1 May 1992, 47 Prefectural governments and 11 metropolitan municipalities altogether designate 2,197 architectural structures, 2,928 Historic Sites, 241 Places of Scenic Beauty and 2,826 Natural Monuments and some 3,000 other local governments designate 6,252 architectural structures, 11,199 Historic Sites, 797 Places of Scenic Beauty and 9,413 Natural Monuments.

As far as the archaeological heritage is concerned, some 300,000 sites are listed as sites of special archaeological interest, Buried Cultural Properties. Those who wish to develop the site should notify the local government of the plan. In 1986, the local governments received 17,760 notifications, among which about 5,600 sites were excavated largely by the developers' expenses. Technical report for the excavation is requested for each archaeological site. Total expenses for the excavation in 1986 was 48.8 million yen (0.44 million US$).

4. Policies and Budget

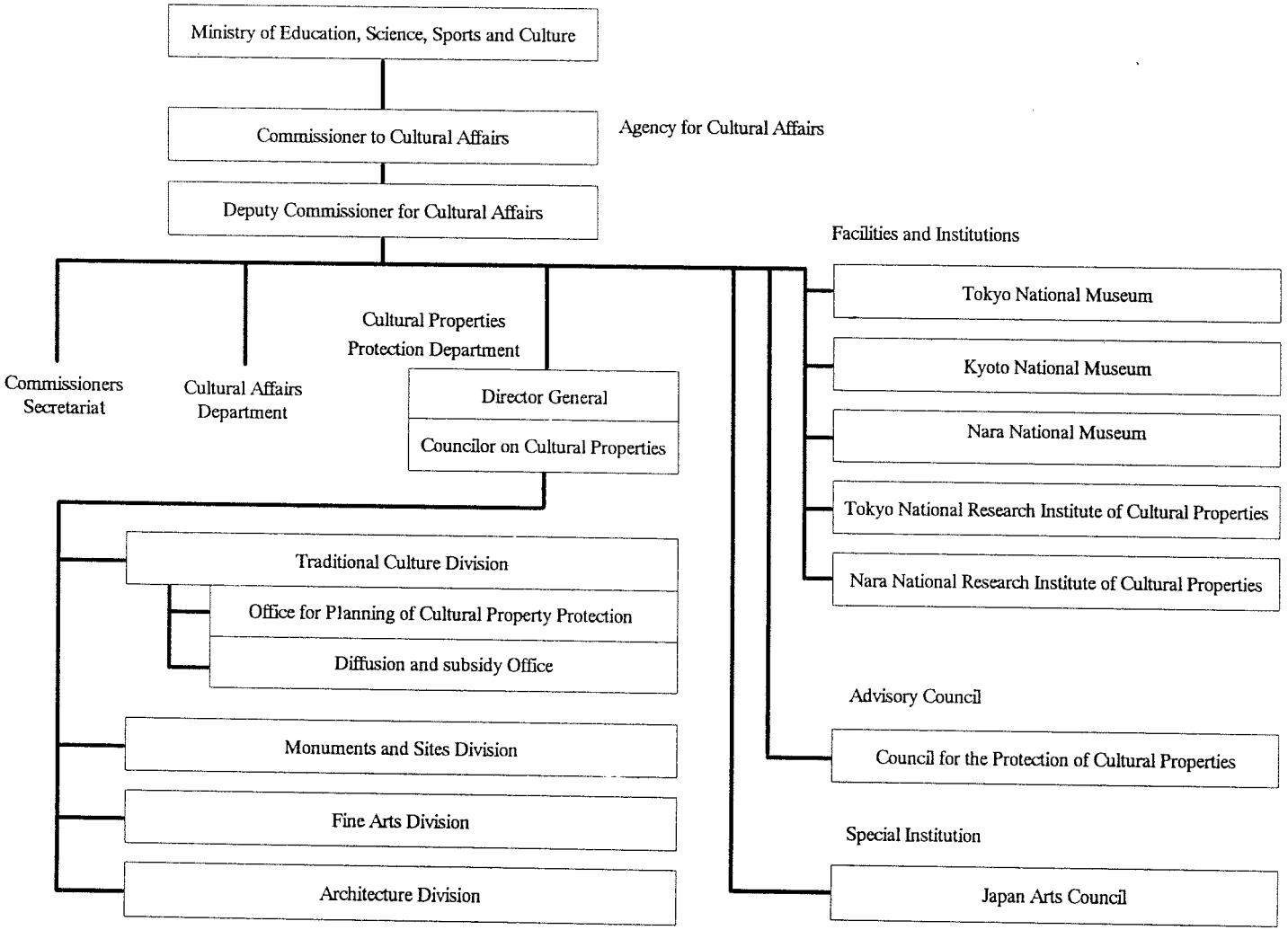
The total budget for the Agency for Cultural Affairs, sole central government agency responsible for preservation of cultural properties of national importance, during fiscal year 1995 is 66.765 billion yen, or 0.09 percent of Japan's general accounts budget of 70.9871 trillion yen. Of this amount, 73.7 percent, or 49,240 billion yen, is used to protect and preserve Japan's cultural properties.

More than 95% of local governments have passed ordinances to protect the cultural assets within their jurisdiction that have not been designated as cultural properties by the national government. Under these ordinances the local governments designate items that are of value to the community and devise measures to preserve and use them. In many cases they provide subsidies to owners for the custody, repair, and public display of the cultural properties in their possession. They also facilitate research and public exhibitions of cultural properties by establishing art galleries, museums, and historical and ethnographical archives; undertake archeogical excavations; and promote the study of cultural properties as part of "social education" (extracurricular youth and adult educational activi-

Table 3 Outline of Tax Incentives Related to Cultural Properties

Provision	Description		Fiscal Year Provision Went into Effect
Exemption on taxable gains	No tax is imposed when a movable property or building designated as an important Cultural Property is transferred by an individual to the national or local government.	Tax exemption (income tax) National Government; Tax exemption (income tax) Local Government	April 1972 April 1975
	A 50% tax reduction is applicable when a cultural property which is the equivalent of an important Cultural Property such as an item of Important Tangible Folk Culture is transferred to the national government.	50% tax reduction (income tax)	April 1992
Special deduction on capital gains	Land designated as an Important Cultural Property, a Historic Site, Place of Scenic Beauty, or a Natural Monument, if transferred by an individual or an organization to the national or local government, is eligible for a special deduction or a claim of capital loss of up to 20 million yen.	Special deduction of up to 20 million yen (income tax) Capital loss of up to 20 million yen (corporate tax)	April 1970
Reduction of inheritance tax	In the case of the inheritance of a private house and its land designated as an Important Cultural Property, the estimated value is reduced for tax purposes.	Estimated value of the inheritance reduced by 60 percent	January 1985
Exemption of land value tax	No land value tax is imposed on Important Cultural Properties, Important Tangible Folk-cultural Properties, Historic Sites, Places of Scenic Beauty, Natural Monuments, or on certain land attached to cultural properties designated by local governments or within Historic Preservation Districts.	Tax exemption	January 1992
	The taxable value is reduced on land attached to certain cultural properties which shoud be treated the same as tax-exempt properties and preserved and utilized.	50% reduction in the land value for tax purposes	January 1992
Exemption of the fixed assets tax, special land holding tax, and city planning tax	No fixed assets tax, special land holding tax, or city planning tax is imposed on a house or its land which has been designated as an Important Cultural Property, Important Tangible Folk-cultural Property, Historic Site, Place of Scenic Beauty, Natural Monument, or is recognized as an important art object.	Tax exemption	April 1950
	No fixed assets tax or city planning tax is imposed on a tradional structure which is within an Important Preservation District for Groups of Historic Buildings (except those engaged in entertaining activities) and has been so notified by the Minister of Education.		April 1989

Table 4 Organization of the Agency for Cultural Affairs



ties) and school education programs; conservation appreciation activities; and a wide range of other activities aimed at furthering interest and awareness among the gengral public.

In addition, local governments make preliminary studies of cultural properties that are being considered for designation by the national government and assist and supervise local groups responsible for protecting intangible folk-cultural properties. Many have also been entrusted with the safekeeping of cultural assets that have been designated as Important Cultural Properties or National Treasures by the national government.

Local expenditures on the protection of cultural properties amount to 87.6 billion yen (US$ 876 millin) in local governments and 50.2 billion yen (US$ 502 million) in prefectures in the fiscal 1993.

To encourage ownership of cultural properties by the national or local government and promote their preservation and use, the national government has devised a system of tax incentives that includes tax exemptions on capital gains and reduction of inheritance tax. The major provisions are outlined in Table 3.

5. Administrative Framework

The present administrative system for the protection of cultural properties in Japan was developed in the Meiji era (1868-1912) and has been revised several times to reflect the times. In the process, protection has been extended to a broader variety of cultural properties, and much thought and consideration have been given to the methods of doing so. The national and local governments, owners of protected properties, and the Japanese people have joined forces not only to preserve Japan's cultural properties and pass them down to the next generation but also to ensure that they are publicly displayed and put to good use.

6. Some Features of Sites and Monuments in Japan

There are several features in the designated sites and monuments in Japan.

First, because historic preservation in Japan was originated the protection of old shrines and temples, emphasis had been put onto the preservation of old shrines and temples compounds. Majority of designated Important Tangible Cultural Properties (60%), therefore, are religious buildings followed by indigenous dwellings (17%) and castle buidlings (7%).

Recently, Japanese-style grand buildings of late 19 century and early 20 century and historic sites of importance from industrial archaeology's point of view began to be considered as important cultural heritage and number of designated Cultural Properties is getting larger.

Secondly, since vast majority of Japanese buildings were and still are made of wood, periodical restoration is inevitable. In case of thorough restoration, structures are dismantled to each timbers and scrutiny of traces of former structural composition is covered to study the history of the building before restore the

structure to the original style or the present design. Almost all the members like wood beams and columns are retained with sophisticated reinforcement measures. Together with the restoration, academic research report of the structure and the record of actual restoration process is published.

Although prewar designation of Historic Sites was strongly biased by the 'Imperialism' which laid top priority on the sites related to imperial family, postwar designation is entirely archaeological/historical. Most of designated Historic Sites are prehistorical (41%), followed by ancient (22%), 'edo' era (17C to early 19C) (21%) and medieval (15%).

Recently, utilization as well as preservation of historic sites is becoming one of main topics. Local Historical Park Program has launched to reconstruct, on the original scale, of buildings and other structures, to provide a physical, visual experience of the former appearance of historic sites.

Lastly, Place of Scenic Beauty, one of three categories' of Monument, is unique to Japanese concept of cultural heritage. Places of Scenic Beauty retains either natural beauty such as seashores, waterfalls, and islands, most of which are associated with famous poem, or man-made landscape such as gardens, parks, and bridges and its environs. More than half (51%) of Places of Scenic Beauty designated by the national government are temple's or private gardens.

PART II - SELECTED PAPERS

Notes

Historic conservation efforts for monuments and sites within Japan might not be well introduced to foreign people, because Japanese experts in these field have written rather few papers in foreign languages. Some five thousands of archaeologists in Japan are producing hundreds of excavation report books every year, but written all in Japanese. Our conservation architects have been concentrating their energy to compile detailed official reports of their repair works, and we share now some 1500 documentation books published since 1930s, which are now essential to understand the thirteen centuries of wooden architectural history in Japan. These are also written in Japanese, but we began recently to add a page of English summary at the end of the book. Though, most of the repair reports have been submitted periodically to ICCROM library in Rome, Professor Knut E. Larsen was the first foreigner who evaluated it as a possible prototype of documentation which meets to the obligation of the Article 16 in the Venice Charter, in his "Architectural Preservatiaon in Japan" published by ICOMOS International Wood Committee in 1994. An unique language, Japanese, might be useful to keep our cultural diversity, but we also well know that it can be a big barrier against mutual communication in this small planet.

Here are gathered several representative English papers written by Japanese professors which depict general features or important topics in the architectural and archaeological preservation fields, based on the above huge amount of Japanese reports. The papers on archaeological preservation are focusing especially to the recent trend of rescue excavations, which has grown up to huge work corresponding with the economic development. Japanese historic gardens are rather well introduced both by Japanese and foreign scholars, and here a list of 22 books in foreign languages is added.

Japan has a century of history of modern conservation system since 1897. These papers, and also the books in the list, are arranged in chronological order.

(*Kanefusa Masuda*)

The Preservation and Restoration of Wooden Monuments in Japan

Masaru Sekino *

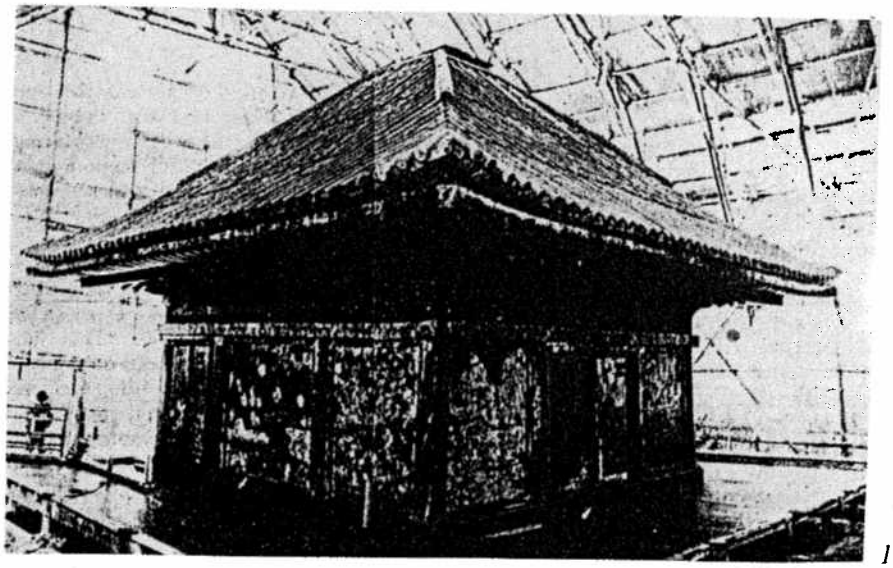
By definition a structure built of organic materials has an average life span much less than one built of stone, brick or other relatively stable inorganic substance. The light, traditional Japanese home is considered to have an average life of forty years under urban conditions. Any such buildings older than 100 years are very scarce. Old farm-houses which used large timbers last longer, and Shinto shrines and Buddhist temples longer still. Nevertheless, with normal maintenance (including periodic re-roofing), a wooden building rarely lasts longer than 250 years; in the temperate zone, under very favourable conditions, 300 years seems to be the maximum.

Biological agents such as bacteria, moulds and insects live off wood. Fire is a constant hazard. Wood also reacts to the presence or absence of moisture - swelling, shrinking and cracking - and other climatic changes. In countries where wooden structures and important to their cultural heritage the necessity for their preservations and restoration have imposed criteria to take these factors into account. Measures thus tend to be more radical than those required for masonry buildings.

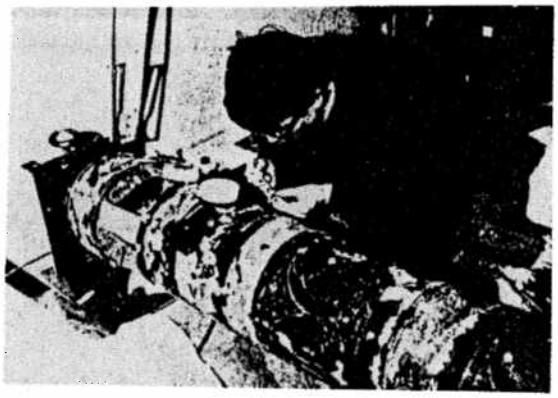
In reconstruction the general principle is to use the same kind of wood as found in the original. When some of the wood used, e.g. pine, was not very durable, as it is particularly subject to insect attach or to rot, the trend in the past was to replace it with more resistant species. Today, however, new developments in chemical treatment make this less necessary.

While in principle wood should not be replaced by reinforced concrete, there are exceptions to this rule. In the interest of saving a large beam from the original structure - no longer capable of supporting its load - it may be hollowed, and a stressed concrete beam placed within to preserve the appearance of the original.

In Japan another exception is made in the case of castles built originally of plaster-covered wood which were destroyed through fire or other causes. They have been reconstructed in reinforced concrete (which is cheaper as well as being fire-proof and not subject to biological attack) from measured drawings. photographs and other reliable information, and their external appearance has not been changed. This, of course, results in a sacrifice of authenticity. Several castles classified as historical monuments



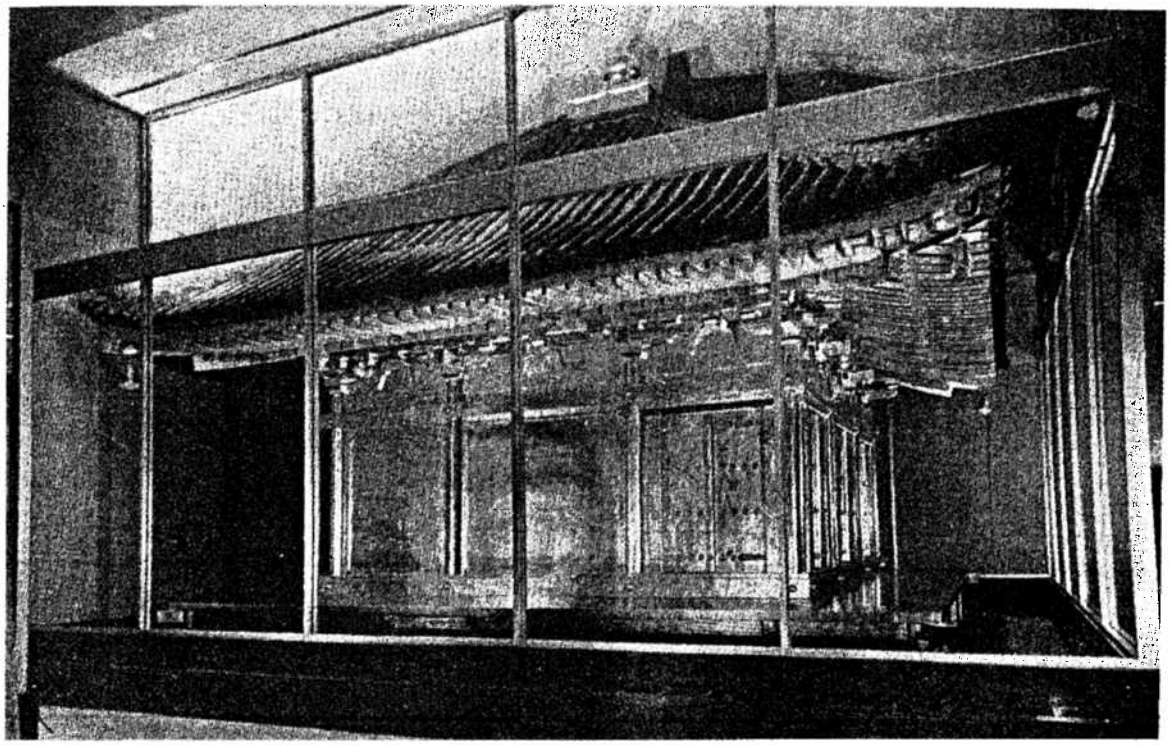
1a



1b

1c

Fig.1. The Golden Hall of Chuson-ji Temple, Hiraizumi(Japan).
(a) After the removal of the early wooden shelter, a temporary shelter allowed work to continue on the hall itself and on a new fire-proof, reinforced-concrete shelter to protect it.
(b) Restoration of the gilt and lacquer ornamentation--a technician examines a fragment detached from the pillar.
(c) The sanctuary after restoration. Traditional materials and techniques were used.
(d) The Golden Hall in its present shelter. (Photos:Sekino)



Id

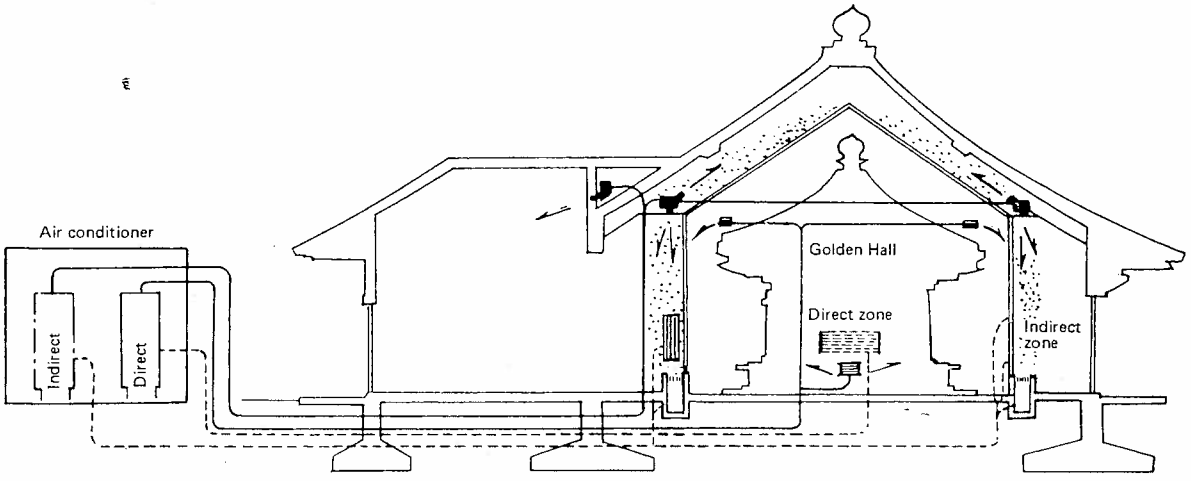


Fig.2. Design of the new shelter for the Golden Hall, Chuson-ji Temple, which is air conditioned, fire proof and earthquake-resistant

and destroyed during the Second World War were reconstructed in this way, but this practice has been limited to castles which, in view of their original role as fortresses, have some justification for being rebuilt in concrete. Otherwise, wood has been used in duplicating the original, as was done in the case of the Golden Pavilion in Kyoto (built during the Muromachi period), after its complete destruction by fire.

Four principal methods are used in the case of wooden buildings whose natural life has already expired: (a) dismantling and reassembling, introducing new elements as required; (b) sheltering; (c) periodical reconstruction following the original design; (d) construction of a scale model.

Dismantling and Reassembly

The restoration of wooden buildings usually starts by dismantling them completely. Each part is carefully examined, any that are broken or rotten are completely or partly replaced, and the building is reassembled. As much as possible of the old material (especially if decorated) is preserved with care.

A wooden building thus continues to exist at the cost of an inevitable, gradual loss of its original parts - a kind of metabolism through which the old gives place to the new; while preserving its original forms, it slowly loses its original material step by step. This is inevitable when restoration takes the form of dismantling and reassembly.

Sheltering

It is not uncommon for a small building, a model, or a part of a building to be preserved and displayed in a museum. There are also examples of buildings being preserved in fairly good condition on the original site, but sheltered by a later structure. Both are forms of indoor preservation in which the building is treated like a museum object. Modern technology can provide a large span shelter if it is considered essential to preserve a timber building in perfect condition.

A good example is the Golden Hall of Chuson-ji Temple at Hiraizumi, Japan, built in 1124. This is a small lacquer-covered Buddhist hall. Its interior decoration is a masterpiece, and soon after it was built, a wooden shelter was erected to enclose it. However, the results were unsatisfactory in one respect: the shelter was too small to allow the building to be seen in perspective. The Golden Hall was recently dismantled and restored, and a new, air-conditioned shelter of reinforced concrete was built for it (*Fig. 1, Fig. 2*).

Periodical Reconstruction

The main shrine of Ise (the oldest Shinto shrine of Japan) is preserved on the periodical reconstruction principle, based on religious tradition. For over 1,200 years, an identical new building has been erected every twenty years on one or other of a pair of sites of similar size. The old shrine is destroyed soon after the new one is built. All parts are perfect copies, so that the original design and proportions are always retained. Other shrines were similarly maintained until the Middle Ages, when forests were still abundant in Japan

and large timbers were available. Since the Momoyama Period (1568-1615), however, periodical reconstruction has gradually ceased, and partial or complete dismantling and reassembly are the principal methods of preservation.

Practical Procedures

Maintenance

Wooden buildings must be inspected regularly, to guard against damage provoked by wind, earthquake, rain, damp and insects, the major sources of deterioration.

Roof

The roof is the most exposed part, subject to attrition by natural forces, especially rain and wind. Hence roof repairs (or re-roofing) usually head the list of repairs.

Partial Dismantling

The edges of eaves, rafter ends, and the roof covering may decay; sometimes even the framework supporting the roof rots. The surrounding veranda and railings may also need repairs. These parts are dealt with by partial dismantling, the main framework of the building being left untouched. If piles have sunken irregularly they are levelled and the slackened framework is tightened up.

Construction of a Scale Model

Famous tea-houses have frequently been reproduced as full-scale models, which is fairly common practice among lovers of the tea ceremony. There also exists a scale model of a pagoda which has been preserved in a Buddhist monastery for over 1,200 years; it was built by a master carpenter before the actual pagoda itself. To show all details properly the scale of models should be larger than one-tenth; a one-twentieth or smaller scale model usually has to omit a lot.

Construction or decoration can also the reproduced in models, as documentation to supplement measured drawings and photographs. A model of a coloured pattern or painting, showing its condition before and after restoration, is especially useful.

Complete Dismantling

Complete dismantling is necessary if a building is on the verge of ruin. It demands all kinds of repair techniques (see below).

Repainting

If paint is peeling slightly, exfoliation can be prevented by various modern techniques; if advanced, there is no remedy but repainting. Repainting usually accompanies major repairs. Lacquerwork is often carried out separately.

Dismantling and Reassembly

Even if maintenance has been carried out properly, sooner or later complete re-roofing will be necessary - usually accompanied by minor repairs elsewhere. A new cycle of maintenance then begins until it is time for a second re-roofing. This is the ideal as well as practical way of maintaining wooden buildings in a condition as close to the original as possible.

However, more frequently than not, maintenance is neglected because of lack of money or proper

supervision. Re-roofing always tends to be behind time, and the damage steadily worsens; frequently, it is only after a severe storm or an earthquake that the owner thinks about partial dismantling. But by then, the building may be on the verge of collapse, and the only hope is complete dismantling and restoration.

Temporary Roof

A building which requires major repairs or dismantling should be covered entirely by a temporary roof. Large spans of scaffolding are covered with zinc-coated corrugated iron of fibre-glass reinforced sheeting, with tiers of catwalks at vertical intervals of 1-1.5 metres under the eaves. A temporary roof gives protection and allows investigation and repairs under all weather conditions.

Survey and Measured Drawings

Wood is subject to warping. Drawings of a building in its dilapidated state may be of documentary interest, but for repair purposes, measured drawings are needed of the building as it originally was. Three-dimensional photographic surveys are now feasible also; they save time and eliminate the need for scaffolding.

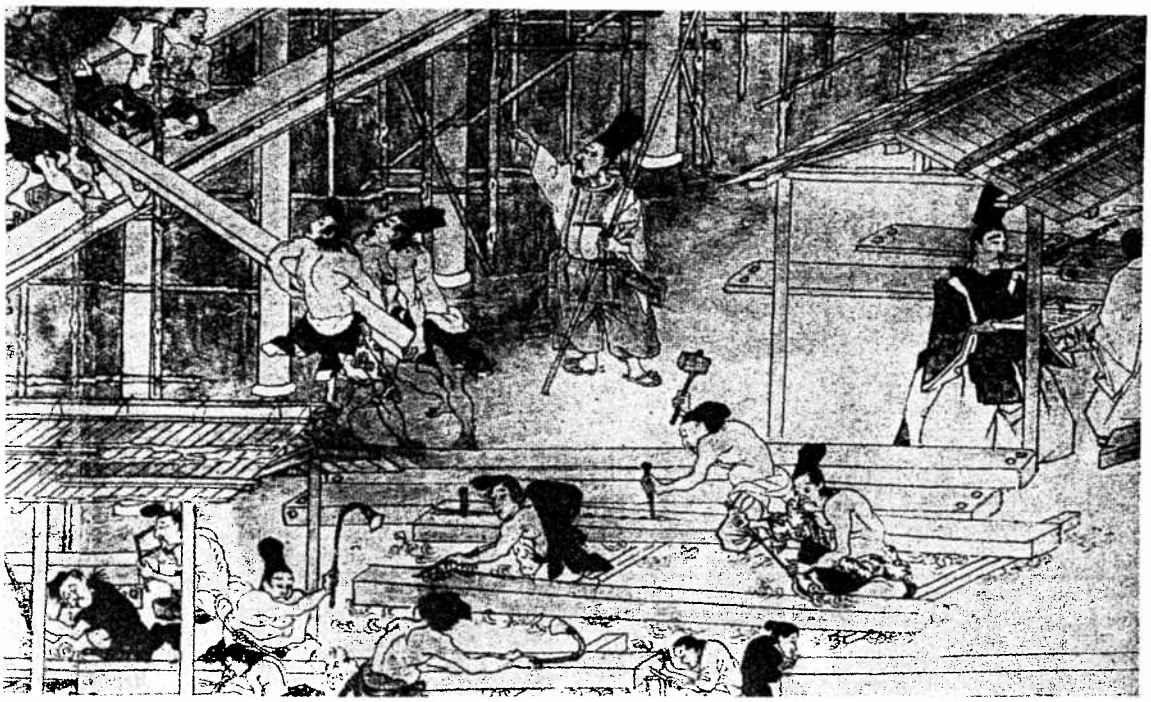
Roofs of ancient buildings in the Far East are characterized by curves. The brackets used to support the curves shrink and become compressed because of drying and the load they bear (particularly at the projecting parts which support the eaves). Rafters are sometimes cut off at the ends through carelessness, and the delicate curved line of the eaves becomes distorted. If that happens, each must be measured and shown on the drawing as it will appear in the restored building.

In other words, the restored roof must be shown on the drawing before work is begun. This demands a thorough knowledge of changes that have occurred in traditional techniques and of the geometric principles involved in the construction of wooden buildings, since the methods used by carpenters to cut lengths and shapes vary over the course of time. The method of sawing wood, the respect for the grain in the curved corner of the projecting eaves, is often regarded as the essence of Japanese carpentry (Fig. 3). The measured drawings to be used by artisans must accordingly be prepared under the supervision of an expert.

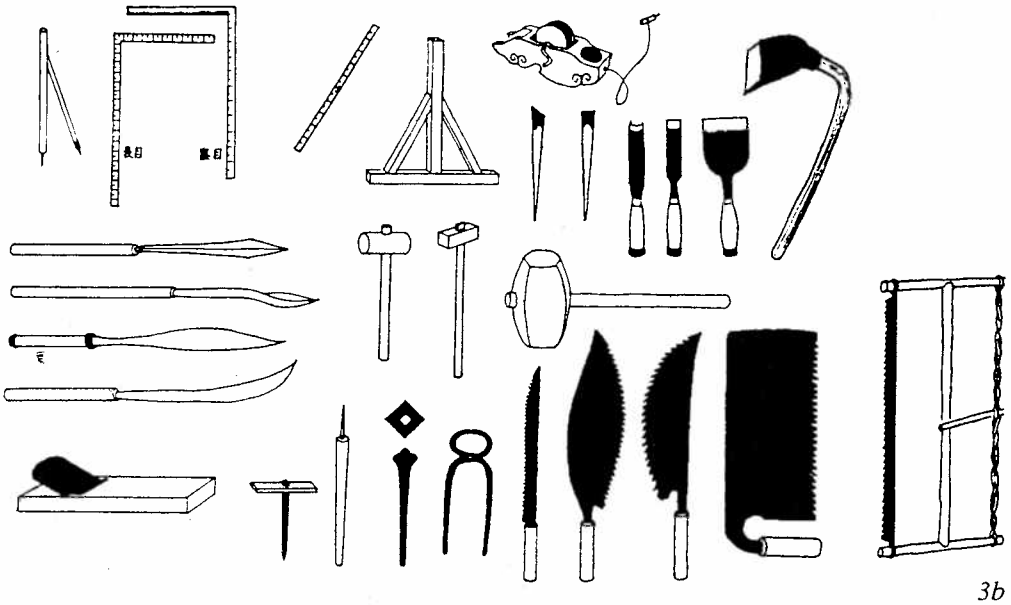
The dimensions of house posts and columns, ties, horizontal bands, rafters and their spacing tended to be more and more strictly regulated by *Kiwari*, a system of philosophical principles that defined classical orders and the proportions of the different elements used in buildings towards the beginning of the Meiji Period (1868-1912). These principles must be kept in mind as a check on accuracy in reconstruction.

Photographs, Rubbings and the Chronological Table

Detailed photographs should be taken of the exterior, interior and the various parts of the building. Rubbings should be taken of mouldings and of wooden parts and metal fittings, special care being taken to record the grain of the timber, nail marks and other traces



3a



3b

Fig.3. Traditional Japanese carpentry.
(a) Scene from the scroll of the Matsugasaki-zinja Shrine(thirteenth century) showing carpenters at work building a shrine.
(b) Traditional tools of the Japanese carpenter.
(Photos;Sekino.)

of workmanship. Photographs and rubbings taken before and during dismantling serve both for the reassembling and as technical and historical documents. They should be catalogued, edited for publication and properly preserved, and combined with ancient plans, sketches, drawings, paintings, documents and records of previous repairs in a chronological table to provide a complete record of the building - changes in location, changes in plans and partitions, later additions, and so on.

Dismantling and Investigation

A small identification plate is first attached to each element of the building. Dismantling begins with the roof and continues slowly and systematically to the foundation, each element being carefully examined and studied. Traces of older repairs can be distinguished from newer ones by the quality of mortises, notches and nail marks, and they help to document the history of repairs. From many points of view, this resembles an archaeological excavation. Graffiti, inkmarks and scribblings may lead to interesting results. If there is a ridge-pole plate, it will bear the date of the original construction or major repairs and the names of the master carpenters. The types of carpenter's tools and the widths of their blades can be deduced from the marks left.

Not all alterations can properly be called restoration, e.g. earthworks to afford protection against floods or damp; substitutions of copper plate in the roof for the original thatched, shingled or cypress bark for economy and fire-prevention reasons; use of rust-proof steel bolts, plates and bars (where they are not visible); reinforcement of the foundations by concrete blocks or slabs.

Elimination of Unwanted Alteration

Ancient buildings might be enlarged, be embellished in later periods, be built of second-hand materials taken from other buildings, or even be reduced in size during earlier reconstructions. All these factors have to be taken into account in deciding how to reconstruct.

Reassembling

After the results of the dismantling investigation have been analysed and the proposals for restorations and alterations are approved, reassembling can begin.

The first step is to separate what is serviceable from what cannot be used again. If perfectly sound, serviceable elements can be used without any particular treatment. If partially damaged or rotten they must be replaced or reinforced. Synthetic resins can be used to bind the old and new materials effectively. Carved and painted wood, if fragile, can be strengthened by injecting synthetic resin and filling hollows with a mixture of the resin and saw-dust. Missing decorative details can be replaced by new ones made by copying patterns from the same building, or from another building belonging to the same period and locality. The details should be inscribed (out of sight) on the new parts. New wood introduced is usually dated with a branding iron. Traditional tools are used to give

the finishing touches, and sometimes ancient tools are specially restored so that their characteristic marks will be reproduced. However, modern machine tools are often used nowadays to lower the cost of labour, particularly where the wood used is not visible, and the final result accordingly is not impaired. Nevertheless, so far as possible traditional techniques are maintained in the actual reassembly.

It is common practice in Japan to paint new wood to match the colour of the old, but paints easily change colour and the result is often disagreeable. To weather a new section, an alternative is to char the surface slightly with a torch and then scratch it with a wire brush. The resulting texture and colour and much less liable to change, and the new wood blends in with the old. Inspection, however, will show the difference between naturally and artificially weathered wood.

Once reassembly is complete, the drawings prepared before dismantling should be used to prepare the drawings of the restored building. Photographs are taken, and an inscribed copper plate is affixed inside, describing the restoration, and indicating its cost, initiator, supervisor, contractor, starting and finishing dates. A summary of the investigation, and drawings, specifications and photographs are incorporated into a report that is published and issued to those concerned.

Unused, old wooden elements of value are stored; those which have ancient inscriptions or graffiti are also stored, or displayed in the museum.

Constituent Materials and Their Preservation

Roofs

The roofs of most wooden buildings in the Far East tend to be steeply sloped, with wide eaves. Leaks that occur during rain storms should be carefully repaired, to avoid the serious cases of rot that are provoked by the growth of moulds and fungi.

Thatched Roofs

Farm houses usually use wheat and rice straw as thatch. It is nor very durable. The best thatch in Japan is made from a grass called *kaya* (Miscanthus). When restoring a thatch roof, the wood and bamboo supports for the thatch should be bound firmly to the wooden frame with straw ropes. Layers of *kaya* grass are then attached to horizontal bars of bamboo. Patching is necessary each spring with fresh straw or grass. This kind of roof lasts from fifteen to twenty-five years. If there is an open hearth, smoke from the fire affects the battens and the thatch, and limits rot and insect pests - making an average addition of ten years to the life of the thatch. At the Shrine of Ise, selected *kaya* grass is smoked before it is used, and the result has been very satisfactory.

Shingle Roofing

Kokera roofing is a refined type of shingle roofing. Thin plates of split cedar or cypress, each about 27 centimetres long, 9 centimetres wide and 3 millimetres thick, are fixed to the roof with the lower 3-4 centimetres exposed to the weather. The shorter the exposed part and

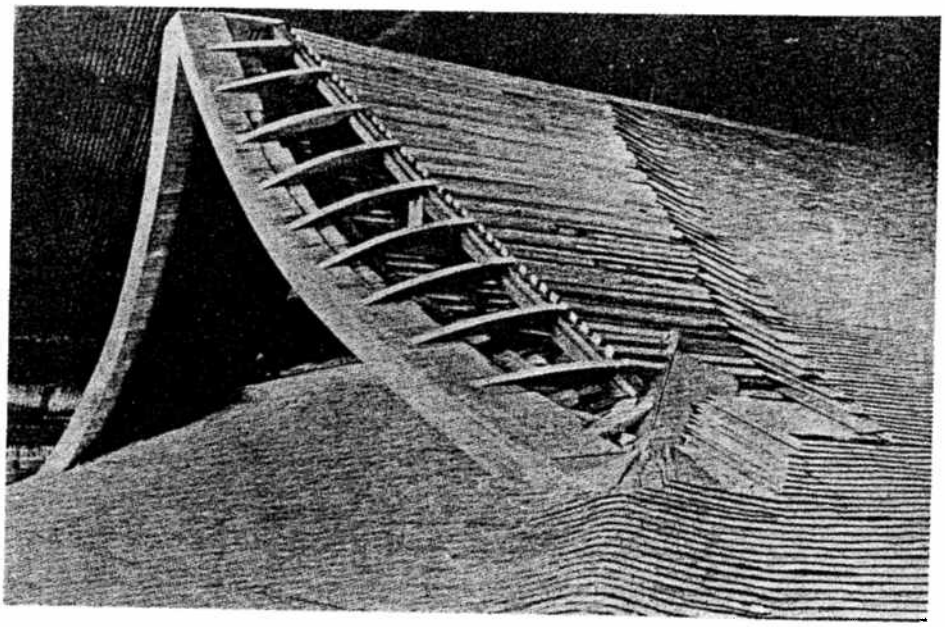
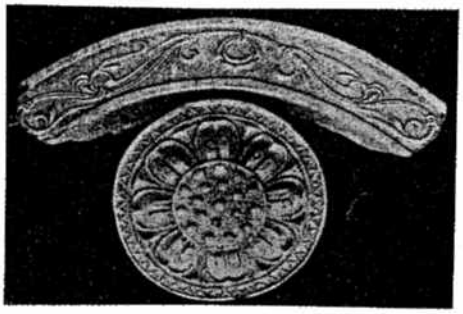


Fig.4. Traditional Japanese shingle (kokera) roofing. (Photo;Sekino.)

5a



5b

Fig. 5. Tile roofing.
(a) Regular tiles, baked, unglazed: alternate courses of convex and concave tiles.
(b) Moulded, ornamental ends of tiles attached at the edge of the eaves. (From the pagoda of the Horyuji Temple near Nara, c. eighth century.)
(Photos;Sekino)

the longer the length of each shingle, the longer the life of the roof, which may last from twenty to thirty years. Shingles should be made by splitting rather than sawing, since the irregular spaces which result between each shingle allow ventilation and prevent water invading through capillary action. Antiseptic treatment to combat fungi, and coating shingles with water-repelling synthetic resin have proved effective. An innovation was the insertion of thin copper plates between shingles at 27 centimetres intervals. The natural corrosion of the copper plate produces blue vitriol (copper sulphate) which spreads over the shingles and helps to control mould and insect damage. It was first applied to the roof of Konchi-in of Nanzen-ji, Kyoto, and the roof lasted for forty years *(Fig. 4)*.

Bark Roofs

Barks are generally waterproof, water-repellant and hard to rot. Cypress bark roofing is typically Japanese. Rectangular sheets of cypress bark are placed in layers (like *kokera* roofing) with only small areas of their lower parts exposed to the weather. Their life span is a little longer than *kokera* (usually from twenty-five to thirty-five years; exceptionally, as long as sixty years). Cypress bark cannot be treated with antiseptics as it is not absorbent.

Baked-clay Tile Roofs

Glazed tiles are waterproof, whereas unglazed tiles may absorb considerable amounts of water and do not last long, particularly if fired at a low temperature. However, well-fired unglazed clay tiles are hard, absorb little water and last well *(Fig. 5)*.

Two types of tile roofing are used in Japan: regular tile roofing and pantile roofing. The former consists of alternative series of concave and convex tiles; the latter is a composite and simplified version of the former, lighter, and simpler to use. The life span of regular tile roofs is estimated at 100 years, that of pantile roofing at about seventy years. Re-roofing requires replacement by about one-half newly baked tiles (about half being weakened by weathering or breaking during the dismantling). New tiles should be ordered from a factory which makes tiles in the traditional way.

Metal Roofs

Japanese roofs are sometimes covered with copper, rarely with lead. Some copper-plate roofs imitate regular tiled roofs, e.g. that of the Mausoleum at Nikko, which lasted for over 300 years. The flat copper-plate roofs of ancient buildings were usually installed as a substitute for the original *kokera* or cypress bark. In the past, this was done to take advantage of the longevity and fire resistance of copper roofing. Flat copper-plate roofing is usually considered to last about seventy years.

Roof-boards and Battens

The usual foundations for roofing are roof-boards or battens which are nailed to rafters. Battens are usually fixed directly to the rafters, but in some buildings of

better quality they are placed on roof-boards which are in turn nailed over the rafters. In either case, they should be treated with fungicides and insecticides.

Roof Frame

When there is no ceiling, the board of the roof and the roof construction system are exposed, and this is taken into account in the design. If there is a ceiling, the roof frame can be made of roughly finished lumber, and unfinished curved timbers can serve as beams. Since such beams are functional and out of sight, strong timbers like pine and zelkova tree are preferred. Since the Middle Ages, the roof frames of Japanese buildings have usually been hidden by ceilings, and the roof frame became independent from the lower part of the building. Hence dismantling of the roof can be carried out without touching the lower framework.

Eaves

In much of the Far East, the eaves of a building project a good deal and keep rain from the walls, openings and verandas, protecting them from damage by rot, frost and dirt. However, of all the parts of a building, the eaves are the most liable to rot. Open-work metal fittings or metal covers nailed to the ends of rafters help to protect them quite effectively from weathering.

Framework of Buildings

Frame

The framework of traditional Japanese buildings consists of columns or posts, beams, penetrating ties and horizontal bands and a series of interconnected rectangular frames made of horizontal and vertical members (Fig. 6). Walls and openings are made between columns. A system of brackets consisting of square bearing blocks and brackets is placed on the top of the column. This type of support was invented in China before the Han Dynasty and was introduced into Japan during the seventh century. It is an elaborate type of cantilever, supporting the deeply projecting eaves that are widespread in the Far East (Fig. 7).

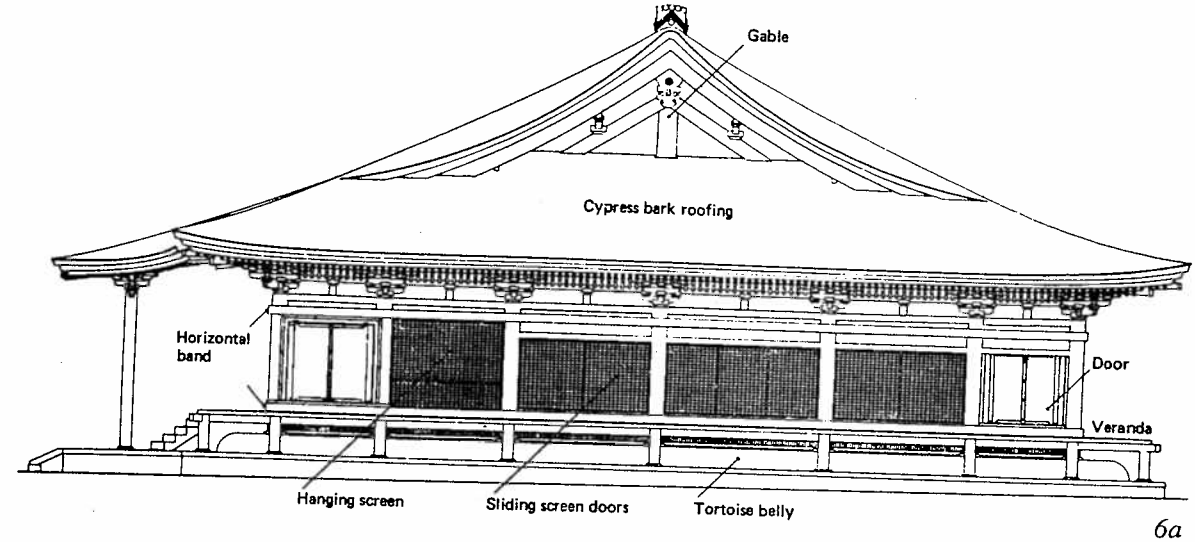
Sometimes columns are shifted during repairs, e.g. a weathered column in the outer wall may be exchanged for another column that was used inside. Sometimes a column is used anew by turning it 45, 90 or 180 degrees in order to turn the unweathered side outwards.

Original cuts tend to be fine and distinct, later ones clumsier, because old wood is often brittle and no longer reacts as fresh, seasoned lumber does to the use of tools. The difference can easily be seen. Mortises and cuts which have become unnecessary may be filled with plugs before reassembly.

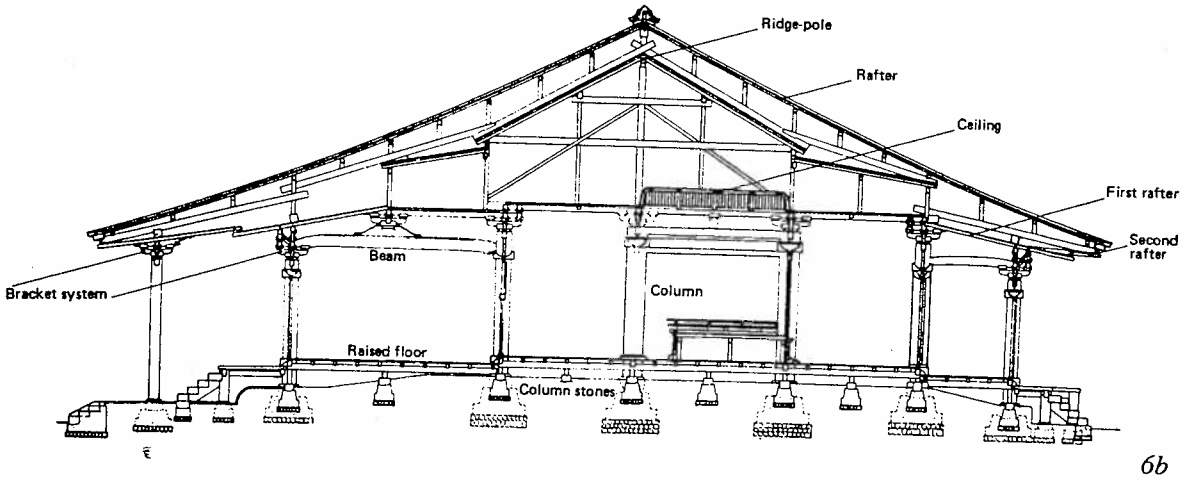
Brackets can vary from the simple to the very complicated, in which function becomes secondary to decoration (Fig. 8).

Complicated systems involve a number of brackets in which the cumulative slight looseness in each joint which results from shrinkage causes major distortions in shape. Adjustment by inserting wooden wedges or lead plates may be necessary when reassembling the bracket system.

The reinforcement of the frame

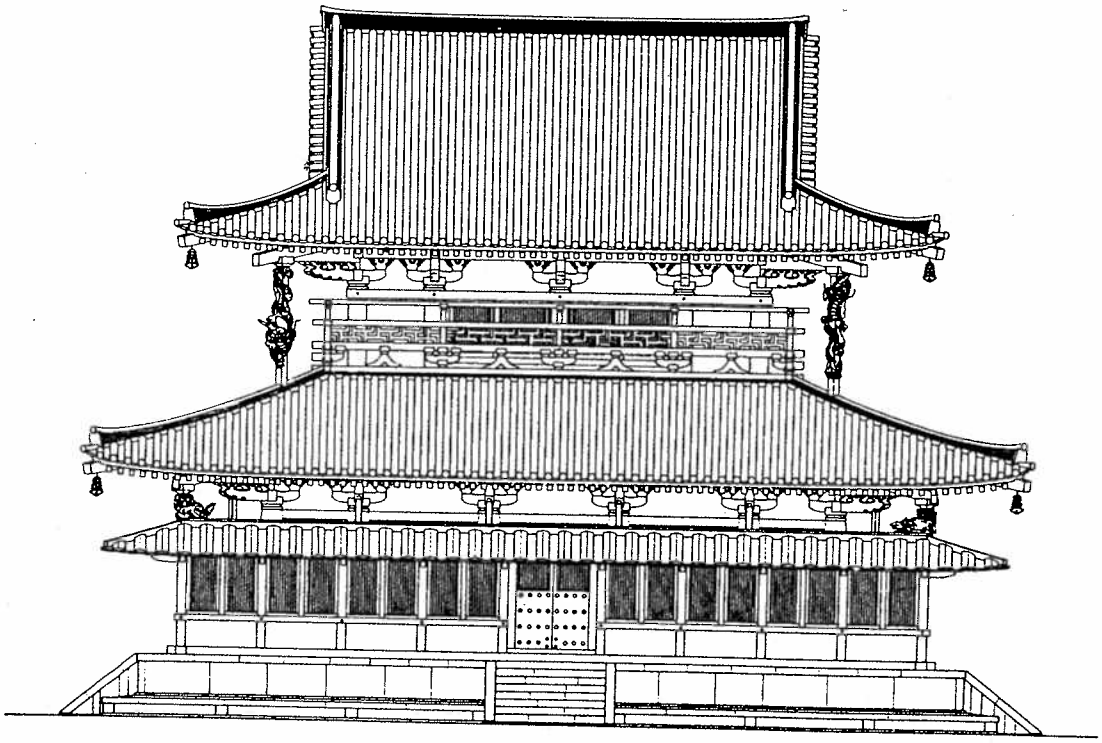


6a

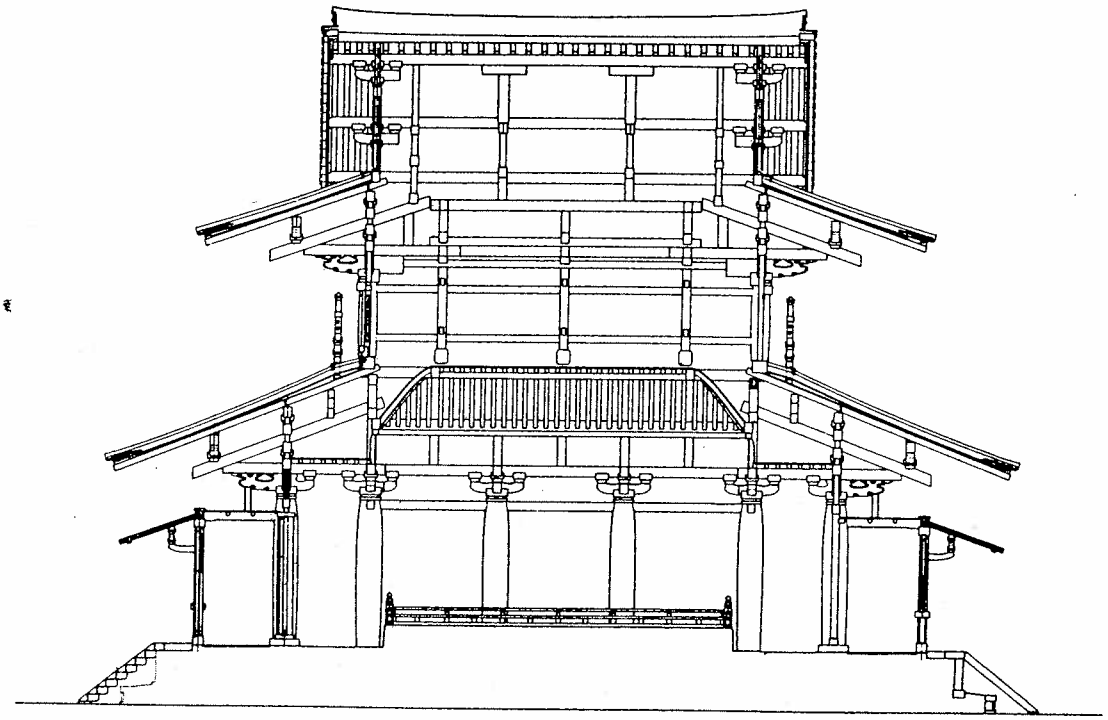


6b

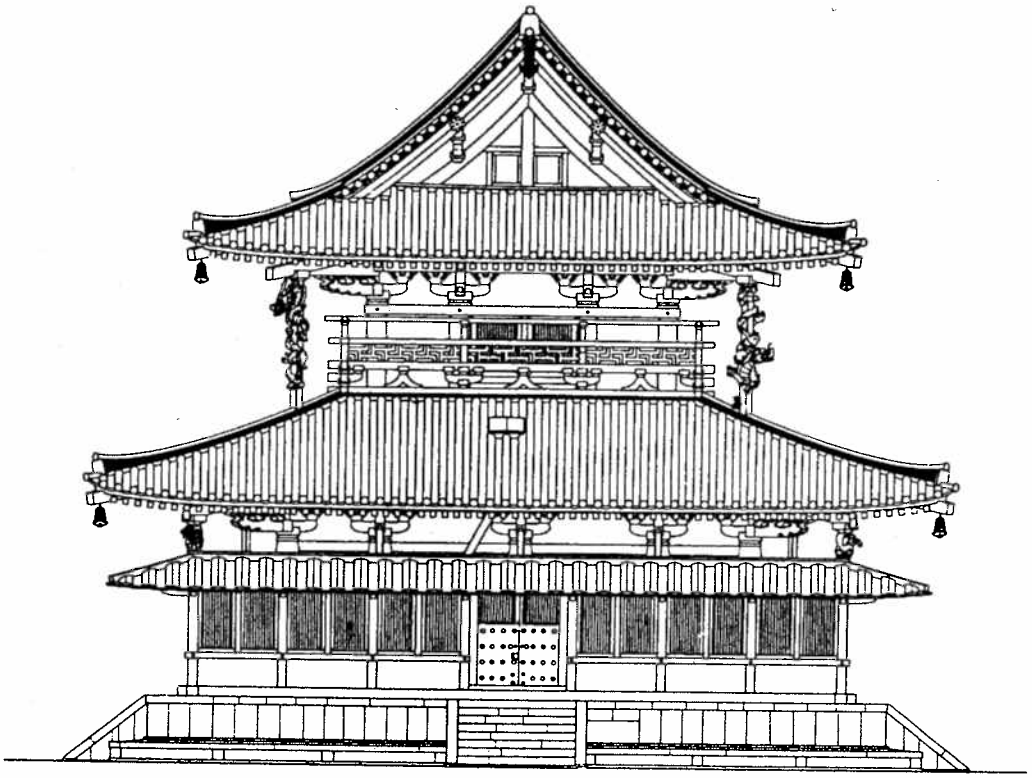
Fig. 6. Framework of a traditional Japanese building (posts, beams, ties, etc.)
(a) Side elevation of the Main Hall of the Daiho-ji Temple in Kyoto (thirteenth century).
(b) Cross-section of the structural framework.



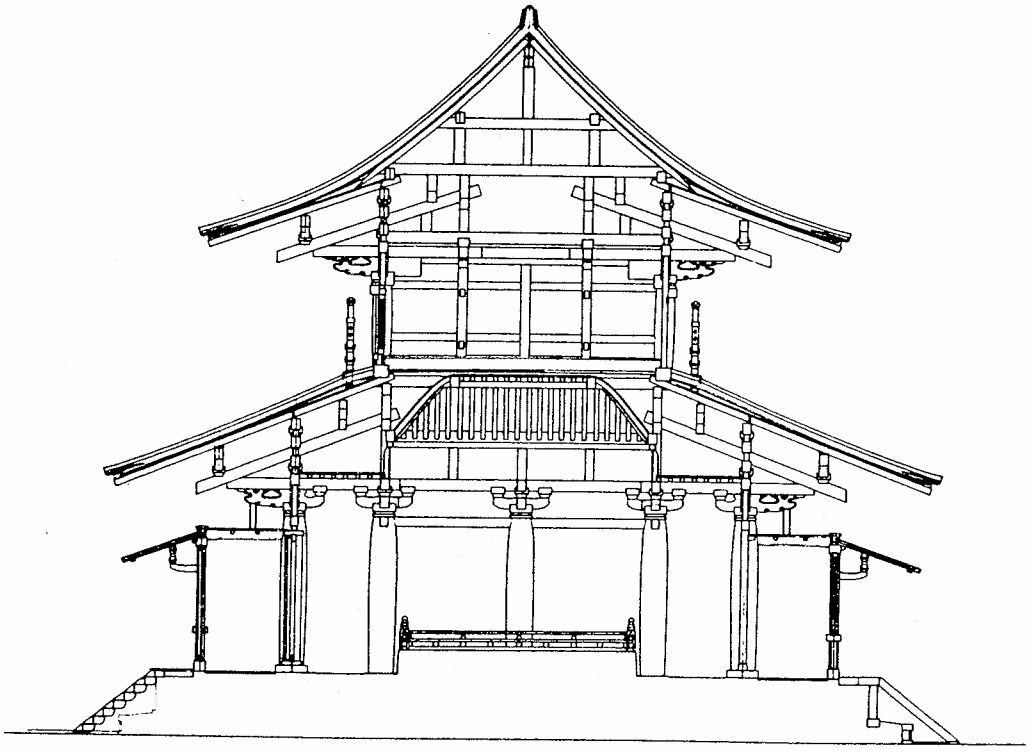
7a



7b



7c



7d

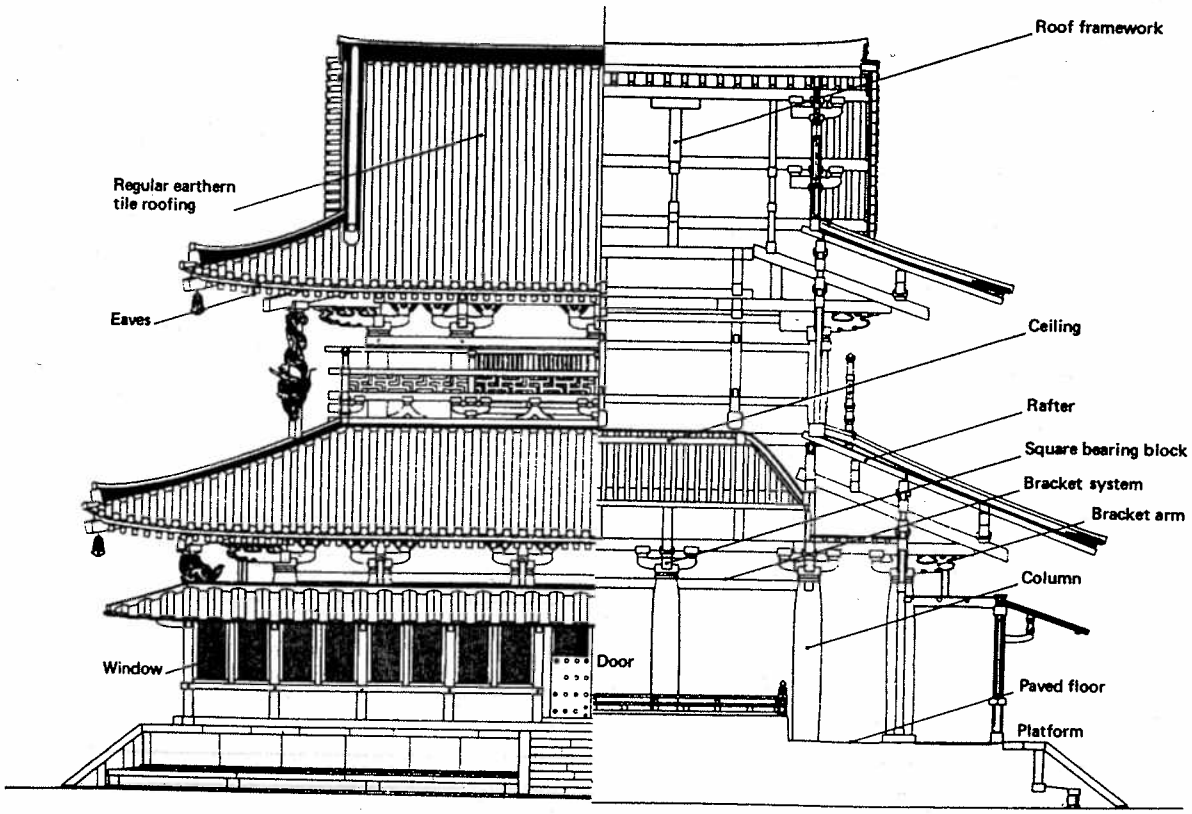


Fig. 7. The Kondo or Golden Hall of the Horyu-ji Monastery, near Nara, founded in 607 A.D. by the Empress Suiko. The architectural style resemble Chinese designs which were current during the sixth century. 7e

(a) Front elevation.

(b),(c) Longitudinal section showing construction features.

(d),(e) End views and cross-section.

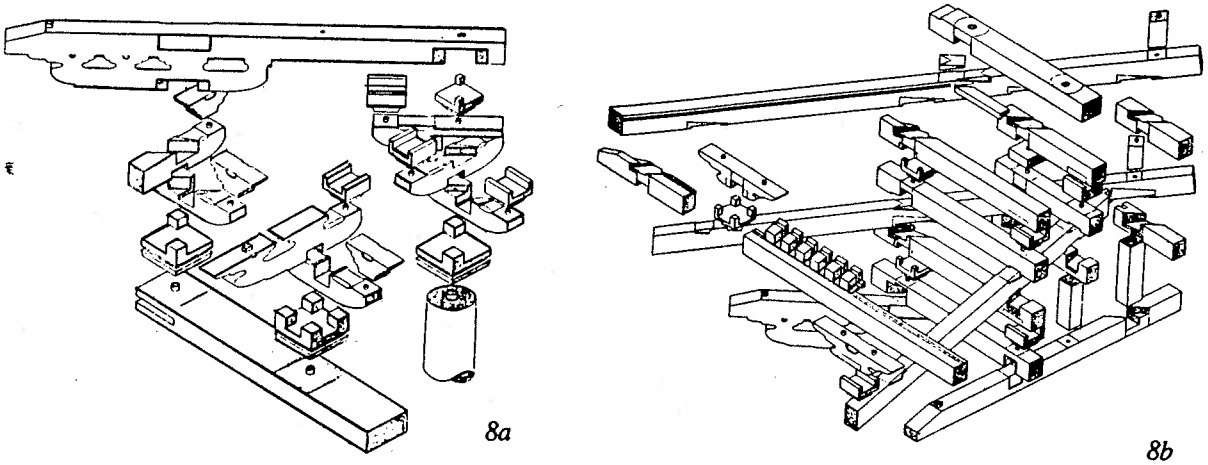


Fig. 8. Exposed view of the complicated series of mortise and tenon joints used in the construction of curved eaves for the five-story pagoda of Horyu-ji (eighth century.)

(a) Support of eaves.

(b) Brackets used to support the compound curves of the corners of the roofs.

should be minimal and inconspicuous. Reinforcement with galvanized or rust-proof steel bolts, plates and bars is effective and satisfactory.
As the strength of a wooden building lessens year by year because of ageing, degeneration and consequent loss of resiliency in the material, a thorough inspection must be made during the restoration to ensure that the structural strength is adequate.

Outer Walls

Walls may be half-timbered or covered, i.e. be divided into sections by the framework, or have the frame covered, and hidden beneath a continuous wall surface. The principal fill or covering used in the Far East is earth or wood. The boarding on half-timbered walls may be vertical or horizontal. Earthen walls consist of bamboo or reed laths, bound and wrapped with straw rope, and covered with mud. This mud wall is then finished off with a coat of plaster. In areas in which extreme weather conditions occur, outer walls are often enclosed with horizontal siding: thin, broad boards are nailed horizontally in lap-streaked design to columns, and studs and vertical battens are then nailed to these boards at regular intervals.

Store-houses and castles often have the underside of the eaves heavily plastered in order to make them fire-resistant.

The preservation of an earthen wall is comparatively difficult. If an old earthen wall is to be re-used in a restored building, is should be cut whole and preserved - possible only when the wall is small enough (e.g. the wall of a ceremonial tea-house). If the earthen wall is large, the only solution is to build it anew, from the laths to the finishing coats. In both cases organic material should be treated with fungicides and insecticides, as materials embedded in earthen walls are liable to rot.

To make earthen walls strong and durable, traditional techniques may be modified and modern materials substituted - water-repellent synthetic resins, for example, have proved very effective.

Doors and Screens

In timber-framed buildings, doors, windows and screens seldom last long. Before undertaking restoration, it should be remembered that old door openings may have been walled over, or new doors inserted in old walls. Plank doors and hanging screens are often replaced by sliding doors or a wall. Old fittings are sometimes transferred to the rear part of a building, new ones replacing them in front. These changes should all be retraced. Missing plank doors can be put back on the old pivots or sockets, hanging screens on the hooks on the underside of the horizontal beams, and sliding screens on door tracks or the tracks left on columns or other parts of the house.

Floors

Earthen Floors and Paved Floors

Earthen floors may be left unpaved, hardened with lime and sand, plastered, or paved with tiles and stones. Restoration should employ the traditional techniques. Broken tiles or stones are usually replaced; if no similar material is available, they may be consolidated

with epoxy resin, blended with powdered material from the original fragments. Replicas may similarly be made if the stones are too fragmentary for repair. After the compound hardens, it can be finished with stonemason's tools.

Raised Floors

Raised flooring allows good ventilation and prevents rot *(Fig. 9)*. In restoration, floor support posts, joists and the undersides of the floor boards are treated with fungicides and insecticides, the ground also being specially treated in termite areas.

Foundations

Podium or Platform

The use of a podium or platform probably originated in China and is widespread in house construction in the Far East. The surface soil is removed, and successive layers of earth are compacted by pounding to make a solid platform. The outer edges of the platform are protected with stone walls, and a stair is provided. Rain-water dropping from the eaves runs off in the surrounding ditches. The tops of stones placed on the platform are flattened or tenoned to receive the house supports (posts). Pebbles or small broken fragments are placed in a circle under these stones and pounded: if the supports sink, the joints loosen and distortion of the building follows. Hence, if the podium is poorly built or the ground is too soft to provide a sound foundation, reinforcement with poured concrete becomes necessary. The lower ends of the house supports or posts should be treated with fungicides and insecticides.

'Tortoise Belly', Sills, Direct Embedding

Even when floors are raised and covered with boards, a podium-like foundation is sometimes made by building a low, flat mound of earth which is covered with plaster or encircled by a series of hewn stones, and also contains stones to support the house posts. This sort of mound is called a 'tortoise belly' in Japan.

House posts may also be placed on the ground on a support or 'sill' of timber. The sill must be made of the most durable wood (cypress, Japanese cypress or chestnut) and thoroughly treated with fungicides and insecticides. Posts driven directly into the ground cannot last as long as those supported above ground, but can have their life span extended by similar treatment (e.g. application of creosote under pressure to the embedded parts).

Painting

External

Most Japanese houses, all of the ceremonial tea-houses and some of the shrine and temple buildings are left unpainted, relying for decoration on the grain of woods, natural materials and the results of fading.

Many of the shrines and temples, however, are painted in bright colours. The traditional paints are mixed with organic glue, which weathering disintegrates. Hence they gradually change colour and flake off. Paint and painted designs should be restored following strictly traditional methods. Synthetic resins help to preserve original paintings.

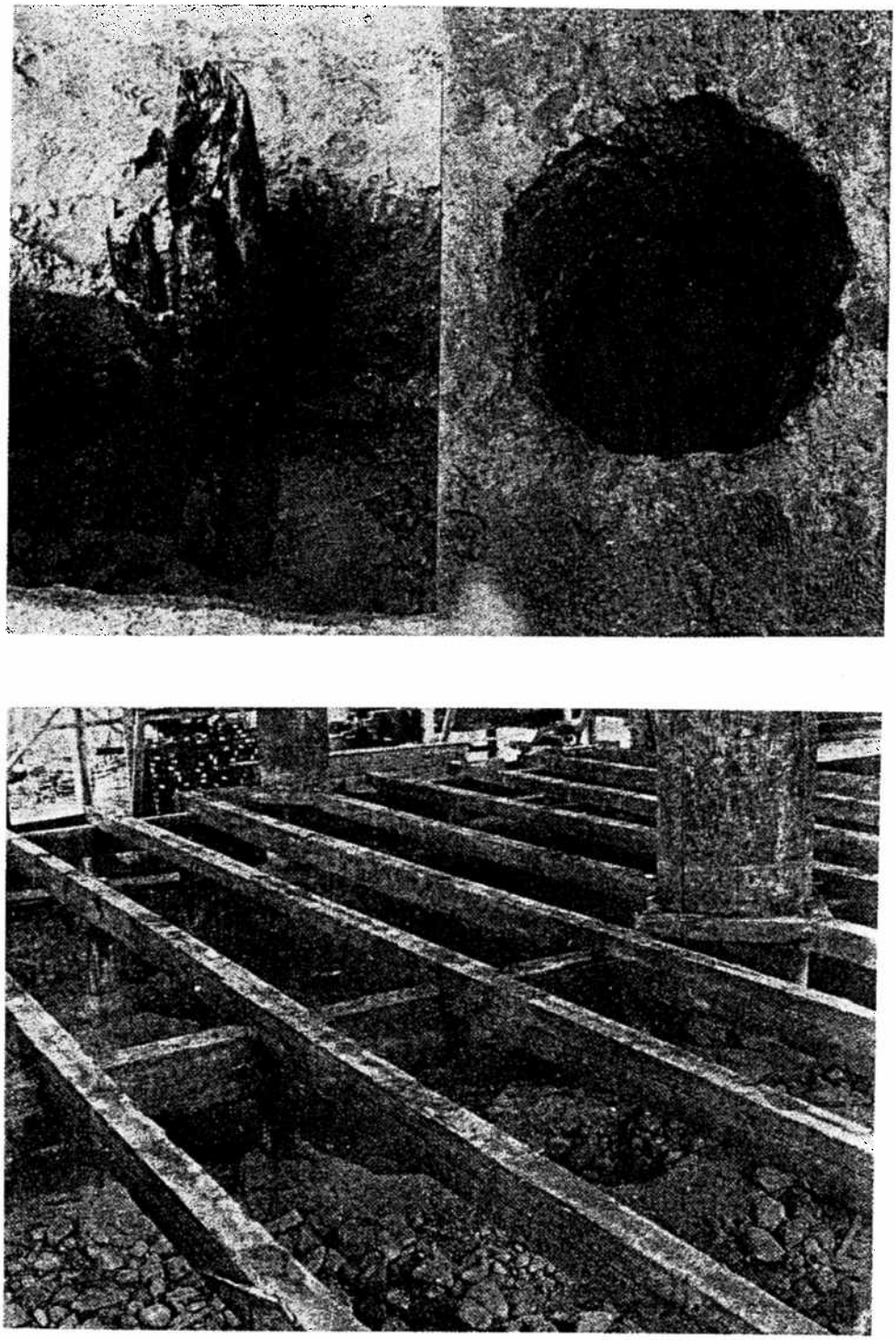


Fig. 9. Floors of wooden buildings supported on piling.
(a) Wooden columns were based on crossed wooden supports. Site of the Heijoky Palace, Nara (eighth century).
(b) Typical design and construction of wooden floor supports (floor boards removed).

Lacquer work is typically oriental, but only in Japan are buildings lacquered all over. Lacquers do not resist ultra-violet rays and exterior lacquers do not last long. A section of the original lacquer film is examined microscopically; photographed in colour, this gives the original colour of the lacquer to be restored.

Wall and Screen Paintings

Mural paintings are sometimes executed directly on plastered earthen walls. They may also be painted on paper pasted to the wall.

Mural paintings may be preserved on earthen walls with synthetic resins: urea resins for the wall itself, acrylic resins to prevent exfoliation of the paints. On wooden walls, they can be preserved by using soluble nylon in the space between the board and the painted surface, or by spreading it over the painting and pressing it with blotting paper. The surplus solution should be removed by a solvent in order to avoid a glossy sheen (synthetic resins which cannot be dissolved after drying must be avoided for this reason).

Paintings on paper are usually mounted on a foundation composed of several layers of paper pasted together. They can be removed and repasted on to a new paper foundation. The work can be easily and beautifully done by a craftsman skilled in traditional paperhanging techniques.

Rot, Insect and Fire Control

Wet and Dry Rot

Some bacteria, moulds and fungi only change the colour of the surface of wood or stain it, but saprogenous bacilli attack and destroy the cell-walls of timber. Generally speaking, bacteria grow at temperatures between 0° and 40 °C, but they increase remarkably at 20°-30°C with a relative humidity of 80 - 100 per cent.

Wet rot occurs when there is sufficient moisture to allow the development of lignivorous bacteria and fungi. On the other hand, excessive moisture may save timber from decaying by depriving such organisms of oxygen. Wooden piles, for instance, if driven below the water line, may last for centuries.

The moisture content of wood in a building comes gradually into equilibrium with the surrounding atmosphere. In the main islands of Japan it is 14-15 per cent. Under 20 per cent, wood is not liable to attack, so that wooden buildings on the ground last well, provided they are well maintained and the relative humidity is kept within reasonable limits by proper ventilation. When it rises to 70 per cent or more, the moisture content of the wood also rises, and the wood becomes subject to attack by fungi and moulds (dry rot). To prevent rot, timbers should be thoroughly dried before use. The timber's resistance to rot varies. Broad-leaved trees tend to be more durable than conifers.

Care should be taken at every stage. The first consideration should be construction that so far as possible eliminates the possibility of organisms growing which provoke rot; timber should be chosen accordingly and, when necessary, treated with antiseptics.

For this purpose, creosote oil

and its emulsions used to be popular, but they tend to stain wood. During the past twenty years, PCP (Pentachlorophenol C_6Cl_5OH) and Na-PCP (Sodium pentachlorophenate C_6Cl_5ONa), which are colourless, have been widely used. PCP is oleaginous, and is used in a 2-5 per cent solution of light oil or butanol. Na-PCP is water soluble and is used also in a 2-5 per cent solution. Since Na-PCP is not inflammable, it has been applied to the buildings of national importance in Japan. It is sometimes brushed on the surfaces and cut-ends of lumber are dipped in it. Timber treated only with Na-PCP cannot be exposed to rain because it is water soluble. A solution may be prepared by adding aluminium or copper sulphate, which will make it water-resistant. Na-PCP sinks 10 millimetres at the cut end and 0.5 millimetres on the sides of cypress lumber after three days of soaking. Hence it is preferable to have the lumber treated after it is shaped, cut or planed. As a rule PCP does not affect metals and paints, but its effect on art objects and paintings must be investigated before use.

Insect Control

Termites are among the pests that are most destructive to structural timber. Dry-wood termites are less dangerous, but subterranean termites which nest in moist ground and attack timber by tunnelling from the ground into wooden buildings rapidly cause tremendous damage. Control measures may include lowering the moisture content of the soil by better drainage, creating chemical (persistent poisons) or physical (metal or concrete) barriers between the insects and the building, and by using termite-resistant or otherwise treated wood.

In the past, arsenic compounds were mainly employed. In the last twenty years, methyl bromide (CH_3Br) has been widely used to preserve historic buildings. It is liquid, and is kept in pressure vessel or bombs. It is applied by first sealing off the space occupied by insect-contaminated wood; filling the space with evaporated methyl bromide (200 grammes per cubic metre) for three hours will kill eggs, grubs and insects. The gas is poisonous, and, as it is non-odorous, should be handled by an expert. At times, a lachrymatory agent is added so that the user is warned of leakages. Vermicidal tanks in which insecticides are applied under low pressure provide an effective means of treatment. However, wood is always liable to renewed attack; it may be coated with a micro-crystalline wax incorporating an insecticide such as lauryl pentachlorophenate.

Fire Precautions

The area surrounding an historic building should be designated and publicly posted as a restricted area where smoking and open fires are prohibited. Electric wiring should always be in good condition, with trip breakers to lessen the danger of short-circuits. Lightning conductors must be provided on or near the building.

Detection

The building should be equipped with automatic fire alarms and be regularly inspected by firemen.

Automatic fire detection units should be allocated inside and outside the building and especially under the eaves, in the roof frame and beneath the floor. An air-pipe fire detection system which reacts to rising temperatures is preferable to one which reacts to a set temperature. Staples fixing thin copper pipes to the ceilings, walls, roof frame and floor joists should also be of copper, since steel staples damage copper pipe through electrolytic action; otherwise the steel should be coated to prevent electrolysis.

The fire alarm system should be connected to the nearest fire station, or there should be a telephone in the premises with the number of the station prominently displayed. A siren to summon people in the neighbourhood is also desirable.

Fire Extinguishing

If a fire is detected early, it may be possible to extinguish it with hand extinguishers. There are many types, and it is important to select those which will not damage cultural property, or spread fires by, for example, their effects on the electric wiring.

If hand extinguishers will not suffice, the fire must be sprayed with a machine pump working from a reservoir or a fire hydrant. If short-handed, the fire fighters can use sprinklers and drenchers.

If the fire shows signs of spreading, the help of professional and voluntary fire brigades must be enlisted.

Fire prevention systems should be planned and equipped by experts with due regard to size, topography, location and surroundings. Regular maintenance and inspection of the equipment is of course essential.

Principles of Conservation and Restoration Regarding Wooden Buildings in Japan

Masaru Sekino

1. Conservation of Historic Wooden Buildings

Throughout their 2,000-year history, the Japanese people have been living in very close affinity with wood. Whilst there are about 3,000 historic buildings designated and protected by the law as National Treasures and Important Cultural Properties, nearly 90 per cent of them are wooden buildings. Very few are stone buildings most of them small stone pagodas. Table 1 gives a breakdown by the era of the existing law-designated historic buildings. As the table illustrates, each era has left to today its characteristic buildings including the Main Hall, Five-storied Pagoda and Corridors of the Horyuji Temple as the oldest. Today, all the historic buildings built in and before the 14th century are designated and protected as cultural properties. Table 2 shows the erawise ratios of the total floor areas of the wooden buildings in the precinct of the Horyuji-Temple while Table 3 shows similar ratios for stone buildings for comparison, taking as an example a part of the historic area at Regensburg in West Germany.* Though there are fundamental differences between wooden and stone buildings, it must be noted that the graphs showing the progressive increase in floor area ratio from age to age are similar for both types of buildings (Fig. 1).

The prototype of Japanese wooden buildings as typified by the Main Hall of Isejingu Shrine is characterized by the use of plain wood or unpainted wood. Also, its posts are dug in ground and its floor boards are raised from the ground level. It has a thatched and gabled roof. Since the roofing of the prototype building wears out in 10 years and its posts dug in the ground rot in 20 years, the existing prototype wooden buildings had to be dismantled entirely and reconstructed wholely with new materials every 20 years. Thus, the prototype has been preserved for 1,200 years thanks to these periodic reconstruction, a method of conserving wooden buildings.

* Bayerisches Landesamt für Denkmalpflege: Baualterspläne zur Stadtsanierung Regensburg II, Kartenteil, München 1974.

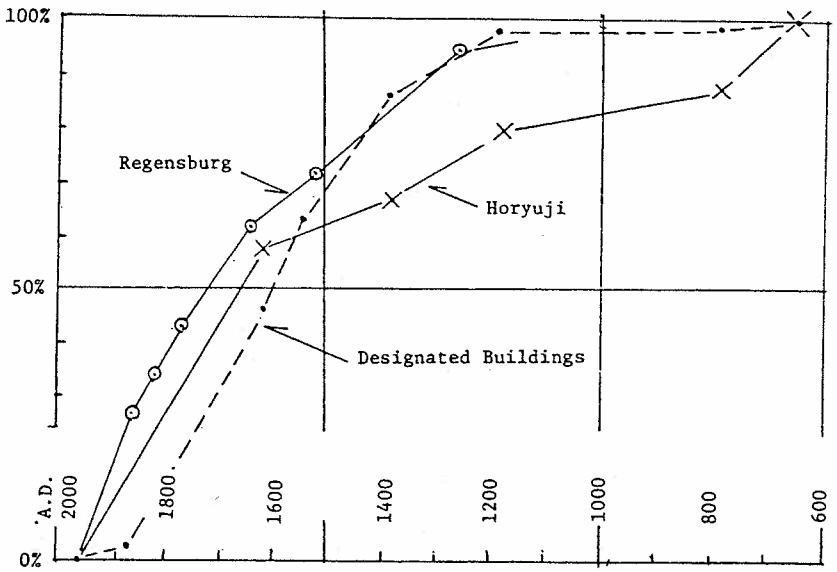


Fig. 1. Three Graphs of Accumulative Ratio (Table 1, 2, 3) corresponding to each Era

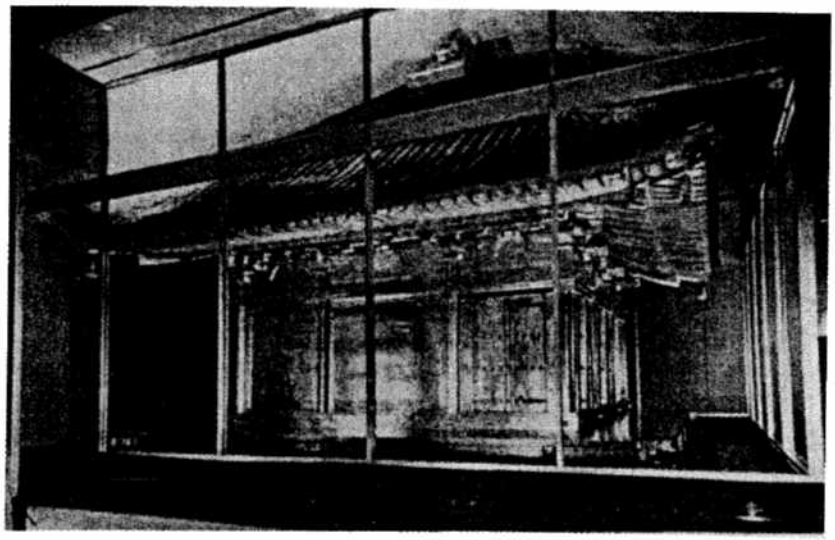


Fig. 2. Golden Hall of the Chusonji Temple (after restoration)

Table 1. Number and percentage of buildings designated as National Treasures and Important Cultural Properties

Era	A.D.	No. of Designated Historic Buildings	Ratio (%)	Accumulative Ratio (%)
Meiji-Taisho	1868-	96	3.4	3.4
Edo	1615-	1,232	43.6	47.0
Momoyama	1568-	413	14.6	61.6
Muromachi	1392-	672	23.8	85.4
Kamakura	1185-	332	11.7	97.1
Heian	794-	49	1.7	98.8
Nara-Asuka	645-	32	1.1	99.9
		2,826	99.9	

Table 2. Percentage of floor area of buildings at the Horyuji Temple

Edo-Showa	1615-	56.9	56.9
Momoyama	1565-	1.9	58.8
Muromachi	1392-	8.0	66.8
Kamakura	1185-	12.0	78.8
Heian	794-	6.7	85.5
Nara-Asuka	645-	14.5	100.0

Table 3. Percentage of floor areas of buildings in historic area of Regensburg

Era	A.D.	Ratio (%)	Accumulative Ratio (%)
Modern	1870-	29.2	29.2
Historic formalism	1830-	5.9	35.1
Classicism	1780-	8.7	43.8
Baroque	1650-	18.9	62.4
Renaissance	1525-	7.8	70.2
Gothic	1250-	24.9	95.1
Romanesque		4.9	100.0

Buddhism arrived in Japan from continental Asia in the 6th century, accompanied by an inflow of powerful Chinese culture. The Chinese influence is identifiable in the buildings of the Horyuji Temple. Unlike the prototype, their pillars are each set on individual stone foundations put on the podium, and baked clay tiles are used for roofing. All the wooden surfaces are painted. The China-influenced wooden buildings naturally have a longer life-time than the prototype ones. Even so, they are subject to weathering and deterioration in the open air. In reality all wooden buildings have a limited life-span. Various conservation and restoration works, therefore, had to be carried out in order to preserve them beyond this natural life-limit, including both partial and total repairs and maintenance. Especially in the course of Japanese modernization, since 1897 the historic buildings have been conserved and restored not only with traditional repair techniques of the master carpenters but also, and increasingly, with scientific methods under the direction of architect/conservators and scientists.

If the historic buildings are small, they are often sheltered, and in rare cases preserved indoors as in museum. In such case the whole building is treated like a museum object. The Golden Hall of the Chusonji Temple at Hiraizumi is a very small wooden architecture built in 1124. Its roof tiles are wooden and all surfaces of the Hall "*urushi*" lacquered with gold foil. Its inner sanctuary, considered one of the finest works of Japanese lacquer art, has a high artistic value. Since the middle ages, the wooden shelter has served to protect the Golden Hall. Nevertheless, the Golden Hall was seriously damaged and needed repair. During 1962-1968 it was completely dismantled and reassembled. At the same time a new ferro-concrete shelter was built to replace the wooden one. A small chamber with glass windows was in the hall of concrete shelter, and the restored Golden Hall was set in the chamber. The in and out of the chamber is air-conditioned to make preservation perfect (Fig. 2).

Japanese traditional homes in the urban environment are believed to have a life-time of 40 years. Actually, only 5 per cent or less of wooden buildings in Japan are more than 100 years old. Although wooden shrines and temples whose structural members have larger dimensions have a longer life-time, we know from our experience that they cannot survive more than 250 or 350 years if they are given only partial repairs including reroofing. If these buildings are to be preserved beyond their natural limits, they have to be completely dismantled and then reassembled.

The dismantled members found seriously rotten or damaged are individually either repaired or simply replaced by new materials. If any parts are found lacking, they are added. The members and components thus treated are then reassembled with the utmost care so as to recompose the original structure. The principle here is to use as much original members as possible. The addition of new materials should be reduced to a minimum. If traditional methods are found insufficient for

conserving these members, recently developed scientific technique should be applied.

2. The Dismantling of Wooden Buildings

Minute survey are conducted before and after the dismantling and reassembly of wooden buildings. Photogrammetry plays an important role in precisely locating and measuring the broken or rotten parts and showing them on charts. Photogrammetry also helps to locate structural deformation that often occurs following repairs and thus to clarify structural defects of the repair works done. X-ray photographing is also indispensable for the survey of the inner structure of the buildings.

The wooden building is dismantled from the top to the ground. Since most of the historic buildings have experienced many partial repairs and even dismantling as well as reassembly, each dislodged member must be put to close scrutiny as to its origin. Also, efforts are made to find the traces of past motises, notches and pegs as well as the documents of the history of repairs. Often, graffiti, scribblings and ink-marks are found on member timber. Ink-marks can show where the member in question was set in the original structure. The traces of treatment remaining on the surface or mortise of the member can indicate the types of carpenter's tools used, including the blade shapes and sizes. If holes with blunt edges are found, they indicate that the holes were made in the course of former repair.

Using these and other data obtained by the surveys before and after the dismantling, parts added in later years are taken away and the later modifications corrected to revive the original structure. In fact it is often found that the original buildings have had second-hand materials from the beginning. Sometimes second-hand materials taken from the same building are found in use in other parts of the building. It is also often found that the scale of the building was made smaller when it was repaired in the past.

If the structure and the shape or the style of the building is to be changed through reassembly, it is called the "alteration of present state." Of course, as a rule, the reconstruction of historical monuments are done in accordance with the Venice Charter, also in Japan.

When reinforcement is needed for the equilibrium of the building from a structural mechanics point of view, bolt, hoop iron, tensile bars etc. are used invisibly. The stronger the foundation, the better the building can be preserved, therefore, a ferro-concrete foundation is laid if indispensable in the case of soft ground.

3. Rehabilitation of Dismantled Members and their Reassembly

After the data from the dismantling surveys are studied and conditions of reassembly and alteration of present state are decided, the dismantled members are classified into two groups, one for re-use and the other not for re-use. The parts not for re-use are replaced and the missing parts filled by new materials of the same kind. While the still

sound parts are used as they are, those which are partially decayed or injured or have missing elements are repaired or consolidated. Synthetic resins can be used effectively for this rehabilitation.

All the wood pieces newly introduced are dated with branding iron. For this kind of work, traditional tools are used. If necessary, original tools are restored.

When all main members are thus ready, the reassembling work is commenced. The reassembly is done as far as possible by the original or traditional methods. In Japan, the contrast between colour and texture of the old materials and new ones is not to be neglected. To keep them in harmony, it is best if the spectator at some distance cannot distinguish between the old and new materials but can clearly perceive the difference at a closer look. One way of giving old colouring is to scorch the wood surface with a torch lamp and then to wire-brush it.

In case a whole building is painted in a single colour, for example in red, the painting of the restored building can be left as it is without repainting, or repainted in the faded tincture of the original colour or in the original colour. Repainting is better for the protection of wood as fresh painting protects the wood surfaces from weathering. The pigments of aged coloured patterns and pictorial decorations are treated scientifically to prevent peeling off. If they are peeled off to a great extent, the patterns are repainted. The same applies to lacquer art objects.

Of the members eliminated not to be used for reassembly, at least the main ones are preserved. Especially, decorative details and those members bearing ink marks and scribblings are carefully treated and put in the museum. Most of the materials not for re-use are kept in the attic of the same edifice so that they can be referred to on the occasion of next repair.

4. Some Cases of Dismantling and Reassembling Historic Buildings

(a) Preservation and Repair of the Hall of Rakando (Important Cultural Property) and the Tea Pavilion (National Treasure)

The Hall of Rakandô in the precinct of the Fukkiji Temple is believed to have been built not later than the end of the 12th century. It was dismantled into 207 members in 1935. Immediately before dismantling, the structure was in the last stage of damage. Only four pillars with beams and series of blackets barely survived under a wallless shelter. (Fig. 3) It had lost roof, eaves, walls and ceilings. Moreover, since the members were left unattended for 30 years in storage, their deterioration progressed. The Tokyo National Research Institute of Cultural Properties treated them scientifically with synthetic resins in 1970-1971. (Fig. 4) The New Rakando was reconstructed in the precinct of the Horyuji Temple by Dr. Minoru Ooka, architect/restorer. (Fig. 5)

Similar but more refined scientific treatment was applied to the removal of the Jo-an, tea pavilion. In this case X-ray photography was conducted before dismantling.

(b) Preservation and Restoration of Three-storied Pagoda, Hokkiji Temple

Let me take one example to study the process of dismantling and reassembly. Along with the five-storied pagoda of the Horyuji Temple, the Three-storied Pagoda of the Hokkiji Temple in Nara is also the oldest existing wooden structure in Japan. It is believed to have been built sometimes from the end of the 7th century through early 8th century. In the early 12th century, this pagoda was put to dismantling for repair from the top to the eaves of the third story, and at the middle of the 13th century underwent the first major repair involving the dismantling down to the bracketing systems of the second and the first story. After the roofing was repaired in the middle of the 15th century, the whole pagoda underwent the third major repair work sometime in the latter half of the 17th century. This increased the inter-pillar spans of the third story from two to three, changed the floor of the first story to a boarding floor surrounded by verandah boarding, heightened the lintel from the floor level, added a rail to both end bays, and replaced the earthen walls below the millioned windows of the second and third stories with wooden panels. Also, the pattern of balustrade was changed and the bronze spires were replaced. After minor repairs were then made toward the end of the 18th century, the fourth major repair work was carried out in 1897-1898 by the prefectural office for cultural properties of Nara. The fifth repair, characterized by the perfect process of dismantling and reassembly, was carried out in 1972-1975. (Fig. 6, 7, 8)

Table 4. Number and Percentage of Members in Wooden Structure in the Case of Three-storied Pagoda of the Hokki-ji Temple (IIX cent.) After Restoration in 1875.

Number and Percentage of Members				
Ages of Members A.D.	1st story	2nd story	3rd story	Total
VII-VIII cent.	280 57.0%	207 48.8%	126 36.3%	613 48.6%
XII cent.		2 0.5%	21 7.1%	23 1.8%
XIII cent.	71 14.5%	62 14.6%	40 11.5%	173 13.7%
XVII cent.	5 1.0%	42 9.9%	16 4.6%	83 6.6%
XIX cent.	135 27.5%	111 26.2%	144 41.5%	370 29.3%
	100.0	100.0	100.0	100.0
Total	491 (38.9%)	424 (33.6%)	347 (27.5%)	1262 (100%)

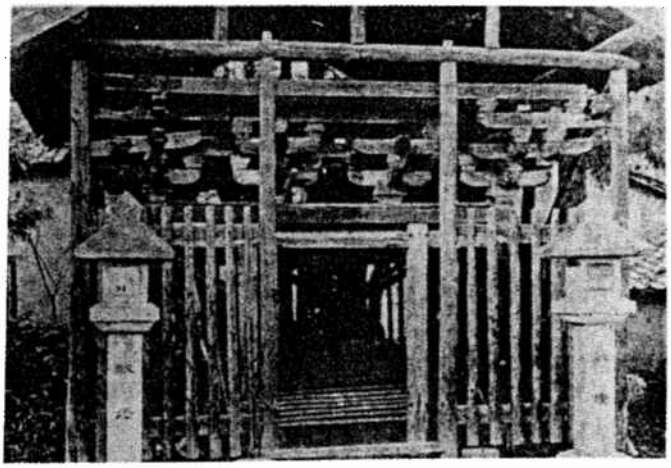


Fig. 3. Hall of Rakando covered by wall-less shelter (before dismantling 1935)

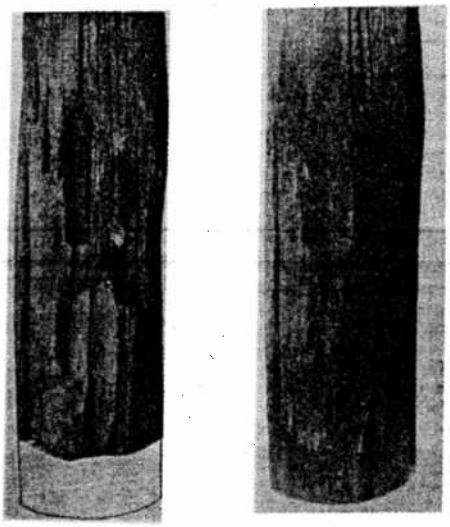


Fig. 4. Deteriorated pillar (before treatment) *Restored pillar (after treatment)*

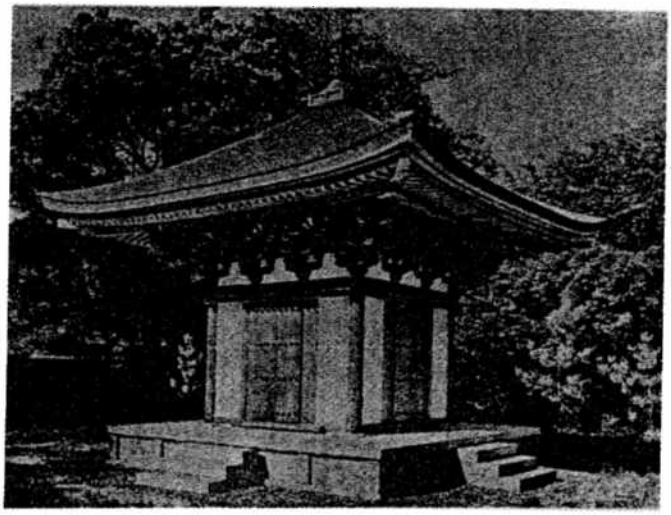


Fig. 5. Hall of Rakando of the Horyuji Temple (after restoration)

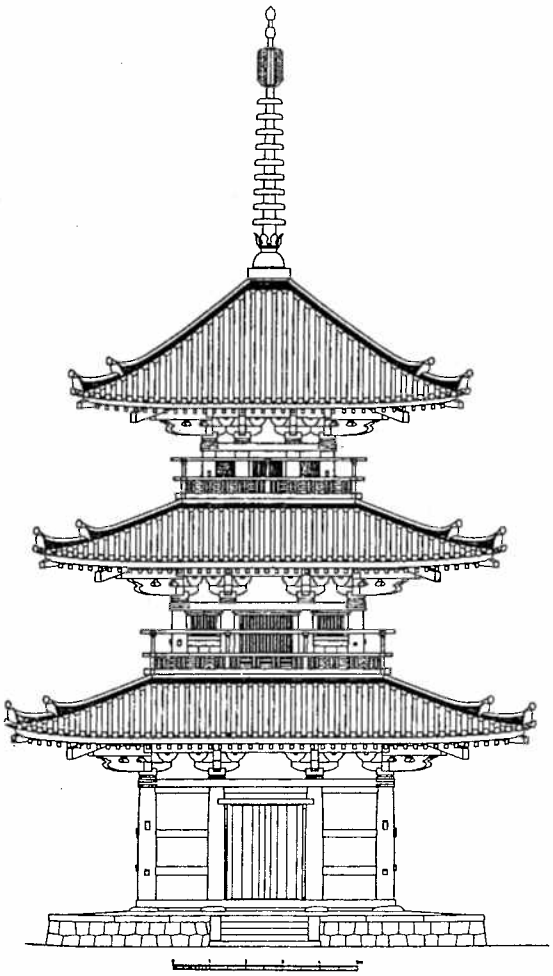


Fig. 7. Elevation of Three-storied Pagoda of the Hokkiji Temple (before restoration)

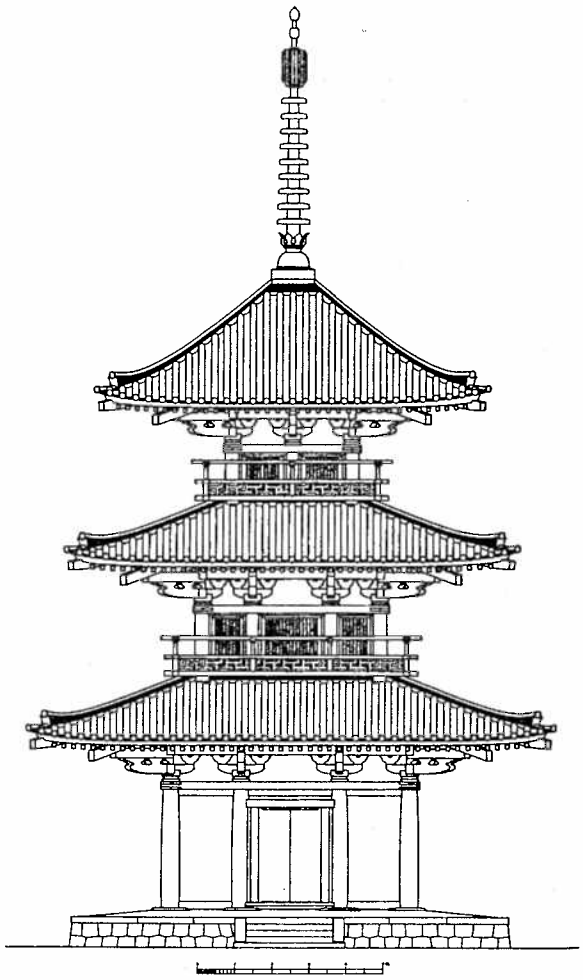


Fig. 8. Elevation of Three-storied Pagoda of the Hokkiji Temple (after restoration)

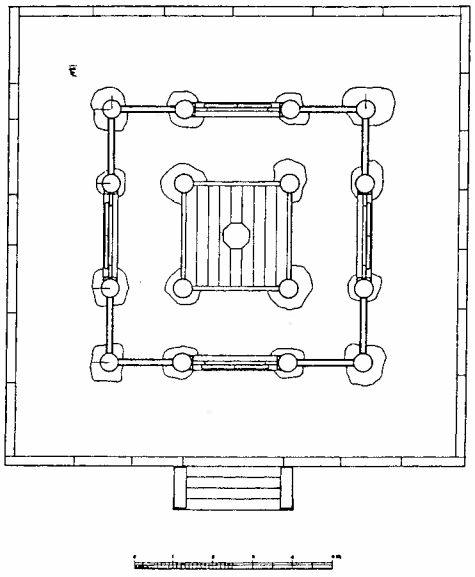


Fig. 6. Plan of grand-floor of Three-storied Pagoda of the Hokkiji Temple (after-restoration)

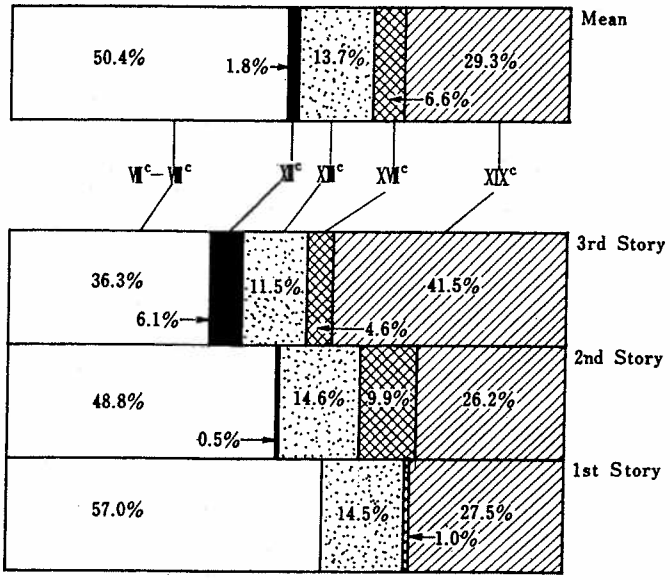


Fig. 9. Age-wise percentage of Members Constructing Each Story of Three-storied Pagoda of the Hokkiji Temple After Restoration in 1875.

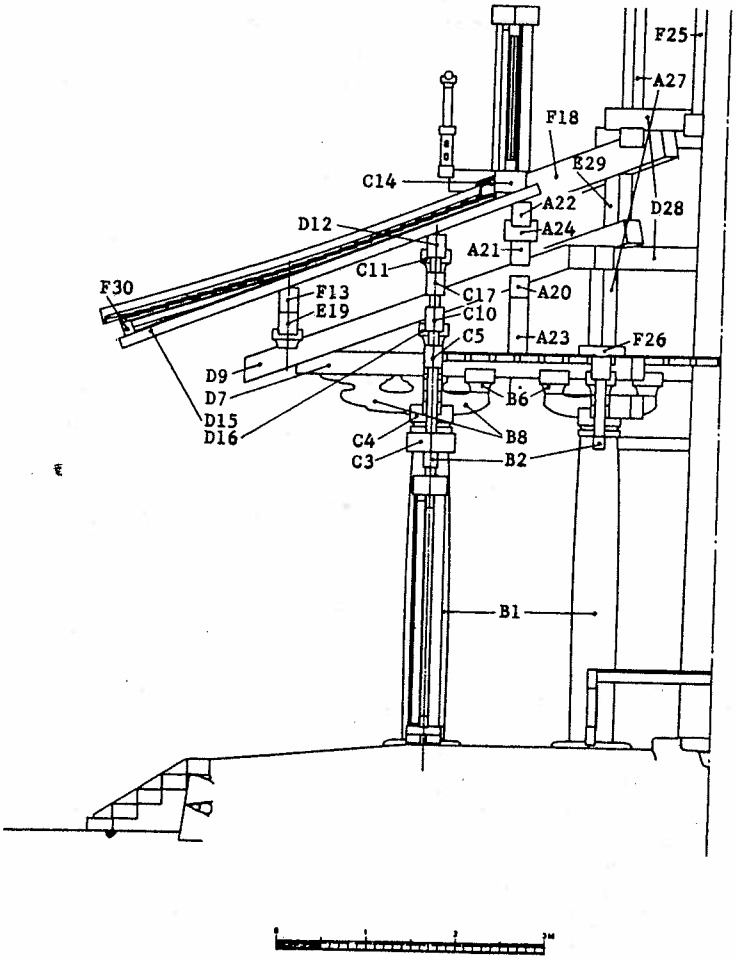


Fig. 10. Section of the first-story of Three-storied Pagoda, Hokkiji Temple (VII-VIII). Showing classified (A-F) ratios of surviving original members (1-30).

Table 5. Ratios of surviving original members in wooden structure in the case of Three-storied Pagoda of the Hokki-ji Temple (IIX cent.) After restoration in 1875.

	Groups	No.	Members (ratio)
A	90%-100%	20:	Irikawa Ichidan-toshihijiki (92%)
		21:	" Ketashitato (100%)
		22:	" Keta (92%)
		23:	" Ichidanme-toshijiki-shitazuka (100%)
		24:	" Nidanme-toshihijiki (100%)
		27:	Shitenzuka (100%)
B	75%-89%	1:	Hashira (83%)
		2:	Kashiranuki (88%)
		6:	Makito, Kumoto (88%)
		8:	Kumimono (84%)
C	50%-74%	3:	Daiwa (58%)
		4:	Daito (60%)
		5:	Ichidan-hijiki (67%)
		10:	Nidan-toshihijiki (58%)
		11:	Sandan-toshihijiki (58%)
		14:	Hashiraban, Shitenwaku (50%)
D	24%-49%	7:	Chikarahijiki (43%)
		9:	Odaruki (36%)
		12:	Gawageta (33%)
		15:	Taruki (29%)
		16:	Ichidanme-makito (44%)
		28:	Shitenwaku (25%)
E	10%-24%	19:	Degetashita-kumohiziki, Makito (24%)
		29:	Shiten-odarukiue-tsuka (13%)
F	0%-9%	13:	Degeta (0%)
		18:	Sumigi (0%)
		25:	Tsukaban, Tsuka (0%)
		30:	Kayaoi (0%)

In every restoration work done in the past from the date of erection, original members had to be reused as long as they were sound and well conserved. One way to evaluate the durability of wooden structures is to indicate the percentage in number of the original members to the whole-original plus members added after restorations.

In the case of the restoration mentioned above, that is, Three-storied Pagoda of Hokkiji Temple, the percentages of the original

members are clearly different depending on the vertical position of the members. Table 4 and Fig. 9 show the percentage of the original members for each story since 1875. From this table, it could be seen that the first story is the best conserved, the third story the worst and the second medium.

In the next, I have tried to survey the same percentage for all kinds of members in different positions of the said structure. The percentage of the original members is peculiar to the structural position of the members, in other words to their technical terms, since the members are named from their position in the structure. Thus thirty terms are identified and indicated in numbers in Table 5 and Fig. 10. I have grouped them in six classes; those members situated above ceiling or under roofing as A class (90%-100%), pillers, beams and brackets inside the building as B class (75%-89%), beams and brackets consistuting outer walls as C class (50%-74%), bracketing arms and supports of eaves including rafters as D class (24%-49%). Those of E class (10%-24%) are small in number, and F class (0%-9%) are horizontal rails on the end of rafters as well as outside eave girders and hip rafters etc, which are subject to heavy loads.

On Tsugite Shikuchi and Woodworking Tools

Nobuo Ito

The most important characteristic of Japanese architecture is that it is built of wood. Its structure is a combination of long and slender timbers. The number of timbers used is so great that it can amount up to 10,000 in a relatively big building. These timbers are assembled in different ways to construct a building.

Jointing two lumbers in a longitudinal direction is called *tsugu* and the part of woodwork for this kind of jointing is called *tsugite*. Jointing two lumbers side by side is called *hagu*, and jointing two lumbers perpendicularly is called *kumu*, and woodwork for *hagu* and *kumu* are altogether called *shikuchi*.

The methods generally used to joint or interlock two timbers can be divided roughly into the following four groups.

1. Two timbers are combined by woodwork.
2. Two timbers are joined with nails, cramps or wooden plugs.
3. The joints and interlockings are spliced or tied with rope.
4. The joints are bound with lacquer or adhesives.

Among these methods, the method 1 (combination) is used most extensively in Japan, and the method 2 (sewing) is used in addition. On the contrary, the methods 3 and 4 are scarcely used. The reason why the methods 1 and 2 developed while 4 did not is because wooden buildings had to be constructed quickly and be dismantled and reassembled for repair once in several hundred years. The method 3 is not accepted except in very vernacular buildings, probably because of aesthetic reasons.

In short, *tsugite* and *shikuchi* methods that combine two timbers by woodworking have developed in Japanese wooden construction.

Next, I would like to outline the historical development of *tsugite* and *shikuchi* methods. In ancient times, there was only a small variety of *tsugite* and *shikuchi* with very simple woodworking. However, in the middle ages, not only their variety increased, but also the woodworking for these methods became complicated. Further, in the modern period, their variety rapidly increased, and the woodworking became more complicate and elaborate. The developments are the product of the effort to increase the strength as well as the apparent refinement of *tsugite* and *shikuchi*. But in essential, the improvements were due to the effective use of construction materials. As Japan was originally rich in building materials beginning with Japanese cypress, it was relatively easy to obtain timbers of necessary sizes in

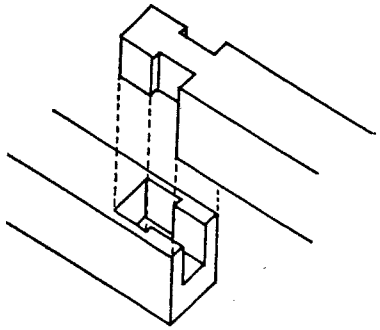


Fig. 1. Old-style Kamatsugi

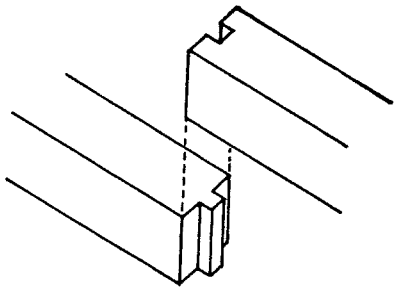


Fig. 2. Mechigaitsugi

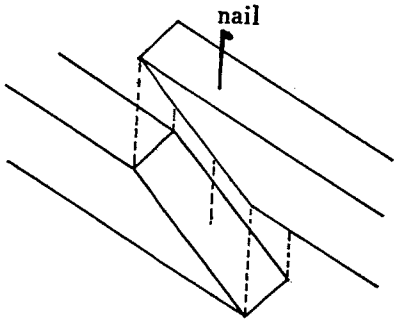


Fig. 3. Sogitsugi

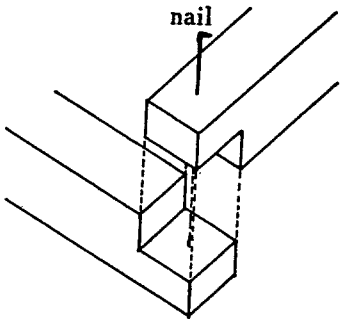


Fig. 4. Aigaki

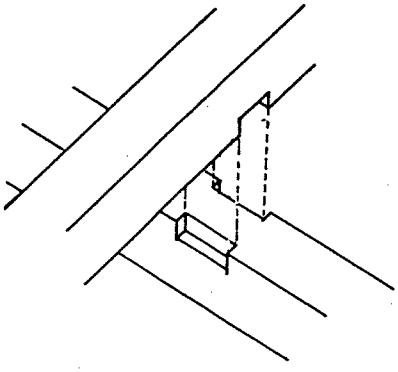


Fig. 5. Watariago

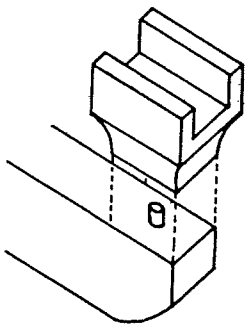


Fig. 6. Dowel at the joint between masu and hijiki

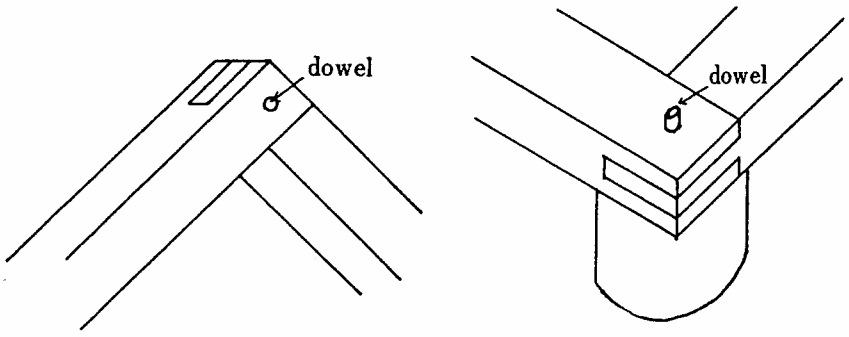


Fig. 7. Flat tenons (left: rafter right: daiwa)

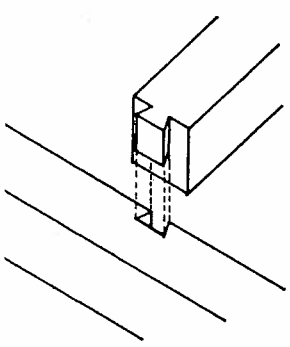


Fig. 8. Aritsugi

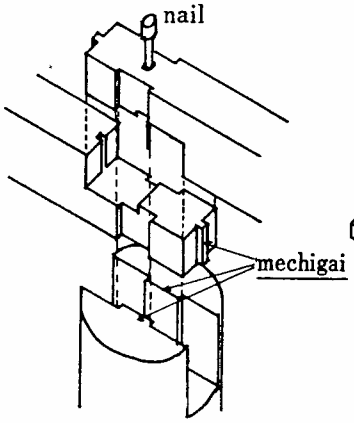


Fig. 9. Kashiranuki and column of main hall of Daihonji Temple

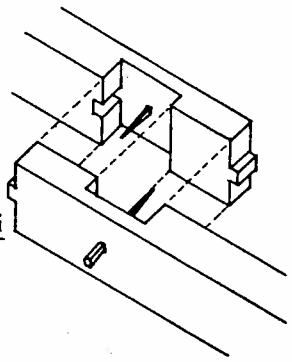


Fig. 10. Hooked joint of floor joist

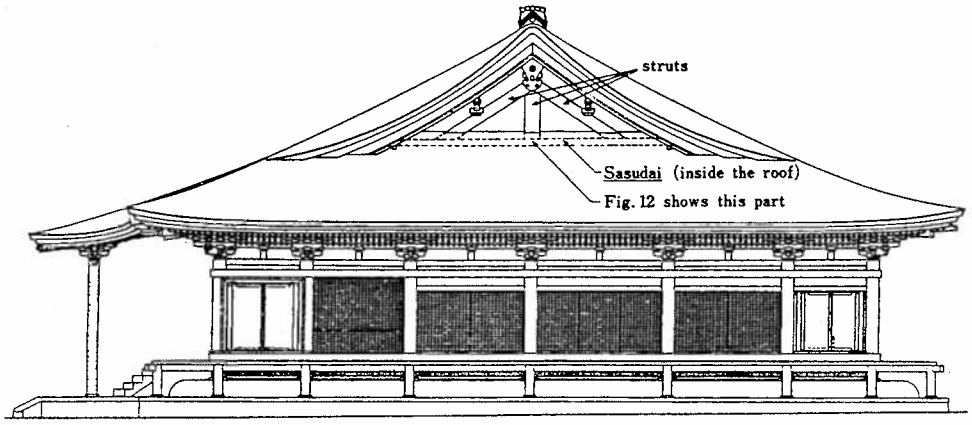


Fig. 11. Sasudai of tsumakazari

ancient times. However, in the middle ages and after, it became gradually difficult to gain large and long timbers. Further, as the timber dealers began to supply timbers of standardized sizes, these standardized sized timbers were mainly used in building urban houses and castles, except in special cases of complicated buildings such as temples and shrines where timbers of particularly ordered sizes were also used. Since the timbers became more slender, and also since timbers had to be connected by *tsugite* even where there was no prop pillars, *tsugite* and *shikuchi* needed to become more solid and firm. For these reasons, the *tsugite* method increased since the middle ages. The woodworking of *tsugite* and *shikuchi* reached the height of their elaboration toward the end of the modern period.

In the Main Hall and Five Storied Pagoda of Horyuji Temple, which are know to be the oldest wooden buildings in the world (which were built in the latter half of the seventh century), very little *tsugite* was used. *Tsugite* was used only for the central pole of the pagoda, beams and other longer timbers. The variety was also very little. Mainly, the old-styled *kamatsugi* (headed rod joint) (Fig. 1) which was called *hakokama* (square headed) was used along with *mechigaitsugi* (grooved and tongued joint) (Fig. 2) and *sogitsugi* (bevel joint)(Fig. 3). Further, *shikuchi* was also very simple, with only two kinds, *aigaki* (halved interlocking) (Fig. 4) and *watariago* (cogged interlocking) (Fig. 5) used for the main timbers. The columns and struts were tenoned on both ends. In the place such as the joint between *masu* (bearing block) and *hijiki* (arm) of the bracket where tenon could not be carved, a dowel was fixed (Fig. 6). Flat tenons were used to combine rafters or *daiwa* (head frame) (Fig. 7).

Simple *tsugite* and *shikuchi* have been characteristic throughout the ancient times, although they did show some development.

On the Five Storied pagoda of Daigoji Temple (built in 952) the head of *Kamatsugi* had a tapering end which was a forerunner of that of the middle ages, and also in some part, *aritsugi* (dovetail) (Fig. 8) was found. In the case of Hoodo of Byodoin Temple (built in 1053), even simple jointings and interlockings without any woodworking were reinforced with cramps.

In the middle ages, as seen in the case of the Main Hall of Daihoonji Temple, *mechigai* and hook were devised in order to reinforce *tsugite* and *shikuchi*. *Tsugite* of the *kashiranuki* (head penetrating tie), which had been a halved joint in the ancient times, developed to a hooked joint with *mechigai* on both tips. At the same time, *kashiranuki* was connected to the column by *mechigai*, that were woodworked on the side walls of the groove to insert *kashiranuki* at the head of the column, in order to maintain a right angle between *kashiranuki* and the column (Fig. 9). On the joint of floor joints the hooked joint was turned 90 degrees and plugged from both sides (Fig. 10). Further, both *tsugite* and *shikuchi* were often combined to strengthen the joints integrally. For instance, when

Sasudai of *tsumakazari* (gable end) (Fig. 11) was jointed in the middle by the technique of the hooked joint with a plug, the flat tenon at the foot of the central strut was substituted for the plug (Fig. 12).

The gate of Kyuanji Temple (built in the 14th century) is an example in which elaborate *tsugite* and *shikuchi* typical of the middle ages were used in a great number. Here, first of all, the form of *kama* changed. The head and neck of *kama* became tapered (Fig. 13). In order to strengthen *tsugite*, *mechigai* was put in *tsugite* and double *kamas* were used to avoid boring a mortise to insert the upper timber (Fig. 14) in the neck of the *kama*. Various other techniques were devised in the middle ages. For instance to tighten the joint the dovetails were combined with *aigaki*, or to meet the shortage of timber, when a timber was too short to make a cross joint, the joint was made in a T-shape to which an end was attached to make the joint appear as if it were a real cross joint. Further on the timbers used in the conspicuous parts such as the balustrade, simple *tsugite* such as *tsukitsuke* (butt joint) or *sogitsugi* was made on the surface, while inside the members, more complicate and strong kind of *tsugite* was made.

As the form of *kama* changed, hooked joints developed to hooked bevel joints (Fig. 15). In Dainichi-Do (Main Hall) of Shorenji Temple (built in 1478), the hooked bevel joint with *mechigai* and plug is found (Fig. 16), and this kind of *tsugite* developed a great deal since then.

In the latter half of the middle ages, the *nuki* (tie) became longer to pass through the building in one, so that it had to be jointed in the middle of the bay independent of the position of the columns. The *nuki* of Togudo of Jishoji Temple (built in 1485) is an example of this form.

In the modern period, the form of *kama* changed once again. The breadth of the neck was no longer tapering which has remained unchanged till the present day (Fig. 17). *Tsugite* and *shikuchi* became more complicated with the progress of time, and at the end of the modern period the variety of *tsugite* and *shikuchi* greatly increased.

The necessary tools for Japanese architecture can be roughly divided into two: wooden inking tools and woodworking tools. The former are set of important tools for carpenters to draw ink lines for woodworking, and the latter are used in cutting and planing timbers. Among the wooden inking tools, most important ones for a carpenter are L-shaped square, *sumitsubo* (wooden ink pot) and *sumisashi* (bamboo pen).

The L-shaped square is of metal. In the ancient times it had no notch marks, and was used only for setting a right angle. But later, notches were cut in, and L-shaped square developed to be used as a measure. In the first half of the middle ages, notch marks of $\sqrt{2}$-fold were cut on the back of the L-shaped square, and practicality of the L-shaped square became greatly extended. In modern period a stereometry technique named *kikujutsu* developed successfully with the use of the L-shaped square.

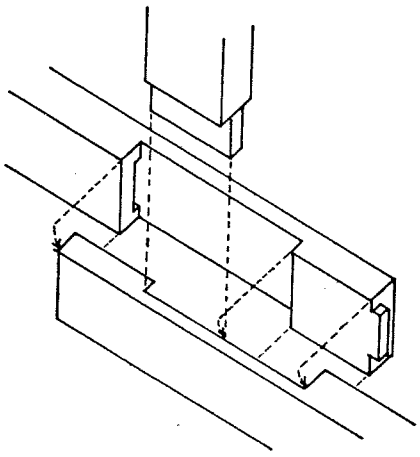


Fig. 12. Sasudai and Strut

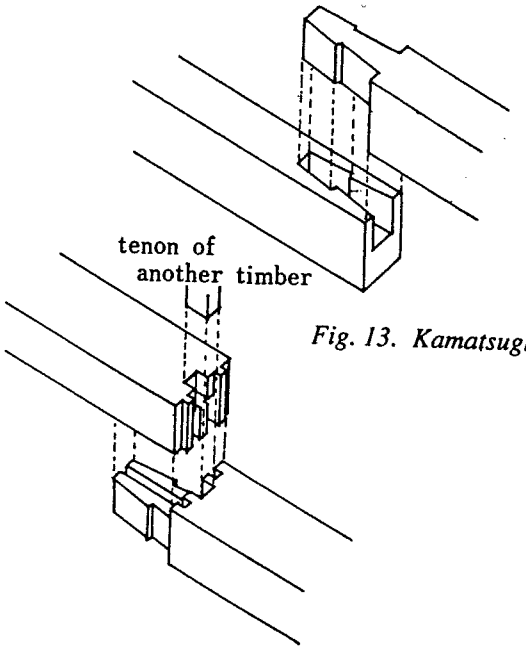


Fig. 13. Kamatsugi in middle ages

Fig. 14. Joint with mechigai and double kama

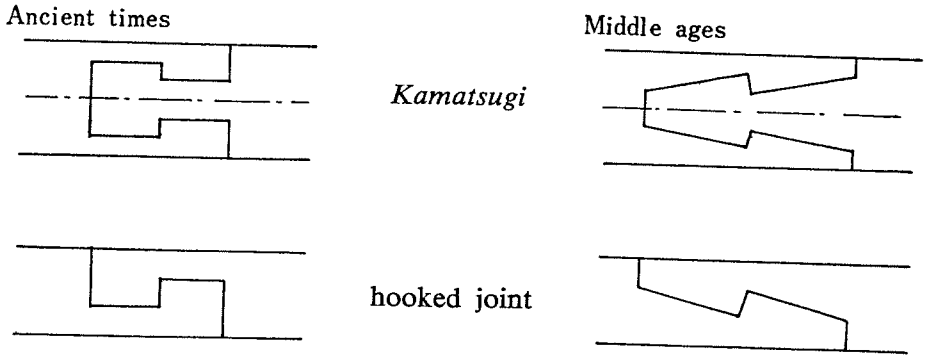


Fig. 15. Relation of figures between kamatsugi and hooked joint

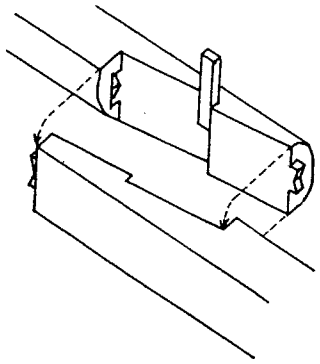


Fig. 16. Hooked bevel joint with mechigai and plug

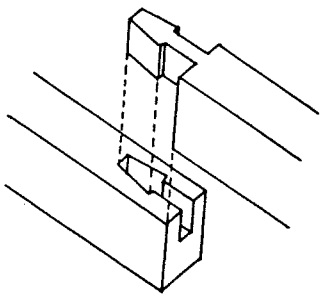


Fig. 17. Kamatsugi in modern period

Since the L-shaped square measures size and the right angle, this alone should suffice to build a Japanese building. However, actually the longer arm of the L-shaped square is only 1.5 shaku (one shaku = 30.3 cm). Therefore, on the construction spot, *shakuzue* (a stick or a ruler) and a large square had to be made. *Shakuzue* is a stick made of wood of high quality. This *shakuzue* is measured, and is used as a standard ruler for a building. The large square is a large triangle to make a right angle accurately. A right angle can be made by making the three sides of a triangle in a proportion of 3:4:5.

The *sumitsubo* is a tool for drawing a long straight line on the surface of a timber. It is made of wood, is boat-shaped and consists of two parts. Inked floss is positioned in the front half, and a roll of cotton string is in the rear half. The cotton string in the roll runs through the inked floss and feeds out into the front direction. A pin is attached to the end of the string. To use *Sumitsubo*, the pin is driven into one end of a timber, and the string is played out and stretched out along the surface of the timber. Then the carpenter plucks the string at the middle, and lets it snap against the timber leaving a straight line in ink. The *sumitsubo* changed its shape from age to age, but its function has remained more or less the same since the ancient times.

Sumisashi is a bamboo pen. One end of it has a sharp edge to draw a thin line, and the other end is slightly pointed to mark points or write figures. Unlike *sumitsubo*, *sumisashi* is an expendable article.

Next, as woodworking tools, we can list adzes, saws, planes, chisels, augers, mallets, and nail pullers. In this thesis, the first three tools will be explained.

Adze: This is a tool to level the surface of a timber. A blade is attached at a right angle to the end of an extremely hooked handle. The adzes of the middle ages, which is now known in the picture scrolls, was a single-handled small one. From its traces on woods we can assume that the edge was relatively round. Comparing with the straight edged adzes that we use now with both hands, the round edged adzes can, we assume, polish a wide surface more neatly.

Saw: Japanese saws have always had their edge in such a direction that a timber is cut by pulling the saws. Saws of ancient times and middle ages had various forms. The most typical of them was a leaf-shaped saw, which is cross-cut saw. There was no rip saw, therefore, wedges were used to divide the timbers. However, in the latter half of the middle ages, rip saws were begun to be used, which made it easier to produce thin boards.

Plane: A plane is a tool for smoothing the surface of a timber. The type of planes now in use called *daiganna* (plane on a stand) with edges attached in a cutting angle on a wooden stand came in to existence at the end of the middle ages. Before the end of the middle ages, *yariganna* (a sort of chisel in the form of a spear) was used. This *yariganna* has a long hand to whose end is attached a blade. The blade had the form of slender leaves with edges in both sides. The *yariganna*

was used to finish woodworking with more refinement and the marks it left was shaped in the form of bamboo leaves. In order to finish more neatly scouring rushes were used to polish the surface of a timber planed with *yariganna*.

Aspects of Japanese Wooden Buildings

Masaru Sekino

Introductory Note

I feel very much honoured to be given an opportunity to make my presentation as the first speaker at this international symposium on preservation of wooden cultural properties opened today.

It is not too much to say that Japanese culture is the culture of wood. On the pieces of land rich in woods and forests, Japanese people made their living by farming, particularly rice farming, from olden times. In the field not only of architecture but also of sculpture, applied arts and painting, they have made works of art with wood as materials, or on the subject of trees or woods, and have treasured and preserved a quantity of them generation after generation as cultural properties.

Everywhere on the earth where there is wood, there are cultural properties made of wood, and their adequate conservation is a problem not only of Japanese but of mankind at large. From this point of view it is most appropriate and meaningful that this international symposium on the preservation of wooden cultural properties is held in Japan with characteristic culture of wood, under the joint auspices of Unesco and the Tokyo National Research Institute of Cultural Properties.

Now, I should like to make my presentation under the subject "Aspects of Japanese Wooden Buildings" with some reference to sculpture and applied arts.

1. Wood, Stone and Brick

Wood grows on the earth in the form of trees, while stone and raw materials for brick are found on the surface of the earth or underground. The former is classified as organic material or plant, and the latter inorganic materials or minerals. In woody land people built houses with wood, and in lands rich in stone or where raw materials for bricks were easily obtained they built houses with stone or bricks.

By principle of conservation, we have lintel construction and arch construction. The former is for wooden buildings and the latter for stone and brick buildings. The history of European architecture is the history of the development of stone and brick architecture, while the history of Far Eastern architecture (i.e. of Chine, Korean Peninsula and Japan) stands in the tradition of wooden construction. In particular, Japanese architecture stood by the tradition of wooden construction and left scarcely any examples of stone or brick construction all through historical ages until mid-19th century.

Therefore, the conservation of

historic buildings in Japan is primarily the conservation of wooden buildings in lintel construction.

Of course, wooden houses existed and still exist also in Western countries. Generally speaking, however, decline of wooden construction and development of stone and brick construction occurred rather early in the Western history. It is dated in Europe at around The Renaissance at the latest. The history of this evolution is very interesting in respect not only of materials and structure, but also of design and style. At the same time we perceive in it a question related to present day and future Japan where there is the decline of wooden houses in the process of modernization.

In the arch construction, cut stones or bricks were piled up to make walls, and arches were used in openings and vaults for inside space. The arch construction was brought to completion in ancient Rome, but quite a few Romanesque and Gothic style buildings do have wooden roof trusses.

Part of the reasons for the architectural transition from wood to stone and brick construction is ascribed to urban development and to protection against the danger of spreading fire which grows with such development. In some wooden buildings traditional laths and mud walls in wooden frames are substituted by brick curtain walls to gain greater endurance. This is the half-timber construction. Not only such half-timber houses but also stone or brick manor houses and vernacular houses with wooden inner posts, beams, floors and roof-trusses are not uncommon in Western countries. Of course in northern woody countries there are a large quantity of genuine wooden houses even in this day.

In the East there are also stone and brick houses as well as wooden houses, but in the Far Eastern countries wooden houses predominate. Palace and Buddhist structures which were typical of Chinese architecture show an aspect of wooden structure brought to perfection. In such edifices, however, stone or black bricks were used for podiums, stone foundations, ground floors and walls, and roofing tiles were used for roofs. In this way stone, brick, and roofing tile which are of better lasting quality than wood were reasonably used since early times in the parts susceptible to corrosion in wooden buildings. This technique was introduced in Japan in the 6th century, except for the use of bricks, which failed to secure a position in Japanese architecture.

After the Meiji Restoration Japan opened her door to the world, and accepting, studying and imitating architectural techniques from Western countries, succeeded in further developing them in the process of industrial modernization. In the Meiji Period (1868-1912) the Western style stone and brick buildings were constructed by architects from Europe and America or by the Japanese architects and master carpenters studied under such foreign architects. Of course, the techniques and styles of Western wooden architecture were also imported and contributed to the rationalization of traditional wood-

en architecture in Japan.

2. Development of Japanese Wooden Buildings

To discuss the architectural evolution of wooden buildings in Japan from the aspects of conservation and restoration, I would like to make a historical division as 1) protohistoric era, 2) ancient and medieval eras and 3) pre-modern and modern eras. These three periods had their own characteristic architectural styles.

1. Protohistoric Era (3c. - 6c. A.D.)

It is only after the late War that it became possible for us to date with archeological evidence the existence of houses made by assembling the timbers prepared with the aid of iron tools as not later than the latter half of the Yayoi Period (3c. B.C. - 3c. A.D.). At the archeological site of Toro in Shizuoka Prefecture, some remains of dwellings and storehouses were unearthed together with those of paddy fields. There were discovered, as well as the pits of dug-in-posts, roots of posts, fragments of foundation boards, and even structural members of *itagura* (board storehouses on pilotis). As for tools, existence of iron adzes and iron chisels was proved by the edge marks on the kerfs of the unearthed timbers. The unearthed boards also bore testimony to the existence of primitive ripping techniques. Thinner boards were made by ripping round timbers along their annual rings. Since such timbers are found in water-logged state, they are treated scientifically in these days with a kind of synthetic resin for conservation. As a consequence of the study of unearthed timbers and the ground-plans of dwelling sites, hypothetical restoration is made of ancient dwellings and storehouses on pilotis.

It is a pity that the development of palace and shrine architecture in the protohistoric era or prior to the introduction of Buddhism from China has not yet been corroborated by archaeological finds, but fortunately we have the shrine structures that preserve the prototype of Japanese architecture. As is universally known, they are the *honden* (inner shrine) of the Grand Shrines of Ise and Izumo. Ise Shrine has been faithfully reconstructed every 20 years since the 7th century. By this strict replacement of all materials with new ones, the Shrine preserves such prototype unchanged to this day (i.e. unpainted wooden buildings with thatched roofs, dug-in-posts, wood boarding walls, up-raised boarding floors, and surrounding veranda boardings under the eaves). We may say that this periodical reconstruction principle constitutes one of the sensible and worthwhile measures to preserve wooden buildings for good, and is also very suggestive as regards the processing of traditional materials and preservation of traditional woodworking techniques. The Inner Shrine of Ise represents the ancestral style of palace architecture. In the precinct of Ise Shrine we also find an *itagura* for storing rice crops, which was prevalent during the Nara Period.

The Inner Shrine of the Grand Shrine of Izumo conveys the prototype of palace architecture. The present building dating from the

18th century survived to this day only with repairs for conservation, without recourse to reconstruction. The present inner shrine is 24 meters high and is the largest of all existing shrines, though according to a record written in and around the 10th century it was presumably larger than the Daibutsu-den (Hall of Great Image of Buddha of Tôdai-ji Temple) in Nara - that means it was 48 meters high. In association with the construction of large-scale imperial tombs in ancient Japan, I imagine that there was in Japan an age when they built massive palaces and shrines with huge trees.

2. Ancient and Medieval Eras (6c. - 16c)

Thirty temples erected in the Nara Period (7c. - 8c. A.D.) are registered and protected as national treasures and/or important cultural properties. They include the main hall, the five-stories pagoda and the corridor of Hôryû-ji Temple, followed by the east pagoda of Yakushi-ji Temple, the main hall of Tôshôdai-ji Temple and so on. We have another similarly important example, which is the *Azekura* of Shôsô-in Repository under the jurisdiction of the Imperial Household Agency. As the oldest wooden buildings remaining on earth, they constitute elements of the cherished cultural heritage of the world.

By the way, according to historical records Daibutsu-den of Tôdai-ji Temple was twice burnt to ashes. The present edifice is the one reconstructed in 1705 on a somewhat reduced scale. It may be regarded as the material which points to an utmost dimensional limit in wooden architecture.

The dismantling and reassembling of ancient structures from the Nara Period has been scrupulously undertaken since 1929, especially after the War, which led to a quantity of architectural, archeological and historical findings. Under the aegis of such achievements, it has become possible to restore to their original forms the palaces and temples traced only by their remains on or in the ground. As clarified by the large-scale post-War excavation of the Heijô Palace Site, the palaces and their subordinate structures in the Nara Period, which were constructed in wood following the architectural tradition of the protohistoric era, have left no earthly traces but the pits and the roots of columns in the ground. It is because the columns of such buildings were set up in pits and they were roofed by shingle roofing or cypress-bark roofing. However, there were some palaces constructed under the influence of the advanced architectural system of the Continent. They were built on foundation stones placed on podiums and roofed with tiles as in the case of Buddhist architecture. By archeological excavation a quantity of relics are unearthed from such sites. These archeological finds provide us with quite a few informations which enabled us to challenge for the restoration of original wooden structures with a certain extent of confidence. Trial models are made from time to time.

As the examples of full-scale restoration of Buddhist edifices on their original sites, we have the main hall and the west pagoda of

Yakushi-ji Temple and the three-storied pagoda of Hokki-ji Temple. The reconstruction work was executed by the prominent master carpenters of traditional wooden architecture and their teams. Such operations are considered extremely important from the viewpoints of the revival of 1200 year-old woodworking techniques which have long fallen into disuse and forgotten, and of successor training. Besides, they facilitate the comparative study of old Japanese and continental wooden buildings which share the same origin.

The present Imperial Palace in Kyoto is a group of buildings reconstructed in the middle of the 19th century. It deserves special notice that its two central halls, i.e. Shishin-den and Seiryô-den, were reconstructed following out the ancient institution as corroborated by historians' investigation. Furthermore, in the Meiji Period, part of Chodo-in of the Heian Palace consisting of Daigoku-den or the State Chamber of Chôdô-in, Oden-mon gate and corridors which had borne witness to the predominant influence of Chinese culture was reconstructed as part of Heian Jingû on a 1/2 scale.

Buddhist architectural style became amalgamated with shrine architecture to some extent, and Japanization of Buddhist architecture made steady progress throughout the Heian Period of from the 9th century through the 12th century. The Phoenix Hall of Byôdô-in Temple in Kyoto and the golden Hall of Chûson-ji Temple in Iwate are the typical examples of the Period. Later in the Kamakura and the Muromachi Periods (i.e. 13th c. through 15th c.) the architectural styles of Sung China were introduced giving further influences, adding a variety of styles to the medieval architecture in Japan, as exemplified by the Sanmon or two-storied gate of Tôfuku-ji Temple in Kyoto, and the Shari-den of Enkaku-ji Temple in Kamakura.

While in the Asuka-Nara Period there was a predominance of wooden architecture in the construction of Buddhist temples, in the sector of Buddhist sculpture wooden statues were fewer as compared to gilt bronze images. Purely Japanese wooden sculpture dates from the beginning of the Heian Period or the 9th century. The Heian Period is the golden age of wooden sculpture, and its techniques became complicated. Single block statues were made down into the 10th century, on the other hand, in the 11th century there developed a technique called *kiyose-hô* of making wooden statues assembling a number of wood blocks from which particular parts were carved out. With such *yoseki* technique they succeeded in making unprecedentedly graceful and well-balanced figures. This tradition was upheld through the history of sculpture far into the Edo Period. In this viewpoint we may safely say that Japanese sculpture was essentially sculpture in wood.

The *azekura* of Shôsô-in Repository is the largest of its kind, composed of two square-floored *azekura* type storehouses connected with plank walls and covered with a single hipped roof of tiles. It has stored, among others the late Emperor Shômu's beloved belong-

ings which Empress Dowager Kômyô dedicated to the Great Buddha (Vairocana) of Tôdai-ji Temple in 756 A.D. together with the inventories, as well as a large number of other equally important objects of applied arts. They have been scrupulously treasured in the Repository under direct supervision of the Imperial Court known as 'Imperial Seal' system. It is opened only once a year for the purpose of airing. Included among the Shôsô-in treasures are, in addition to the objects made by Japanese artists in the Nara Period, a quantity of exquisite furniture, implements, garments, etc., from China and other countries west of Japan, which were made with highest skill and techniques. While textiles comprise a large percentage, the collection also includes quite a few examples of lacquer art and wooden articles made with *yoseki* and a variety of other techniques, preserved in good conditions - some of them looking as if they were made only a few years ago. In this sense they are the qualified treasures of the world. We find in this an eloquent testimony to the suitability of *azekura* as the storage of applied arts for one thing and to the coherent policy of custody executed throughout the period of over twelve hundred years. 'Encasing of wood in wood' would be the best way of preservation. But, because the interlocking three cornered timbers that walled the *azekura* got thinner by weathering, the treasures were removed to the newly constructed modern ferroconcrete and air-conditioned repository.

3. Premodern and Modern Eras (16c - 19c.)

Most of the premodern and modern religious structures registered as important cultural properties are the mere followers in the previous era's styles and techniques, but in the 16th and the 17th centuries architectural operations were very active. The buildings became gorgeous with ostentatious ornamental details involving numerous carvings, colouring, coloured paintings including *urushi* (or lacquer) art. As represented by Tôshô-gû, Futaarasan Jinja and Rinnô-ji Temple, such religious buildings indicate the ultimate aspect of wooden architecture.

Next, I should like to move on to the wooden residential buildings peculiar to Japan. Residential buildings are practical in design and feasible for frequent modification and renovation, and smaller in size as compared with monumental edifices of shrines and temples. The structural members such as posts and beams are more slender, and accordingly the life span of such houses is not so long - usually 300 years at the longest. In future, a systematic and long-time observation will have to be executed in regard to the dismantled - and - reassembled buildings for the purpose of determining how long they may endure.

Very old monuments in Kyoto, Kinkaku (reconstructed in 1959 after the fire of 1955) and Ginkaku are the masterworks of architecture highlighted by landscape, and are characterized with the elements and details peculiar to the period of transition from the ancient to the medieval era. Tôgu-dô Hall in

Jishô-ji Temple represents the prototype of premodern residential architecture, and is classified as its oldest example. In quite a few cases residential buildings were transplanted to different places or remodelled for reuse, or in some other cases, dismantled timbers were given a second life as part of the materials in different construction. In the course of dismantling and repair of the famous Katsura Detached Palace, we also came across the traces of such episodes. Sankei-en in Yokohama is an open-air museum where residential buildings, tea-houses and other architectural assets of high cultural value were collected by private efforts from all over the country for the purpose of their permanent preservation.

Next, about castles. In Japan we have no example before the 15th century. Feudal lords in the 16th and the 17th centuries emulously erected castles in the center of their home towns. In this fashion wooden castle architecture unique in Japan developed to its culmination, as we call the golden age of castle construction. The donjons were skyscrapers of 3 to 7 stories with layers of eaves, pave stone foundation, and thickly plastered mud walls for prevention against fire, constituting the symbols of castle-towns. Himeji Castle is an example of the golden age. The towns which lost castles in air-raids during the last War desired to reconstruct them. However, due to financial reasons and in particular to difficulty of obtaining timbers of great dimensions from domestic sources, they resorted to steel-frame reinforced concrete construction. In such cases, they were made to reproduce the original outward appearances as faithfully as possible, consulting the drawings, plans, photographs and other reference materials that remained, but inside they were made modern in style and utilized as museums and the like. The typical examples are Osaka Castle and Nagoya Castle.

Merchants' houses in such castle-towns and farmers' houses in rural areas are collectively called *minka* (vernacular architecture). Influence of *shoin-zukuri* which was characteristic of *samurai* houses is traced also in vernacular architecture. The life span of vernacular architecture is regarded as approximately 200 years. Since castle-towns frequently fell victim to fire, there developed mud wall construction, such as *nuriya-zukuri* and *dozô-zukuri* for better protection against fire. On the other hand, mud walls easily collapse by earthquakes, as proved by the Kantô Earthquake of 1923. After that, wooden architecture came to be largely restricted in urban areas for fire-prevention purposes.

3. Characteristics of Japanese Buildings

Japanese buildings are built with quite a few interesting techniques developed and maintained by master carpenters. On this occasion I will refer to the three basic questions: 1) functions of horizontal, vertical and diagonal members, 2) *tsugite* and *shikuchi*, methods of woodworking for jointing or interlocking such three kinds of members, and 3) *kikujutsu*, a stereometry technique required for drawing ink lines for woodworking and for drafting.

1. Horizontal, Vertical and Diagonal Members

Lintel construction consists of square frame works shaped by vertical posts, horizontal beams and penetrating ties. When posts are set up in pits, they may be stable, but when they are erected on stone foundations, they remain unstable and often shape parallelograms. In order to prevent such contortion, upper parts of the posts must be fixed by brackets that consist of arms and blocks. Mud walls also serve this purpose. In and after the medieval era, penetrating ties developed to connect posts. By the use of supporting brackets, it became possible to make deep eaves by way of cantilevers.

One of the outstanding characteristics of Japanese wooden buildings is the slanting roof. The triangular shape of the roof ensures stability. In the case of an ancient dwelling called *tateana-jûkyo*, the principal part of the shed was dug in the ground and outwardly it appeared like a roof placed directly on the ground. The inner structure of an architecturally advanced roof called 'truss' is composed of horizontal roof beams, vertical roof struts supporting purlins and double beams, and penetrating ties connecting such struts. They are clearly differentiated from the trusses of European wooden buildings. The former are called *wagoya* (Japanese truss) and the latter European truss. Of course importation of the European truss dates from the latter half of the 19th century.

In the roof trusses of Japanese vernacular houses, thick crooked three trunks are used as they are with little modeling for such horizontal members as beams and purlins. Carpenters' skilled art is required for their fabrication. Roof trusses are once put to trial fabrication on the ground and then dismantled and finally fabricated on the already fabricated posts, beams and purlines.

Furthermore, in order to support deep eaves, members called *hanegi* (cantilevers) are placed along the slanting lines of eaves to balance on purlin edges, and roof struts are erected on the cantilevers. Eaves are fixed to the cantilevers. Of course trusses are closed by ceilings together with cantilevers. This type of trusses are called *nogoya* (hidden truss), which provides room for freely designing the curve and gradient of roof and eave and also facilitates the repairing and remodelling of the roof. This is the unique Japanese architectural device developed in and after the medieval era.

Next, as the device for securing stability for the square frame made by posts and beams in lintel construction of wood, there is the application of diagonal members, which are *sujikai* (diagonal brace) and *hoozue* (strut). We do have some examples of their use in ancient buildings, but they were not popular yet. In and after the Meiji Period, Japanese people paid attention to the sensibleness of such diagonal members which had been introduced with the European wooden truss. Encouraged as an effective earthquake-proof measure, it came into wide use. This type of truss was promptly adopted in the Meiji Period in the conservation of

architectural monuments. King post and queen post trusses were adopted in place of Japanese trusses in dismantling and repair of *kondô* and *kôdô* of Tôshôdai-ji Temple and *azekura* of Shôsô-in Repository executed in the Taishô Period. However, these are exceptional cases. Today, such alteration of existing state is subject to full deliberation in view of the fundamental principle that original aspects of historic structures should be preserved even to roof trusses. However, the fact that wooden five-storied pagodas built with practically no diagonal members never collapsed by great earthquakes remained a mystery until dynamics succeeded in demonstrating the natural period of vibration of the pagodas and the damping capacity inherent in this kind of wooden structures.

2. Tsugite and Shikuchi (Joints and Interlocking)

In jointing horizontal, vertical and diagonal members explained above in relation to the structures of wooden architecture, management of the points of intersections requires the highest techniques. And the techniques of jointing short members longitudinally to the required length are equally important. The former woodworks are called *shikuchi* and the latter *tsugite*. Trusses for thatched roofs are primitive, and the members and tied together with creepers, ropes or slender, pliant but strong sprigs. But, to combine two timbers, they are either scarfed, or plugged, or mortised. In Japan woodworks of *tsugite* and *shikuchi* markedly developed in the modern era, and a variety of forms were devised. Because the members were usually finished unpainted, the woodwork became more and more elaborate, and the complicated inner mechanism could not be known from outside. However, excessively elaborate *tsugite* and *shikuchi* exposed dynamic weakness to earthquakes. Based on the study of earthquake-resistance of construction conducted in the Meiji Period, Western-type brace, bolt and nut, and a variety of other armatures came to be used. This must also be taken into consideration in dismantling and repair of cultural monuments.

3. Kikujutsu (Stereometry)

If Japanese wooden architecture is to follow the system of preparing in advance all respective members in exact sizes to fit in the right positions indicated in the drawing, and then assembling them into a building, it is absolutely necessary that ink lines are drawn correctly to direct woodworking and that woodwork is conducted accurately with excellent techniques manipulating a variety of tools. In regard to the ink lining, which is the precise drafting in ink on the surface of each timber, an advanced Japanese stereometry technique named *kikujutsu* developed in the modern era. To do the drawing there were four essential tools, i.e., a pair of compasses, L-shaped square, level, and *suminawa* (inked floss and inking line). Of these, L-shaped square is made of iron or brass and is notched to serve both as a measure and a square. With *kikujutsu*, a good

command of this L-shaped square enabled a carpenter to draw base lines, fix angles and draw geometrical figures accurately. The peculiarity of Japanese L-shaped square is that it bears two kinds of notch marks on it - ordinary graduation in Japanese *shaku* system and notch marks of $\sqrt{2}$-fold of the measure graduation. With the use of this L-shaped square they could do the arithmetical operations, calculation in $\sqrt{2}$ scale drafting, drawing of regular triangles, pentagons, hexangles, octagons, etc. It had the functions of a kind of comptometer. *Kikujutsu* originated from the Chinese *kô-ko-gen* proportion of the three sides of a right-angled triangle and developed on the strength of *wasan* (Japanese mathe matics) which achieved a remarkable progress during the Edo Period. *Kikujutsu* enabled master carpenters to draw only with the help of this L-shaped square precise ink lines for woodworking on the hundreds and thousands of timbers used in a large-scale building. The inked timbers were all cut and planed to instructions and then assembled straight out, no errors to be detected as to construction and designs. *Kikujutsu* has been discarded as difficult to learn after Western mathematics of geometry and trigonometry and geometrical drawing were introduced in and after the Meiji Period and took the place of *wasan*. Today it is placed under government protection as one of Japanese traditional techniques.

Restoration of Wooden Buildings

Kakichi Suzuki

1. Designation

1-1

For the preservation of historic buildings in Japan, a designation system is prescribed in the Law for the Protection of Cultural Properties enacted in 1950. Previously it was governed by the Law for the Preservation of Ancient Temples and Shrines (1897-1929) and next by the National Treasures Preservation Law (1929-1950). Under the present Law there are three categories of designation: national, prefectural and municipal. While national (or State) designation has been in force since 1897, local authorities proceeded to make their protection system after 1950 following the national one. Prefectural designation started around 1955, and until now 46 prefectures out of 47 have established their own protection systems. Municipal designation lagged farther behind. Since around 1965 there started a general movement for municipalities to establish their own cultural property protection regulations, and as of 1980, 2755 (80%) out of 3278 municipalities have such regulations. Designation and protection are conducted also under such by-laws.

Increase in cultural property buildings designated by the State since 1897 is as shown in Fig. 1. Though not a few historic buildings were lost in war in 1945, generally speaking, designated buildings have continued to increase.

1-2

Invaluable historic buildings are in principle designated and protected as 'important cultural properties ('national treasures' included'), but some of them are designated in some other categories under the Law: 'historic sites' or 'tangible folk-cultural properties' - 111 items in the former category and 18 items in the latter. The Law was amended in 1975 to include the system for preservation of groups of historic buildings. Accordingly, selection of such preservation districts was brought into practice.

1-3

As of July 1982 there are 1950 items (or 3143 buildings) designated by the State as 'important cultural properties' (Cf. Tables 1 & 2). And 18 districts are selected by the State as 'important preservation districts for groups of historic buildings' (Cf. Table 3).

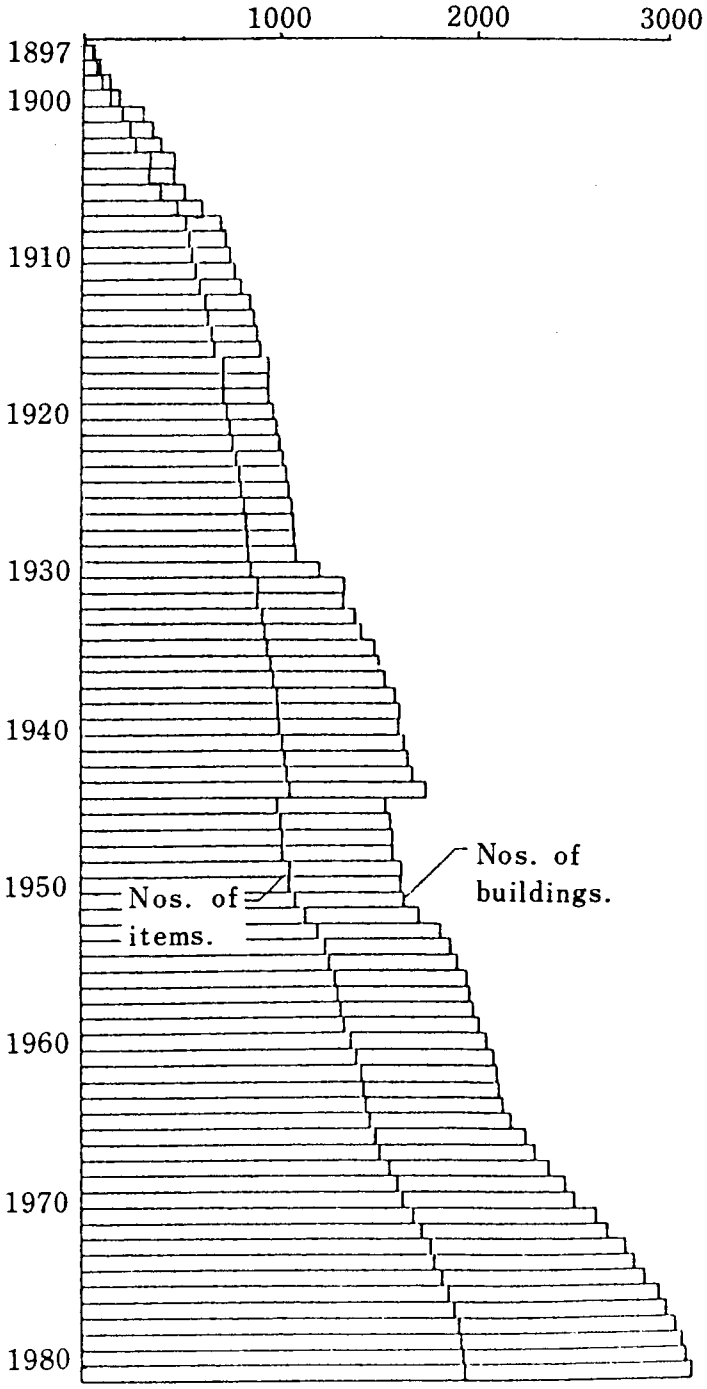


Fig. 1. Buildings designated by the State.

Table 1. Types and Age of Buildings Designated as Important Cultural Property by the State (as of July, 1982)

Period Type	Asuka–Nara (593–793)	Heian (794–1184)	Kamakura (1185–1332)	Muromachi (1333–1572)	Momoyama (1573–1614)	Edo (1615–1867)	Meiji– (1868–)	Total
Shrine		(3) 5	(15) 53	(8) 296	(6) 148	(26) 457	2	(58) 961
Temple	(26) 30	(22) 32	(53) 159	(30) 341	(11) 111	(10) 244	1	(152) 918
Castle				(1) 1	(13) 117	(2) 113	1	(16) 232
Residential archit.				(2) 7	(13) 37	(5) 90	2	(20) 136
Western–style archit.						(1) 8	100	(1) 108
Vernacular archit.				2	2	501	37	542
Stone const–ruction, etc.	1	13	122	53	(1) 11	(1) 46		(2) 246
Total	(26) 31	(25) 50	(68) 334	(41) 700	(44) 426	(45) 1457	143	(249) 3143

Note: Figures in parentheses indicate the number of National Treasures.

Table 2. Breakdown of Important Cultural Properties by Ownership

State	Prefecture	Shrine	Temple	Other jurid. persons	Private	Others	Total
177 (5.6%)	302 (9.6%)	941 (29.9%)	1162 (37.0%)	112 (3.6%)	432 (13.8%)	17 (0.5%)	3143 (100%)

Table 3. Important Preservation Districts for Groups of Historic Buildings (as of July 1, 1982)

Type of district	Number of districts
Residential quarter of *Samurai*	6
Business district	2
Post town	3
Temple town	2
Tea-house district	1
Industrial district	2
Farm village	1
Group of Western-style buildings	1
Total	18

Table 4. Breakdown of Important Cultural Properties by Roofing Materials

Materials	Tile of all kinds	Vegetable materials	Copper, slate, etc.	Structure without roof
Nos. of buildings	1137	1301	423	283
Construction	Wood 2829 (90%)		Stone, etc. 314 (10%)	

Table 5. Breakdown of Buildings Designated by Prefectures

Type	Shrine	Temple	Castle	Residential architect.	Vernacular architect.	Western-style a.	Stone construct	Others	Total
Nos. of bldgs.	510	443	30	58	218	56	442	53	1810

Most of the historic monuments in the State ownership are castles and public buildings such as governmental or other public offices, schools and museums. Among the prefectural properties, two-thirds are castles and public buildings, and one-third are vernacular houses. Maintenance of vernacular houses by their owners often falls into difficulty. In such cases to owners donate or sell them to local public bodies to ensure their preservation. The Government grants subsidies to such local public bodies to enable them to acquire the assets concerned.

1-4

By type of construction, cultural property buildings designated by the State include 2829 wooden buildings and 314 stone and other buildings. Most of the stone structures are simple in construction like little pagodas and *torii* or Shinto shrine gates, and there are very few stone buildings with inner space, exclusive of Western style buildings introduced into Japan in the Meiji Period.

Table 4 shows their breakdown by roofing materials. The table indicates that ninety percent of State designated buildings are wooden structures, and nearly half of them are thatched with vegetable materials. Historically speaking, indigenous Japanese buildings like shrines, residential houses and vernacular houses were originally roofed with vegetable materials, and Buddhist temples introduced from China in late 6th century were roofed with tiles. But, in early 8th century there appeared quite a few Buddhist temples roofed with vegetable materials as a result of architectural Japanization. On the other hand, roof-tiles were used for castles, residential houses and vernacular houses in and after the 16th century in due consideration of their better durability and fire-proof quality. As regards the shrine construction, there began to appear in and after the 17th century shrines roofed with copper for better durability.

1-5

Table 5 shows the breakdown of the buildings designated by prefectures. By type, tendency is similar to those designated by the State. By age of construction, most of them date from the 16th century or later, except for the greater part of stone monuments, which were constructed from the 13th to the 16th century.

There are about 3000 items of buildings designated by municipalities.

2. Types of Repair Works and Achievements

2-1

Traditional Japanese wooden structures are characterized by the minimal use of metals such as iron nails and iron cramps, priority being given to wooden joints called *tsugite* and *shikuchi* which are shaped from the timber itself, tightened also with wooden pegs and wedges. Particularly in the main frame work composed of pillars and beams and in the roof structure, no metal parts are used in principle. Because of this construction, when we repair a building, only the deteriorated pillars and beams are easily removed and replaced with new ones. If the building is heavily deteriorated, it is also

easy to dismantle the entire building into individual members and reassemble them. In many cases, the best way to make full use of the traditional techniques without damaging the original timber is to dismantle the building and repair the deteriorated part of individual timbers or, if necessary, replace the old timbers with new ones which are shaped in the same forms as the original *tsugite* and *shikuchi*, then reassemble them in the same way as the building was originally constructed.

2-2

In Japan, a land of much rain and high average humidity, roof and below-floor parts are deteriorated and rotten most easily.

For this reason, traditional Japanese architecture has double roof structure, except for simple architecture like vernacular architecture, namely *keshô-noki* (dressing eaves) seen from below and *no-yane* (hidden roof structure) constructed above it. Therefore, at the early stage of rain leaking, the only treatment required includes no more than the repairing of hidden roof structure and re-roofing of tiles, cypress bark or wooden shingles. This method is called the 'roof repair' (*yane-gae*) (Fig. 2).

But continued leaking of rain water makes the building more and more deteriorated, first the dressing eaves then down to the main structure such as crossing beams (*keta*), series of brackets, beams, pillars and so on. Even in this case, if the deterioration is not so advanced, it is possible to do sufficient repair on the building leaving the main structure standing untouched, but dismantling as far as the rafters of eaves or the outer crossing beams and pillars which support the eaves. This method is called 'half dismantling and reassembling repair' (hereafter referred to as 'half dismantling') (Fig. 3).

On the other hand, in the case of deterioration of the foot of pillars, we do the *netsugi* (cutting the rotten foot part and replacing it with new material) repair. This method is carried out by lifting up the entire building only slightly.

2-3

According to historical evidence, Japanese wooden buildings needed half dismantling every 100 to 130 years, and every 300 to 400 years larger scale half dismantling including even the renewal of some beams or pillars, or complete dismantling and reassembling repair (hereafter referred to as 'complete dismantling'). In the case of tile roofing, as the durable length of tile is about 100 to 130 years, modest half dismantling and roof repair are done simultaneously. For example, in the case of the Golden Hall of Hôryû-ji Temple which was constructed around 680 A.D., larger scale half dismantling was done around 1100, in 1374 and 1603, and complete dismantling in 1945. In between these repair works, roof repair and modest half dismantling were also executed about every 100 years.

Besides half dismantling and complete dismantling - collectively called 'radical repair' -, cypress bark roof, Japanese wooden shingle (*kokera*) roof, thatched roof or roof of any other vegetable materials

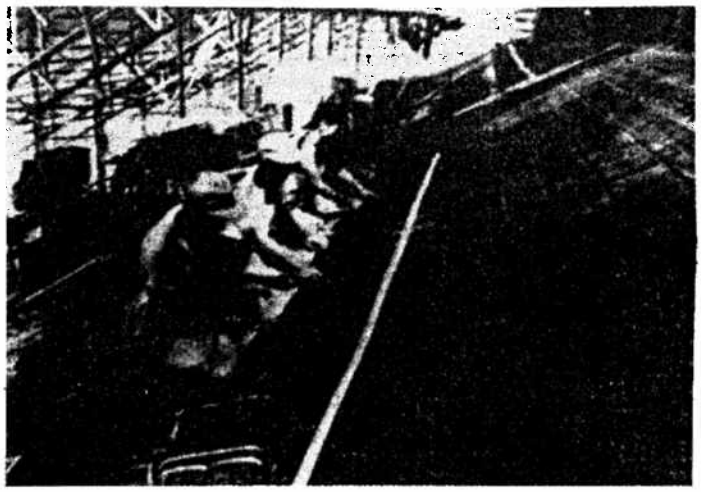


Fig. 2. 'Roof repair' work (Main Hall of Kimpusen - ji)

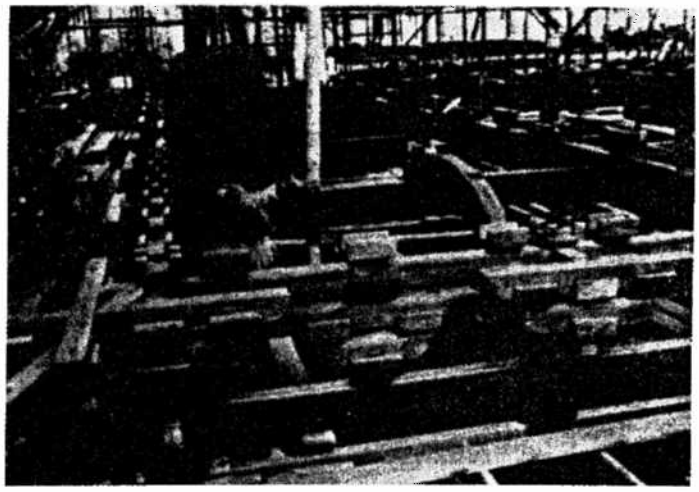


Fig. 3. 'Hall dismantling' work (Kondo of Kanshin - ji)

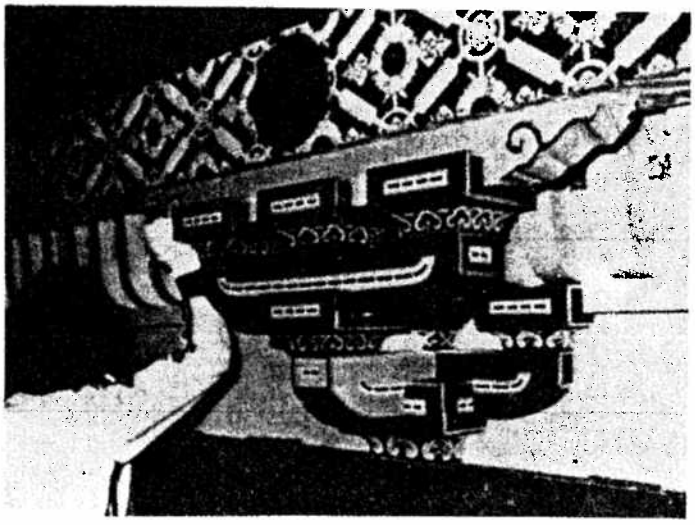


Fig. 4. 're-painting' work (Kariden of Tosho-gu).

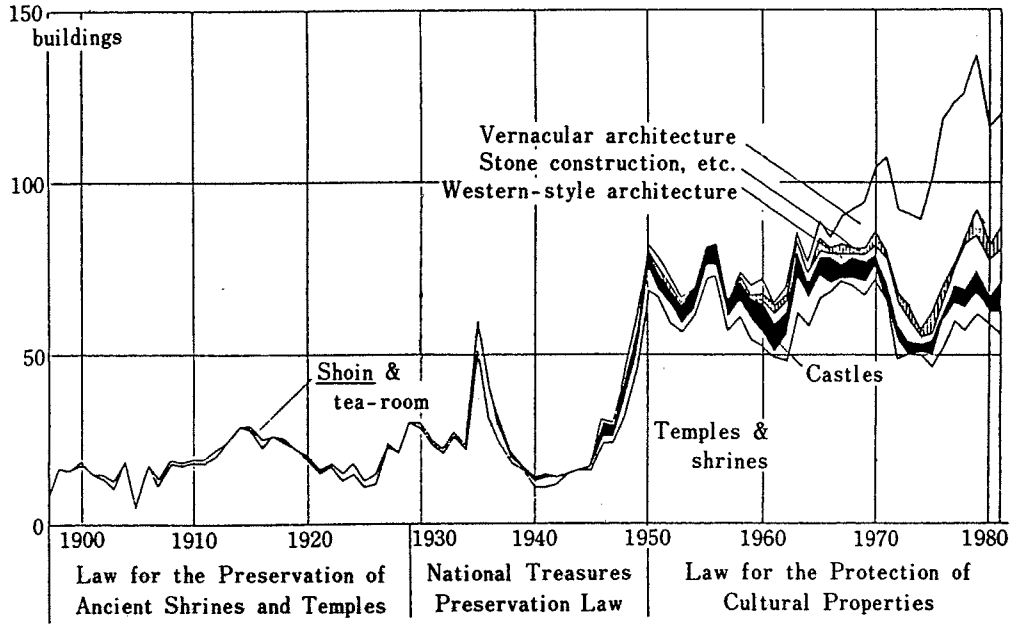


Fig. 5. Buildings repaired classified by types of architecture.

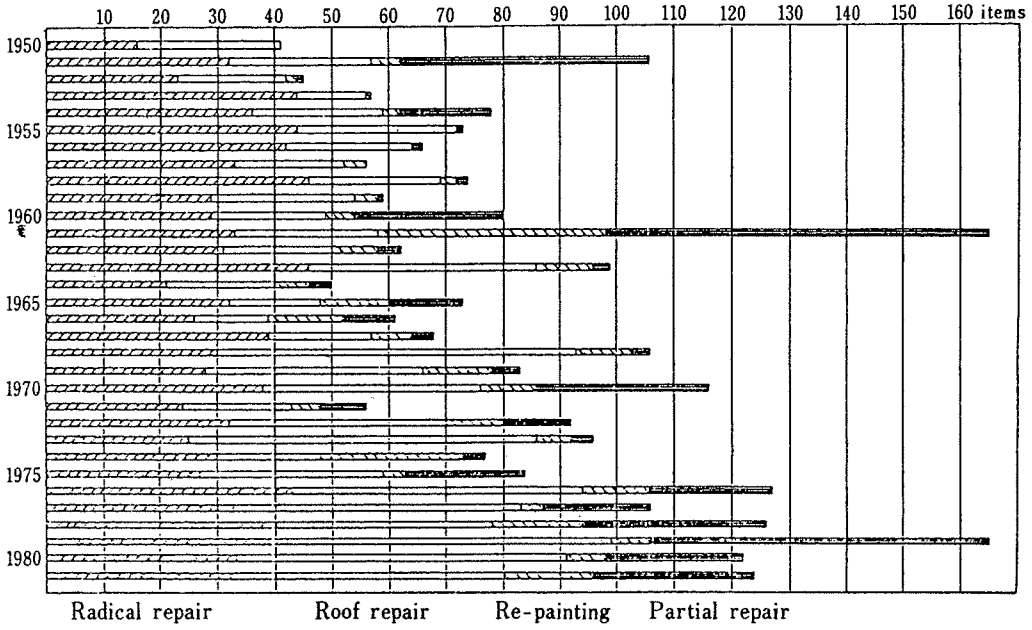


Fig. 6. Architectural repairs classified by method of repair.

requires re-roofing every 35 to 40 years and the exterior *urushi* paintings and pigments need re-painting every 50 to 60 years (Fig. 4).

2-4

The repair works under the protection system dating from 1897 have also been following these historical methods of maintenance mentioned above. Out of the 2829 wooden historic buildings designated as important cultural properties under the Law, 1772 buildings underwent radical repairs by 1981. As roof repair and re-painting are conducted periodically regardless of radical repair, buildings that have experienced repair work 2 or 3 times come up to a considerable number. The number of repair works which have been conducted with Government subsidies during the 85 years between 1897 and 1981 reached to 3905 all-inclusive. Chronologically, during the 1897 to 1914 period of 18 years governed by the Law for the Preservation of Ancient Shrines and Temples 157 repair works were performed (8.7 cases a year on an average), during the 1915 to 1949 period of 35 years under the National Treasures Preservation Law 867 repair works (24.8 cases a year on an average) and during the period of 32 years i.e. from 1950 to 1981 under the Law for the Protection of Cultural Properties 2881 cases of repair works were carried out (90 cases a year on an average). Fig. 5 shows the quantitative transition of repair works undertaken by types of architecture.

In the period under the Law for the Preservation of Ancient Shrines and Temples, only religious structures and residential buildings owned by temples and shrines were eligible for designation, but with two revisions of law in 1929 and 1950, designation of castles and Western style architecture started, and accordingly repair works were also extended to these monuments from around 1923. Furthermore, in accordance with the increase in number of designated vernacular houses from around 1960, the number of repair works for vernacular houses increased and reached to one-third of all works after 1965. The reason for this sharp increase is that we lay emphasis on the policy to repair vernacular houses within 4 or 5 years after designation.

2-5

Fig. 6 shows the breakdown of repair works by method of repair since 1950.

The repair methods are classified into five categories, namely, complete dismantling, half dismantling, roof repair, re-painting and partial repair. Partial repair means mainly repair work on the small scale such as repair of exterior walls or verandas and very often includes the restoration work following typhoon and other disaster.

The average number of completed repair works is as shown in Table 6. According of the table, the average number per year of completed repair works for the last five years up to 1981 is 117.2, which is almost twice as large as the average number per year for the ten years from 1950 to 1959, that is 59.5. But as far as the number of radical repairs is concerned, it is 37.0 per year for 1977-1981, and 35.1 per year for

1950-1959. As is clear from this table, the number of radical repair works per year is practically the same during the 30 years since 1950. On the other hand, the number of roof repairs shows a sharp increase, and particularly the number of partial repairs shows a marked increase in recent years.

The reasons for this phenomenon are partly attributed to the fact that the total cost of partial repair had been paid by the owners in principle until 1950, whereas it came to be partly subsidized by the Government thereafter, but largely to that due to the shortage of qualified restorers available, cases of radical repairs could not be increased. Lots of monuments in need of radical repair have been left as they are only with such first-aid treatment as re-roofing or partial repair in the hope that it may arrest further deterioration, thus contributing to the increase in number of partial repair works.

Table 6. Averaage Number Per Year of Repair Works

Repair / Period	Radical repair		Roof repair	Re-painting	Partial repair	Total
	Complete dismantling	Half dismantling				
1930-1939	16.7 bldgs. (79.0%)	0.6 (3.0)	3.5 (17.0)	0.2 (1.6)	0 (0)	21.0 (100)
1950-1959	30.9 (52.0%)	4.2 (7.0)	21.2 (36.0)	1.8 (3.0)	1.4 (2.0)	59.5 (100)
1977-1981	26.0 (22.0%)	11.0 (9.0)	43.2 (37.0)	10.8 (9.0)	26.2 (23.0)	117.2 (100)

In the category of radical repair works the number of complete dismantling is on the decrease whereas that of half dismantling is increasing. It is because the age of monuments to be repaired has become younger.

From among the 1341 wooden monuments constructed before 1615, we already finished complete dismantling on 1172 (88%) monuments, and increasing number of repair works are lately conducted on the monuments constructed after 1615. Generally speaking, as regards the repair of massive buildings with thick frames like temples and shrines which were constructed after late 17th century, treatment with half dismantling method is appropriate for the time being. And vernacular houses constructed after late 18th century can be repaired even without dismantling them. On the other hand, Western style buildings are less durable in Japanese climate because of their shape. Among wooden framed ones, in particular, there are not a few examples which are in need of complete dismantling, though only 80 to 100 years old.

3. The Operation of Repair Works

3-1

Repair of a monument is in principle performed on the site, and in the case of radical repair such as complete dismantling and half dismantling, professional restorers are stationed there for the purpose of doing detailed investigation and securing adherence to traditional specifications and techniques. Also in the case of roof repair and re-painting, if the monument is large in scale or requires special specifications and techniques, restorers are stationed on the site. Otherwise, a restorer only makes a periodical round and gives technical advices to the contractor.

Table 7 shows the placement of professional restorers as of September 1982. There are at present 134 professional restorers responsible for planning and supervision who are engaged in the repair works of monuments. Among them, 87 are stationed on respective sites and the remaining 47 belong to the sections in charge of cultural properties protection of local public bodies or the head office of the Japanese Association for Conservation of Architectural Monuments. By periodical visits these 47 professional restorers supervise the personnel stationed on the repair sites and give technical advices on the sites without resident restorers. The term of repair works for a building is 6 or 7 years at the longest, but the average term is between 18 and 27 months for radical repair and between 3 and 9 months for roof repair and re-painting. The site of roof repair or other nonstructural repair site in the same table where restorers are stationed is a large scale work site with the term of work ranging between 2 and 4 years.

Table 7. Placement of Professional Restorers (as of Sep. 1982)

Repair Nos.	Complete dismantling	Half dismantling	Roof repair	Re-painting	Partial repair	Total
Sites	27	12	20	7	9	75
Sites with resident restorers	27	12	5	5	1	50
Restorers	51	21	8	6	1	87

In addition to the professional restorers mentioned above, there are 20 officials of the Architectural Division of the Agency for Cultural Affairs, who are responsible for administration and technical guidance.

3-2

The major system for execution of repair work approximately up to 1970 was the direct management system. Under this system, the owner directly employs carpenters called *miya-daiku* (high skilled

carpenters originally specialized in shrine construction) who have traditional techneous jobs beginning with scaffolding and throughout all phases of dismantling and reassembling, and makes them execute wood-work. *Miya-daiku* also make investigation of historical techniques and dimensional research assisting the restorer and put the results of such studies to practical use in the course of reassembling. *Tobi-ninpu* are also responsible for earthworks like foundation work and preparation of mud plaster for mud walls.

Timber and other necessary materials are to be bought and supplied according to the restorer's estimation. Other than carpentry, such works as roofing, walling, finishcarpentry, painting and ornamental metal working are commissioned to particular craftsmen. In this case, usually the craftsmen's cost includes both materials and labor.

The master carpenter of *miya-daiku* is responsible for the completion of the whole building, also assuming the leadership in other associate fields of work mentioned above. This direct management system is a traditional construction system practiced since around late 16th century, when Japanese craftsmen's organizations got systematized.

However, this direct management system is on the decrease in recent years, while cases are increasing also in this field of work where they adopt the all-in-contract system which is employed in the common building construction. It is due to the fact that because the working site moves from one place to another all over the country, direct employees are handicapped in getting stability of living, which leads to the decrease in number of well trained *miya-daiku*. It has become an urgent problem also in Japan to train and secure such craftsmen with traditional skills.

3-3

The basic policy of the repair work is not to reduce the historical value of the monument. In this regard, we must respect and hold to traditional techniques and specifications and also try to reuse the original materials as far as possible. Synthetic resins have come to be used largely in recent years in the rehabilitation of original timbers. For the complementary and replacing timbers, the same kinds of timbers are used as the original ones and not only the shape and the finishing of their surface but also the joints such as *tsugite* and *shikuchi* are made with the old techniques. When the reinforcement is necessary, reinforcing elements are added independent of the original components with a view to avoiding further damage such as cutting and bowling in the original timbers. If the complementary or replacing timber is used in dressing part, antique looking colour is applied to the surface not to be recognized at a glance. The purpose of this colouring is not to disturb the entire harmony of the architectural design. The unpainted timber used in Japanese wooden architecture keeps natural beauty worthy of appreciation even after long years. Moreover, in many cases, it rather creates

unique subdued beauty, which constitutes part of architectural design in an antique building. For this reason we often refrain from colour restoration even if the building was originally painted. The antique looking finish of the new timber is done from the same point of view.

3-4

In most cases of radical repair work accompanied with dismantling of the building, some or other restoration work becomes necessary. As I mentioned before, Japanese wooden buildings have already received repetition of repair works, so it usually happens that some of the original members and the original techniques used in the part above the eaves and in the floor structure have been changed. Few doors, windows and interior fixtures remain in the original state, as a result of change in the purpose of use and of deterioration. It is because remodelling is quite easy in Japanese wooden construction. Even in the main structure, remodelling has been made in later period to enlarge the opening or the interior space, simply by cutting the lower part of a pillar and inserting a beam to support it.

In the case of repair work it always needs careful examination to decide whether the restoration should go back to the original form of the building or to which stage of alteration. The decision should be made and permission given by the council composed of specialists after examining the historical value of each stage and the authenticity of the data for the proposed restoration on the basis of the proposal made by the restorer in charge stationed on the site.

Generally speaking, in the case of wooden building, later repair work and remodelling were usually done without fully correcting the deformation of the building, uneven sinking of the foundation and bending of the timber, with the exception of repair accompanied with complete dismantling. Consequently, if we correct these deformations in the course of dismantling and reassembling, not infrequently the changed part in later repair fails to fit well. And the technical feature of the original building has diminished, because the main frame and the eaves have no longer retain their original shape as a result of later repairs executed on the basis of already deformed state.

Therefore, in many cases of complete dismantling, it is judged more appropriate to restore the building to the original style, so that we may ensure the revival of original techniques. On the contrary, in the case of half dismantling and partial repair, it is considered reasonable to avoid major restoration until a restoration policy is determined following a thorough investigation to be made at the future opportunity of complete dismantling.

Present Condition of the Training of Specialists in the Conservation of Cultural Properties in Japan

Nobuo Ito

Training and refresher courses in Japan have been held on a considerable level in each field. However, it may be said that these courses are not well unified when seen from the viewpoint of the total system. This is due to the special nature of the Japanese education system and the history of the protection of cultural properties.

Administrative measures for the protection of cultural properties have been taken in Japan since 1871. At the beginning, it was not conducted on a legal basis, but was performed merely as a budgetary project of the government. However, a law was established for the first time in 1897 for the conservation of buildings and art objects. Another law was established in 1919 to protect historical sites, places of scenic beauty and natural monuments. In 1929, the domain of the protection of buildings and art objects was extended by a revision of the first law. In 1950, the Law for the Protection of Cultural Properties was enacted by integrating the above mentioned laws and adding provisions for the protection of intangible cultural properties. This law was revised several times and, at present, the following five categories are defined as cultural properties.

(1) Tangible cultural properties: Buildings, pictures, sculptures, applied arts, calligraphic works, classical books, ancient documents, and other tangible cultural products which possess a high historical and/or artistic value in and for this country (including lands and other objects which are combined with them altogether to embody such value), archaeological specimens and other historical materials of high scientific value.

(2) Intangible cultural properties: Art and skill employed in drama, music and applied arts, and other intangible cultural products which possess a high historical and/or artistic value in and for this country.

(3) Folk-cultural properties: Manners and customs related to food, clothing and housing, to occupations, religious faiths, festivals, etc., to folk-entertainments and clothes, implements, houses and other objects and, therefore, which are indispensable for the understanding of changes in our people's modes of life.

(4) Monuments: Shell mounds, ancient tombs, sites of palaces,

sites of forts or castles, monumental dwelling houses, and other sites which possess a high historical and/or scientific value in and for this country; gardens, bridges, gorges, sea-shores, mountains, and other places of scenic beauty which possess a high value from the point of view of art or visual appreciation in and for this country; and animals (including their habitats, breeding places and summer and winter resorts), plants (including their habitats), and geological features and minerals (including the grounds where peculiar natural phenomena are seen) which possess a high scientific value in and for this country.

(5) Groups of historic buildings: Groups of historic buildings of high value which form a certain antique beauty in combination with their environs.

Dealing with so many varieties of cultural properties under one law is rare even in the world. Administration related to the protection of cultural properties is also executed unitarily by the Agency for Cultural Affairs, an extra organ of the Ministry of Education, Science and Culture.

However, because of such historical changes in law mentioned earlier, the actual state of the conservation of cultural properties differs somewhat in each field and the training system of transmitters is considerably different in each field. Moreover, when viewed historically, the fact that many professional groups of Japanese specialists had little interaction among themselves and that such phenomenon continued at least until World War II in spite of modernization after the nineteenth century may also have contributed to such differences. For example, for architectures, carpenters formed the main group with small groups of masons, plasterers, roofers, finishing carpenters and metalworkers following them. For art objects, technicians involved in their production came from various fields; painters, sculptors of Buddhist images and mounters were included as leading technicians. In applied arts, there were metalworkers and *urushi* workers. For iron pots, swords and armors, technicians with specialized skills worked independently of each other. And behind them were craftsmen who produced materials and tools such as *urushi*, paper, gold leaf and brushes.

This is the situation surrounding tangible cultural properties. The situation surrounding other types of cultural properties is also complicated. For example, with intangible cultural properties, since they are transmitted by nature from person to person, the training of transmitters is essential. However, Japanese performing arts are also classified and even further divided into many schools which form exclusive groups respectively. Noh player groups are the best example.

As for historic sites, places of scenic beauty, natural monuments, and folk-cultural properties, special technicians concerned with their protection have not necessarily existed. In most cases such work was done by ordinary citizens. In preservation districts for groups of historic buildings, even if the

construction and conservation of each building in the district were carried out by carpenters, the conservation of the whole district was not considered specially.

In the above mentioned specialist groups, transmitters were trained within each group. But as the training method was premodern, based on apprenticeship and live-in discipleship, it declined gradually after the Meiji era and virtually collapsed after World War II. In their place, modern organizations were built gradually. In 1898, the Japanese Association of Artists (Nihon Bijutsu-in) was established. Of the members of this Association, specialists in charge of restoration of sculptures met and established a restoration workshop. As for the conservation and repair of architectural monuments, in addition to carpenters, persons in charge of planning and supervision were assigned to field offices by the government or local public bodies. At first, they were civil servants belonging to the government or local public bodies or free lancers, but they established the Japanese Association for Conservation of Architectural Monuments in 1971. Mounters established an association called *Sokoshi Renmei* in 1959. Besides these, there are many groups of artisans working with Japanese cypress bark, shingles, *urushi* and Japanese paper that are concerned mainly with the production of traditional materials and transmittance of traditional techniques. However, many restorers of other fields of fine art objects still work individually.

Postwar training of transmitters specializing in the conservation of cultural property owe much to the activities of such groups. But further consideration shows that there are unexpectedly few legal measures which support and guarantee activities of these groups. The Law for the Protection of Cultural Properties, from its revision in 1975, has specially laid down a chapter to promote the protection of traditional techniques for the conservation of cultural properties. According to this chapter, the Minister of Education, Science and Culture has the power to designate traditional techniques or craftsmanship which are essential to the conservation of cultural properties and to take suitable measures to train their transmitters by granting subsidies. The Agency for Cultural Affairs has also established, by another law, the National Theater to train transmitters of traditional performing arts and to cover its expenses. This is the only measure having clear legal background. But the Agency for Cultural Affairs is engaged in many other training and refresher projects. It grants subsidies to the aforementioned groups, within budget, to conduct many activities.

After World War II, Japan has become a society consisting of people with high academic background, and young men who would become transmitters of conservation techniques of cultural properties are at least high school graduates, most are university graduates, and even postgraduates are not rare. To meet such a change, the role of school education in the training of transmitters is great. However,

universities in Japan cannot discard its shell of academicism. It is a fact that many cannot discard its shell of academicism. It is a fact that many transmitters have come from conservative educational systems. As for courses coping with new needs, only the Tokyo National University of Fine Arts and Music has courses in both conservation science and restoration techniques at postgraduate level, but they are limited to small classes. Within existing educational systems, courses in the training of curators do not exist, while interdisciplinary courses for the training of museum officers who are concerned with a more general type of work in museums are held at many universities on a bachelor's level. Thus, newly qualified museum officers lack the professional knowledge and experience needed for curators. When compared with world-wide qualifications which require at least a master's degree, it is clear that the Japanese system lags behind.

As for courses closely related to cultural properties, history, archaeology, art history, architecture, landscape architecture and folklore may be listed. However, generally specking, the academic purposes of these courses are far removed from that of the conservation of cultural properties. Therefore, unless there are professors who are interested in the conservation of cultural properties, appropriate lectures and training needed to foster specialists in conservation are not given.

As mentioned above, training of specialists in the conservation of cultural properties in Japan are conducted by the Agency for Cultural Affairs, related organizations or by individuals. School education has not contributed sufficiently to the training of specialists. Thus, there are many problems which need to be improved in the future.

Training of Architects as Conservators in the Course of Higher Education in Japan

Eizo Inagaki

First, I think it necessary to explain the actual condition of Japan in relation to conservation and restoration of buildings designated as cultural properties. The qualification of architects working in this field have not yet been clearly established in Japan, and they are even separated completely from general architects. Unlike some other countries, we have no such system in which a person who has the qualification of an architect can obtain further qualifications to take part in the restoration of buildings. At present, very few Japanese architects take interest in the renovation of old buildings, and there are equally few who devote themselves to the creation of contemporary architecture by adopting traditional techniques. On the contrary, those architects who plan and supervise works of conservation, repair and restoration are employed by the Agency for Cultural Affairs, national research institutes, or prefectural boards of education. The technical skill of these conservation-architects is extremely high-grade and sensitive, but they have never received any formal education related to the conservation of cultural properties; rather, they are self-made specialists who have trained themselves through experience in research and restoration. The conservation-architects, thus, form an exclusive group that is completely isolated from ordinary architects, and the exchange of persons or information between the two groups is extremely limited.

Behind this lies the fact that in Japan, after the Meiji Restoration in 1868, the main stream of architecture moved away from traditional wooden architecture and toward dealing solely with the newly introduced architectures of brick, steel and concrete. The techniques of traditional wooden architecture have been transmitted within the realm of skilled craftsmen, but in the academic world they have been made simply the object of study by architectural historians. Activity related to the conservation of historical buildings began in 1897 when the "Act of Conservation of Old Shrines and Temples" was made law. Thereafter, parallel progress was made between the technical methods of research, repair and conservation of cultural properties and the academic systematization of the history of Japanese architecture. Great achievements were often brought to both areas by the same person. A number of scholars of architectural history who belonged to universities

actually worked as conservation-architects who could direct restoration works until the 1950's.

After the establishment of the "Law for the Protection of Cultural Properties" in 1950, the system of conservation of cultural properties was swiftly regulated, but from about this time a gradual change took place in regard to the close relationship between the education of architectural history and the actual conservation of cultural properties. The methods of research, repair and restoration have been improved in organizations in charge of conservation and these organizations themselves have come to play the role of educating young specialists. As a result, chances for scholars of architectural history in universities to participate directly in works of conservation have gradually decreased. Such a change was fairly subtle; nevertheless, we can point out the fact that, compared to earlier generations, university scholars are seldom offered an opportunity to experience research activities that accompany conservation on a big scale such as excavations of building sites and dismantling and reassembling of old buildings. They obtain information regarding restoration work on old buildings which have been designated as cultural properties either by the government or by prefectures only in the form of detailed reports. Thus, the contribution of academic scholars in architectural history is no longer expected.

The role of scholars with regard to the conservation of cultural properties has changed from making contributions toward improving the essential techniques to studying more peripheral problems. Their activities now include making preparatory or wide-range research of a building for designation as a cultural property, cooperating with prefectural offices for the designation and conservation of cultural properties, discovering and researching old buildings or historic townscapes deserving to be designated as cultural properties, measuring old buildings, and planning renewal programs upon requests by regional offices or personal owners. Since 1966, following the plan made by the Agency for Cultural Affairs, several types of research have been made on a nation-wide scale including "Urgent Research of Traditional Houses," "Research for Conservation of Groups of Traditional Buildings." or "Research of Shrine and Temple Architecture of the Pre-modern Age," and some of these researches are still continuing. Scholars from many universities have cooperated in these researches and, in many cases, graduate students have also participated as members of the research staff.

With the present situation, it can be seen that the relation between conservation of cultural properties and education in universities is rather indirect. However, in order to assess the extent of education in conservation at various universities more accurately for this report, a questionnaire was sent out to each scholar. Those scholars selected are involved with the study and education of architectural historians in the departments of architecture or related departments, including a small number of scholars who spe-

cialize in town planning or architectural designing. Of the seventy-eight persons to whom questionnaires were sent, fifty-seven persons returned them. From the results, it may be possible to grasp fairly well the actual condition and general tendency of university education on conservation today.

Undergraduate and graduate education on conservation should be considered separately. Generally speaking, in undergraduate education most of the student's time is spent in fundamental courses such as design, planning, structure, mechanical equipment and construction method that are basic requirements for present-day architecture, leaving no time for specialized education. It may be understood that there is a course of architectural history in most universities and, in forty-two cases, aside from history, some attention is also given to the philosophy of conservation with examples. The depth of these courses varies widely according to each university, from a brief general observation to a systematically composed lecture. In one university there is a course for third year students centering on the problems of conservation, in which the professor gives lectures on such subjects as the structure and techniques of traditional Japanese wooden architecture, the methods of its conservation and restoration, and the conservation of traditional townscapes.

Progress in the study of the history of Japanese architecture has been based on information obtained through restoration works of cultural properties and excavations as well as on studies of documentary records. Therefore, when lecturing on architectural history, it is inevitable that reference be made to the achievements of restoration and excavation, or more generally, to that of conservation. Consequently, lectures on architectural history are naturally coupled with an introduction to conservation. In other words, lectures on the history of Japanese architecture are, more or less, no other than a systematic introduction to the techniques of traditional wooden architecture. In the present system of university lectures, then, it can be presumed that it is only in lectures of the history of Japanese architecture that the student is exposed to traditional wooden architecture.

Most of the universities also have courses in the history of western architecture. In such courses the problems of conservation are referred to because the architectural ideology of the nineteenth century cannot be discussed without the phenomenon of historicism or the concept of conservation. There are three universities that have courses in the history of Asian architecture in which professors refer to the actual state of conservation of cultural properties in the each country viewed through their own research experiences on location.

A senior student is responsible for either a graduation design or graduation thesis or both in all the universities. There are not a few cases in which a theme related to conservation is given by the professor or chosen by the student himself (23 out of 57 replies). The interests and methods adopted by the student are so varied that they cover themes

like design survey, measurement of old buildings, research on the relationship between regional history and its architecture, renovation of old buildings, and arrangement of townscape. On the whole, however, there is no example that can be regarded as systematic training of conservation-architects because the choice of theme is usually left to the student and relatively little systematic guidance is given by the professors.

Generally speaking, during the two years of the master's course in graduate school, in comparison with the undergraduate years, a student seems to have enough time to attend to his own theme of study. According to the result of the questionnaire, twenty-five universities have lectures or training classes related to conservation in the master's course. The way of choosing a subject for the master's thesis or design for a degree is not so different from that of the undergraduate. However, since the master's course is particularly important for a student in regard to his later course in life or as the first stage of training to become a specialist, it would seem clear that this is perhaps the best period for training a conservation-architect. And, in fact, a student who takes an interest in the conservation of cultural properties appears mostly in the master's course. Nevertheless, for the present, there is not a single university that has a special course for training conservation-architects. No more than two universities have independent lecture courses on the field of conservation of cultural properties where such subjects as the history of conservation, laws and ordinances, examples of restoration, international activities, and ideology and examples of townscape conservation are discussed fairly systematically. In one of the two universities, a lecture is given by a scholar who has a clear intention to propose the creation of a new study that might be called "Conservationology of Cultural Properties." In addition to these, there are some universities in which professors give lectures on conservation-and-adjustment planning to townscapes in the light of their own experiences.

In reality, lectures on conservation in the graduate school are more in number and given by those better qualified in content than those of the undergraduate course, but there is scarcely any chance of practical training. Notwithstanding, there is a summer course of excavation practice organized by the Nara National Cultural Properties Research Institute at the sites of Heijo, Asuka and Fujiwara Palaces, in which a number of graduate students form various universities participate every year.

The basic reason why intensive training for conservation-architects is not made in graduate schools is that, according to the questionnaires, there is difficulty in finding employment in this field. Among graduate students every year, there appear a number of people who want to work as administrative officials working with cultural properties or as conservation-architects. But only a small percentage can enter the practice of conservation after taking the master's degree. With the present situation we cannot expect there being enough posts or social necessity permitting utili-

zation of knowledge and skills they have received during their training. Thus, it may be difficult to give students who seek systematized education on conservation anything more than personal guidance.

As has been explained above, for the time being, universities can give only relatively basic information or elementary training for conservators. However, scholars and conservators all keenly feel the necessity of providing more opportunities for specialized training, and their voices are gaining strength. In summary, several answers to the questionnaire suggest the following:

> As a first step, a university or national organization (such as national research institutes of cultural properties at Tokyo or Nara) should provide a curriculum of training for specialists and invite competent specialists from all over the country as members of the teaching staff. Graduate students who participate in this curriculum of lectures and training would be admitted to take some units that could be transferred to all universities and credited toward the master's degree. Such a program should be opened to applicants other than graduate students who want to receive some training in conservation as well as to those who are actually working in the fields of planning, administration or construction and to foreigners.

This proposal is, in short, a suggestion to make a Japanese version of ICCROM. There will be some obstacles in legislation or in finance before the realization of this proposal, but it is clear beyond a doubt that Japan needs an organization of this kind of training for specialists.

Training of Conservation Specialists for Cultural Property Buildings

Kakichi Suzuki

The difference between modern and traditional construction methods and materials in the production of buildings in Japan is extremely great. Japanese architecture was changed considerably in the course of the country's development to a modern nation by learning the advanced techniques of Europe and the United States and by adopting brick and stone architectures which were of different natures from the traditional wooden architecture.

However, as brick and stone buildings were seriously damaged by the big earthquake that attacked Tokyo and Yokohama in 1923, such constructions were prohibited by law, and modern buildings with ferro-concrete and steel-skeleton constructions were recommended. At the same time, countermeasures against earthquakes were applied to wooden architecture and various new techniques which had not existed in traditional architecture, such as the reinforcement of joints with metal fittings, the use of mudsill and the insertion of braces were introduced. Moreover, during the War from 1941 to 1945, most of the large Japanese cities were reduced to ashes by fires caused by incendiary bombs because dwellings and other buildings in the city zone were made of wood. Therefore, the establishment of cities strong against fire was a great task of post-war days. Consequently, after 1952, when the nation became fully intent on reconstructing the country, administrative measures for construction were aimed at making cities earthquake-proof and fire-proof. In case a building larger than a certain scale was to be erected, wooden structure was prohibited. Further, all wooden structures were obligated by law to employ earthquake-proof and fire-proof construction methods. For example, the exterior of buildings were to be covered by inflammable materials in order to prevent damage by fire. As a result, the construction, material and design of wooden buildings were greatly changed compared with those of traditional wooden buildings whose design was characterized by exposed wooden framework and eaves. The traditional construction of wooden buildings, which had been widely used until nearly fifty years earlier meant a violation of laws. If such a construction was inevitable, special permission had to be obtained. And such regulations still hold true.

Apart from these disaster preventive measures, innovation of materials and structures recently

promoted from the point of view of economy has made the difference between modern and traditional styles more significant. For example, the process of making traditional Japanese clay walls, which was performed by replastering clay layers several times on the latticework of fine bamboo, required at least two months, because replastering had to be carried out after the previous clay layer had been completely dried. However, in recent times, the process of making walls similar to the traditional Japanese style, in a shorter time, by shaping grounds of veneer boards and by spraying fibrous material with synthetic paste thereon is becoming popular. Traditional techniques are not used except in such special cases as for tea ceremony rooms and elegant residential *sukiya* style buildings.

As the difference of materials and techniques between traditional and modern architecture in Japan is great when compared with that in other countries of the world, it has become more and more difficult to secure traditional materials and techniques. Fortunately, the law to regulate common buildings is not applicable to buildings designated by the government as important cultural property, and, of course, traditional materials and techniques can be used in their restoration works. Therefore, repairs and restoration works are the only fields today where traditional techniques may be handed down. The training of specialists for the restoration of cultural property is not only necessary to maintain the cultural property itself, but also important from the point of view of the transmittance of traditional techniques.

The system of designation and protection of historic buildings by the government was established in Japan in 1897, and, at the same time, restoration works from the scientific standpoint were started. Since then, both designations and restorations have been continuously conducted and the number of buildings designated as important cultural property by the government totaled 1,982 items or 3,196 buildings in 1985, while the number of buildings restored from 1897 to 1984 extended to 1,918 buildings. The annual number of restoration works had been some twenty until 1950, but afterwards it increased rapidly and has now reached about eighty. However, since restoration works take eighteen to twenty-four months on average in the case of common size buildings and three to four years in the case of large ones, the number of buildings completed in a year is forty on average.

Restoration works are conducted under the planning and supervision of one chief conservation-architect and one or two assistants who are stationed at the field office. In order to make certain that appropriate traditional techniques are employed, they supervise the restoration by guiding technical workers such as carpenters, roofers and plasterers. They also investigate the history of the building and techniques used and, make up drawings of the building before and after restoration. The compilation of the reports of restoration work after completion is the task of these conservation-architects as well. The conservation-architects work-

ing in about eighty restoration field offices throughout the country receive guidance from a central governmental office, namely the Agency for Cultural Affairs.

The number of conservation-architects in Japan reaches, at present, 145 and the number of technical workers who are engaged in various subworks is some three hundred. The former are always in charge of the restoration works of cultural property as members of the staff of local public bodies or the Japanese Association for the Conservation of Architectural Monuments (JACAM), while the latter are all regional technical workers belonging to private small-scale firms which contract when restoration works are conducted. Therefore, even among these technical workers there are those who specialize in restoration works and those who are employed when necessary.

Concerning the outline of the history and the present state of the training of conservation-architects, Mr. Masao Takahashi presented a paper entitled "The Development of Training Programme for Conservators of Wooden Architectural Monuments in Japan" at the International Symposium on the Conservation of Wooden Cultural Properties held in November 1982 under the cosponsorship of the Tokyo National Research Institute of Cultural Properties and Unesco. Therefore, the curriculum of training courses which are held at present shall be introduced below in detail.

The training courses for conservation-architects of cultural property are divided into following three courses.

A) Courses Sponsored by the Agency for Cultural Affairs

The Agency for Cultural Affairs, the central governmental office which is responsible for technical guidance and supervision, has determined the qualifications of chief architects in charge of restoration works. Those desiring restoration work submit to the Agency in advance the name of the chief architect for approval.

Courses have been established to authorize chief conservation-architects and are composed of two classes, general (A-1) and advanced (A-2). To qualify for the general course, candidates must have had experience with restoration works as full-time personnel for over ten years in the case of high school graduates, or for over six years in the case of university graduates. Candidates for advanced class must have had experience of over six years as full-time personnel after getting the qualification as chief architects. Only architects who have the qualification of advanced class chief architects can be in charge of restoration works of buildings which are of special importance, such as old buildings erected before the thirteenth century, buildings of exceptionally large scale and buildings which require special techniques for investigation and restoration.

B) Courses Sponsored by Associations for Restoration Established under the Assistance of the Agency for Cultural Affairs

The associations in this category are JACAM, the Association for the Conservation of Cultural Prop-

erties Owned by Two Shrines and One Temple in Nikko, and the Nation-wide Association for the Preservation of Roofing Techniques for Temples and Shrines. These three associations, which are designated as holding bodies of techniques for the preservation of cultural property and are granted subsidy from the government, respectively hold training courses for the transmitters of traditional techniques.

The courses by JACAM, aimed at the training of specialists to be in charge of the planning and supervision of restoration works at field offices, are divided into two: the training course of beginners' class conservation-architects for new employees (Ba-1) and the refresher course of middle class conservation-architects to improve the technical levels of assistants already engaged in restoration works (Ba-2). It also holds two courses for carpenters, both general (Ba-3) and advanced (Ba-4). The Association for the Conservation of Cultural Properties Owned by Two Shrines and One Temple in Nikko, which is a holding body of conservation techniques of coloring and *urushi* on buildings, holds a training course (Bb) in coloring and *urushi* techniques especially for middle-class technicians similar to those who have taken Ba-2. The Nation-wide Association for the Preservation of Roofing Techniques for Temples and Shrines is a body of technicians dealing with cypress bark, shingles and other roofing materials now scarcely used except for cultural property buildings. It holds a course to train transmitters of this special technique (Bc).

C) Course Sponsored by a Private Guild

This course is held by the Cooperative Society for Plaster Industry in Kyoto Prefecture in order to train transmitters of plastering techniques of Japanese walls even now being used in tea ceremony rooms and *sukiya* style buildings (C). There is no governmental subsidy to this course, because the techniques are useful not only for cultural properties but also for ordinary buildings.

The terms and curriculums of the above-mentioned training courses are as follows:

A-1) Course for Chief Conservation-architects for the Restoration of Cultural Property Buildings (General Course)

A series of lectures of twenty days in total, which are composed of two terms in continuous years each of which is ten days per year, is given to about ten persons out of those working as assistants under chief conservation-architects in the planning and supervision of the restoration works of cultural property buildings. Attendants who finish the course are given qualification as chief conservation-architects.

Curriculum is as follows:

Types	Subjects	Hours
General	Designation and Custody of Cultural Properties	2.0
	History of Architecture	10.0
	Laws and Regulations	3.0
	Materials	13.0
	Special Lectures	3.0
Planning and Execution	Restoration Planning	3.0
	Estimation of Costs	2.0
	Planning for Disaster Prevention	2.0
	Construction Techniques	10.0
	Various Construction Methods	18.0
	Preventive Methods against Damage Caused by Birds, Insects, Animals and Fungi	3.0
	Modern Mechanical Construction Methods	2.0
	Drawing	3.0
	Investigation Methods	10.0
	Investigation for Restoration to the Original State	2.0
Management	Planning and Supervision	4.0
	Labor Management	2.0
	Accounting	2.0
	Recording and Compiling	2.0
Practice of Planning		2.0
Self-study		2.0
Total		100.0

A-2) Course for Chief Conservation-architects for the Restoration of Cultural Property Buildings (Advanced Course)

This course consists of intensive lectures of one week for five to ten conservation-architects selected from those who are actually in charge of planning and supervision of restoration works of cultural property buildings as chief conservation-architects and who have attended the general course.

Curriculum is as follows:

Types	Subjects	Hours
General	Lectures on the Protection of Cultural Properties	6.0
	Special Lectures on Art History	4.5
	Special Lectures on the History of Architecture	4.5
	Special Lectures on Materials	4.5

Planning and Execution	Environmental Preservation	1.5
	Supervision and Management	1.5
	Restoration Techniques	6.0
	Conservation Science	4.5
	Traditional Techniques	3.0
	Contemporary Construction Methods	1.5
	Construction Technology	3.0
Self-study		3.5
Total		44.0

At the end of the course, evaluation is made upon the presentation of the results of self-study.

Ba-1) Training Course for Beginners' Class Conservation-Architects for the Restoration of Cultural Property Buildings

A one year training course is given to five or six persons newly employed as restoration technicians for the restoration of cultural property buildings. Trainees work as assistants under chief conservation-architects at restoration field offices to which they are assigned. While working, they are also given twelve courses a year, each course lasting about six days, at fixed places where lectures, practices and visits (lectures on-the-spot) are carried out by turns.

Curriculum is as follows:

Types	Subjects		Hours
Orientation			2
General	Administration for the Protection of Cultural Properties		2
	Laws and Regulations		2
	History of Restoration Works		7
	History of Architecture		8
	Construction Techniques		15
	Construction Forms and Appellations		10
	Materials and Standards		9
	Wood, Roof Tiles, Cypress Bark and Shingles	(5)	
	Plastering	(2)	
	Painting and Metalworks	(2)	
	Kiku and *Kiwari*		6
	Kiku (technique for making curved eaves)	(4)	
	Kiwari (technique to determine dimensions of members)	(2)	
	Joinery		3
	Measuring		4
	Drawing		2

	Special Lectures		10
Planning and Execution	Introduction to Planning and Supervision		4
	Planning		7
	Basics	(3)	
	Execution	(4)	
	Construction Techniques		27
	Foundations	(4)	
	Woodworks	(6)	
	Walls	(2)	
	Urushi and Coloring	(5)	
	Roofing	(6)	
	Scientific Treatments	(4)	
	Investigations		27
	Introduction to Investigation	(3)	
	Damage	(2)	
	Members	(4)	
	Specifications	(4)	
	Restoration to the Original State	(4)	
	Documents	(3)	
	Alteration of the Present State	(4)	
	Miscellaneous	(3)	
	Planning for Disaster Prevention		2
Management	Field Management		1
	Field Accounting		2
	Sub-total		150
Practice			150
Visits			160
	Sub-total		310
Grand Total			460

Ba-2) Refresher Course for Middle Class Conservation-Architects

Various problems of restoration works are examined and discussed in this course. Forty to fifty attendants are invited and they visit one appropriate restoration spot on average every day for four to five days a year. This course takes six to ten years continuously, unlike other courses which are shorter in duration, and is very effective. Furthermore, a two day meeting of all chief conservation-architects is held by JACAM every year, during which various topics related to the practice of restoration works are presented and discussed.

Ba-3,4) Courses for Carpenters

Among carpenters working in the restoration of cultural property buildings, those with five to ten year experience are invited to the gener-

al course, while those who have served almost over twenty years are invited to the advanced course. About ten carpenters are invited to each course: a general course of twelve days over a period of two years and an advanced course of six days in one year. The general course is offered every year and the curriculum is shown below.

Types	Subjects	Hours	
		1st Term	2nd Term
General	Introduction to the Protection of Cultural Properties	4	-
	History of Architecture	2	2
	Materials	2	-
	Safety and Hygiene	2	-
	Kiku	-	6
	Kiwari	-	4
	Carpentry Techniques	3	3
Execution	Investigations during Dismantling	5	5
	Repairs of Old Members Processing of New Members and Assembling	2 (Processing)	(Assembling)
	Consolidation and Anti-damage Treatment	2 (Anti-damage)	2 (Consolidation)
		2	2
Practice		16	16
Visits		8	8
Self-study		8	8
Total		56	56
		112	

Since the advanced course is significant in leveling the ability of skillful carpenters, it is held at five to six year intervals.

Bb) Training Course for Painting Techniques of Cultural Property Buildings

A six day training on the specifications and techniques of coloring and *urushi* on buildings is held once a year in Nikko for about six persons among middle-class technicians involved in the restoration of cultural property buildings. Training in coloring and *urushi* is conducted in alternating years. As an example of the course in coloring, lectures on such subjects as the historical changes of patterns, the strokes of brush, the kinds and processes of coloring, the kinds and natures of pigments

and the planning and supervision of coloring works, and practices are given.

Bc) Training Course for Technicians Dealing with Roofing Works of Cultural Property Building

This course is held for newcomers who have entered special contractors with the hope of becoming roofing specialists. Two to three persons are trained over a period of two years.

Curriculum is as follows:

Types	Subjects	Hours 1st Term	Hours 2nd Term
General	Ethics	0	4
	History of Fine Arts	4	0
	Survery of Japanese Literature	0	4
	Sociology	4	0
	Economics	4	0
	Anthropogeography	8	0
	Mathematics	12	0
	Folklore	4	0
	History of Japanese Architecture	24	0
	Architectural Designs	16	0
	Architectural Styles	16	0
	Architectural Constructions	16	0
	Labor Safety and Hygiene Regulations	0	8
	Law for the Protection of Cultural Properties	0	8
	Industrial Technology	0	4
Specialized	Nature and Kinds of Materials (Cypress Bark, Shingles and Miscanthus)	48	0
	Collection of Materials	32	0
	Shaping of Materials	48	0
	Special Materials	56	0
	Professional Tools	32	0
	Ordinary Construction Methods	72	0
	Special Construction Methods	64	0
	Safety and Hygiene Works	0	16
	Waterproof Construction Methods	0	16
	Antiseptic Treatments	0	16
	Reinforcement Methods	0	16
	Anti-damage Treatments	0	16
	Preparatory Works	0	16
	Scaffold Construction Methods	0	16
	Dismantling Methods	0	24

	Calculations	0	16
	Specifications	0	24
	Process Control	0	16
	Practice of Architectural History	32	32
Prac-	Measurement	8	40
tice	Drawing	8	64
	Collection of Materials	144	0
	Shaping of Materials	240	0
	General Practice	68	172
	Special practice	0	240
	Practice of Scaffolding	40	40
	On-the-spot Practice	200	392
		1200	1200
Total			2400

C) Kyoto Advanced Job Training Institute of Plasterers

This institute allows the sons and employees of association members to acquire practice in Japanese wall construction methods and others, making the most of the traditional characteristics of Kyoto. The terms are three years for middle school graduates and two years for high school graduates. At present there are six students in each class. Lectures and practices of four hours are given from five to nine p.m. twice a week.

Authenticity in the Context of Japanese Wooden Architecture

Eizo Inagaki

All wooden architectural monuments of Japan have periodically undergone major repair work -- including partial dismantlement -- over the course of their history. The parts most susceptible to deterioration are the roofing, eave framing members and joists, which require frequent repairs. In cases in which the roof is covered with organic materials like thatch, boards or shingles made of Hinoki bark, the entire roof has to be replaced every 30 to 50 years, and even if the covering material is clay tile, all or part of the roofing must be replaced approximately every 100 years.

The repair work involving deteriorated parts such as rafters, roof trusses, eave framing members of joists is conducted in larger scale operations with longer intervals of 300 to 400 years. In this case, the basic frame composed of posts and beams remains untouched, and only the rotten members are replaced, or the damaged parts are repaired by partial substitution of material by joining the new material to the old using spliced joints or spliced fill. The scope and cycle of repairs differ according to the style and structural design of the buildings. There has been a long history of this type of repair technique, which has proven to be an optimal method of maintaining wooden monuments in Japan. These techniques are closely related to the inherent nature of the structural system of Japanese architecture, which in effect has been designed to facilitate the process of repairing by dismantling all or part of the buildings. They are constructed with a structural system which was assembled in anticipation of later being disassembled -- assuming that the building would need to be dismantled and that the deteriorated members would be replaced or that new parts would be added in place of missing ones for the sake of the building's survival.

It was in 1897 that Japan as a modernized nation set up a program and started protection and conservation of the architectural monuments designated as cultural properties. In those days, when modernization was proceeding rapidly and traditional wooden monuments were coming to be regarded as buildings of the past, the government recognized the urgent need to extend support for the protection and conservation of wooden monuments.

The conservation of architectural monuments is classified into four categories: 1) partial repair; 2) repair by re-roofing; 3) repair by

partial dismantling; and 4) repair by complete dismantling.

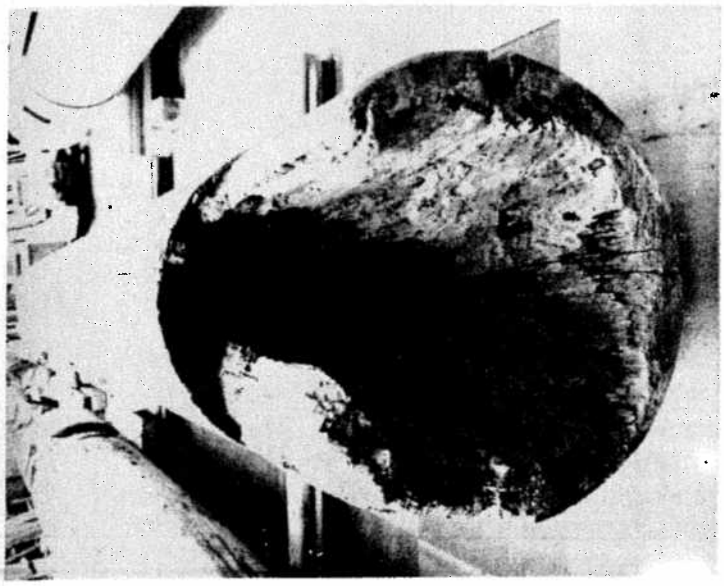
The first three are recognized as traditional repair techniques which have been continuously employed over the long course of history up through the modern period. The last category, repair of monuments by complete dismantling, is a later technique developed during the modern period. This technique has the advantage of offering opportunities to examine and verify the history of each wooden member as well as to introduce unobtrusive internal reinforcement into the post and beam structure.

The program for the protection and conservation of cultural properties presently being carried out by the National Agency for Cultural Affairs is based on the conservation methods and the results of scientific investigations initiated in the late nineteenth century. Particularly after the 1940s, detailed examinations have been carried out on monuments during the course of the conservation work, and these have contributed greatly to the discovery of changes in the application of techniques in each period of history. It is common practice to trace, one by one, the history of individual members and then to reconstruct theoretically the entire history of the building since the time of initial construction. Investigations for this purpose are carried out by examining as clues all of the traces left on the members, such as cut ends, nail holes or slight differences in the degree of weathering.

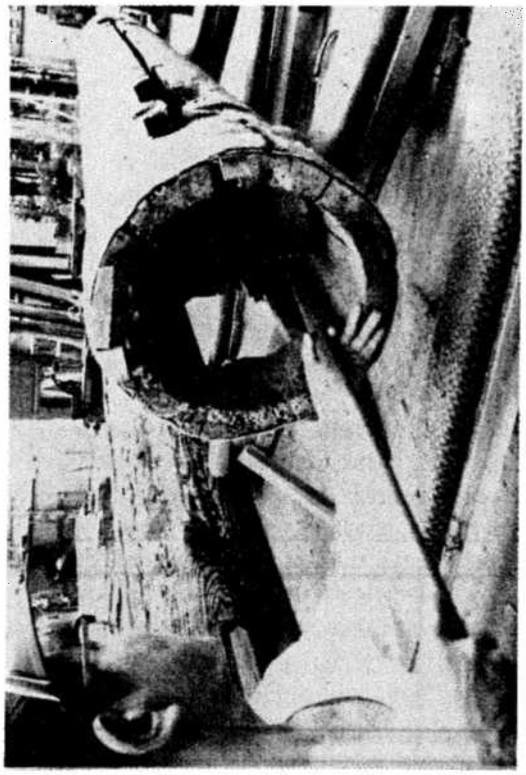
Repairs of the rotten column

Photographs taken during the conservation of the Hall for Sacred Dances, Haushiwake Shrine (Akita prefecture, 15th century).

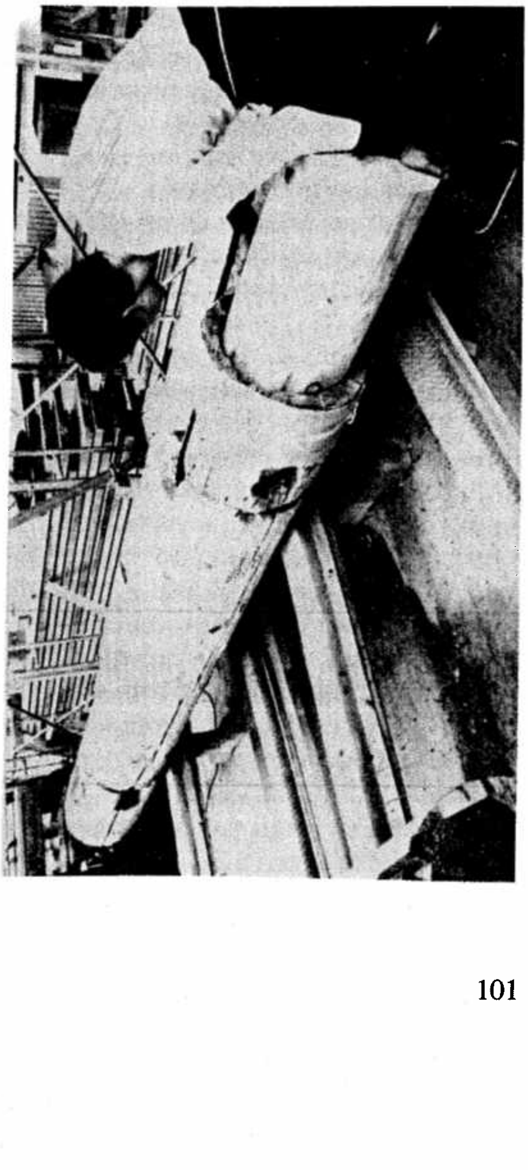
a. The upper part of the dismantled column. Excess humidity resulting from water leakage caused the deterioration. The inner portion was also damaged by termites.
b. The rotten part was removed, and a mortise with a diameter of 33 cm and a length of 66 cm was scraped out.
c. The new fill material was inserted into the scraped - out hole in the column.
d. The columns after completion of the repair work. The column at the extreme left had deterioration only at the tenon, where a support tenon with a length of 25 cm was filled in. The second column from the left was in a perfect state of conservation, and therefore the original column was used as is. For the third column from the left, the one shown in photographs a, b and c, a new tenon was made with new fill material added to replace the damaged part.



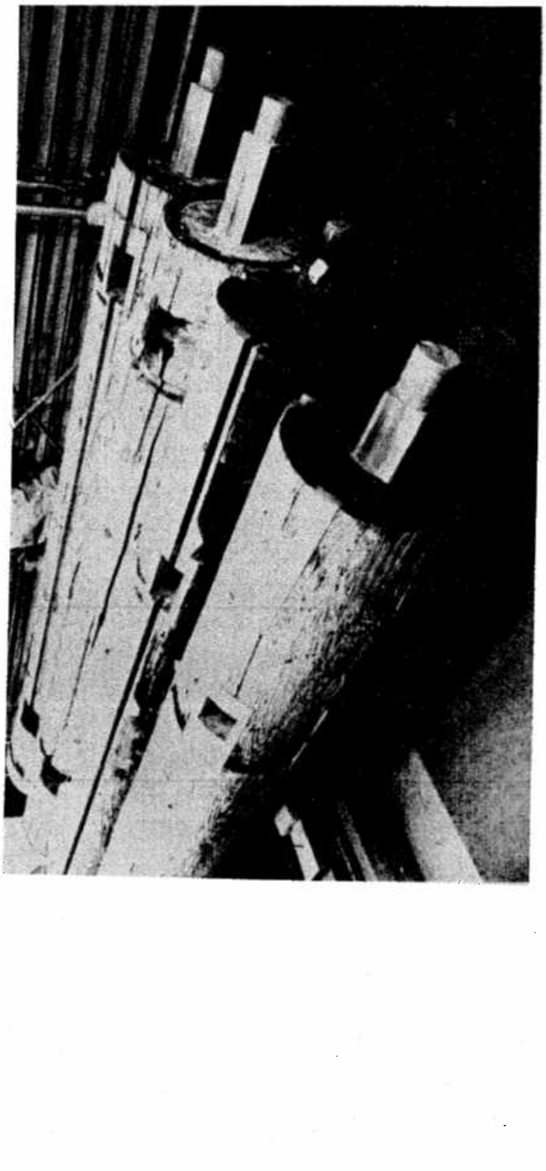
a



b



c



d

Architectural monuments can be contemplated as accumulations of fragmented data which can describe the history of a building since the time it was erected. It is needless to mention that it would be ideal to preserve every single piece of this fragmented data. In reality, however, when the damaged areas have been repaired and the members are to be assembled again, it is not possible to follow up on all of the traces left on the surface of the members when planning the reassembly. Here, a choice must be made from among the original style, several modified styles which may have evolved in later periods, and the latest style which existed prior to the dismantling. In view of the complexity of various issues related to conservation planning, restoring a building to its original style may not always be the best solution.

Considering the types of conservation methods used in Japan, how should Japanese practices be evaluated from the viewpoint of authenticity?

Would it not be fair to assume that the criteria normally associated with the concept of authenticity reflect the sense of value and historic perspective of particular cultures where the materials are durable, and where history can be etched in the surface of materials? Would it not be the case that these are cultures in which the basic materials are those that can withstand rain or wind, and where the material is the fundamental element upon which the history of human life is reflected through the quality of design and workmanship? Where material is considered the point of departure for this expression, respect for the concept of authenticity follows naturally from appreciation of the value of the original material itself.

In such cultures, the temporal elements are crystallized in materials, and the four critical aspects of authenticity -- design, material, workmanship and setting -- may be comprehended as a single value system centered on materials.

Conversely, materials used for Japanese architecture are not meant to bear the load of history. If Japanese wooden post and beam structures deteriorate, they will eventually collapse and decay -- and nothing will remain except roof tiles and foundation stones. In other words, unless the building as a whole stands as an intact structure, no separate part of it can survive or keep its architectural integrity or its expression as structure. Even if some crystallized historic value can be discovered in the old members, it would most probably not represent the essential value of the monument. If we are to preserve the authenticity of Japanese monuments, it is a prerequisite for us to maintain them in the context of the complete structure. To attain this objective, it is indispensable for us not to lose the heritage of traditional design methods and workmanship techniques that were employed at the time when that building was constructed. And repair work -- especially, repairs by partial or complete dismantling -- can give us a precious opportunity to identify and transmit the authentic history of Japanese architecture to the next generation.

Rescue Excavation in Japan

Migaku Tanaka

The protection of archaeological sites is one aspect of a larger programme for the preservation of cultural properties in Japan. The objects of preservationist activities as specified by the Law for the Protection of Cultural Properties 1952 can be divided into the following categories: tangible cultural properties, consisting of works of art such as paintings, sculptures, ancient manuscripts, and historical architecture; intangible cultural properties, such as the arts and skills employed in drama, music, and applied arts; archaeological sites or natural phenomena such as places of scenic beauty or flora, fauna, or mineral preserves, which together comprise the monuments category; folk-cultural properties, comprised of the customs of daily life and folk arts; and finally, groups of historical buildings from which historic environments were composed.

The first legal protection for tangible cultural properties was provided in 1897 by the Law for the Preservation of Ancient Temples and Shrines; this law became the Law for the Preservation of National Treasures in 1929. For monuments, legal protective measures began with the 1919 Law for the Preservation of Historic Sites, Scenic Spots and Natural Monuments. These two laws were combined in 1950 as the Law for the Protection of Cultural Properties, and the protection of intangible cultural properties was newly instituted with the promulgation of this law. In the 1975 revision of the law, further protection was extended to folk-cultural properties and groups of historic buildings.

The administrative machinery dealing with the protection of cultural properties at the national level is the Agency for Cultural Affairs, attached to the Ministry of Education; at the prefectural and municipal levels, it is the local Board of Education. The administration of site protection is also carried out by these various bodies. Site protection begins with site registration; registration procedures were first conducted by the prefectural Boards of Education between the years 1960 and 1962 at the national government's request. At that time, listings of 138,000 sites were made. Subsequently, the prefectural Boards of Education rather than the national government became the instigators of site registration activities, and recently, there has been a trend for the responsibility for registration to be taken up at city, town, and village government levels.

The basic principle of site registration is for all archaeological sites of the protohistoric Kofun

period (fourth to sixth centuries AD) and earlier to be included, but there is at present no unified national policy for the registration of later sites. Most prefectures register sites only up to the early historic period, but some include medieval sites and some register particular types of site dating to the pre-modern and recent eras. For example, while castles, shrines, and temples dating to as recently as the pre-modern period might be registered, houses of the military elite or the remains of pre-modern villages dating to the seventeenth or eighteenth centuries or later might be excluded. Generally, as efforts at site protection are intensified, there is a tendency to extend registration to sites of more recent times and of a greater variety of function. However, of the 263,946 sites currently registered, approximately 90% date to the Kofun period or earlier. Considering that only 150,000 km^2 of Japan's total land area of 370,000 km^2 is fit for habitation (mountainous and volcanic areas being excluded) the density of registered sites distributed in this habitable area reaches 1.8 sites per km^2. Nationwide distribution maps showing the locations of these registered sites were first published between 1965 and 1968. At present, the second, revised edition of these maps is being prepared at a scale of 1:70,000; in addition, several prefectures are publishing separate site maps at larger scales.

Site registration does not automatically entail protection and preservation; it is merely the means of identifying site locations for reference in urban planning. Protection is extended to certain registered sites through the procedure of historic site designation as provided for in the Law for the Protection of Cultural Properties. Designated sites currently number 1,163 and account for a total of 169 km^2 of land in 1982. About 20 to 30 new sites are granted designated status every year, and these include all varieties of site from Paleolithic remains to places connected with people active in the restoration era of nineteenth-century Japan or the stages for events of those times.

Activities contemplated in designated site areas which would change the current state of the site must have the approval of the Director of the Agency for Cultural Affairs. Activities inimical to the site's preservation are forbidden. In the case of sites on private property, such restrictions violate the property-owner's personal rights to the land and constitute a problem in implementing site protection policy. To get around that problem, designated site areas are usually not left in private hands, but are gradually being purchased and turned into public lands by prefectural or municipal bodies. For this process, 80% of the purchase funds are provided by the Agency for Cultural Affairs. In the fiscal year 1982, the Agency's grants for land purchase account for 7,500 million yen,[1] or 0.015% of the national budget. This sum is provided for within the 28,497 million yen allowance (0.057% of the national budget) for the protection of all cultural properties.

The purchase of designated site areas with national funds began in 1955, and so far, 350 sites extending

over 11.5 km^2 total area have been bought. Moreover, there are several sites which were purchased entirely with national funds; these account for 1.16 km^2 of national land. Sites which have been purchased have generally been turned into historic parks maintained by the legal holding bodies, which may be prefectures, cities, towns, and/or villages. There are currently 153 of these developed historic sites, and the funds for maintaining them are again provided by the Agency for Cultural Affairs.

Only a small proportion - less than half a percent - of the total number of registered sites have designated status; the rest are directly exposed to the tide of national programmes for land development. The Law for the Protection of Cultural Properties specifies that the Agency for Cultural Affairs must be notified two months in advance of any construction project carried out in a site area recorded on the distribution maps of registered sites. In response to this notification, the Agency issues a directive, usually to the effect that archaeological excavation should be carried out prior to construction; sometimes, however, depending on the site circumstances, it decides that an investigation shall be carried out simultaneously with the construction. Then, according to the results of these investigations, the Agency may request the developer's cooperation in preserving the site and may sometimes give it designated status.

In 1980, there were 3,408 rescue excavations and 2,801 concurrent construction investigations, making a total of 6,209 archaeological sites investigated at the direction of the Agency for Cultural Affairs. This is fourteen times the number of archaeological operations conducted in 1965, which totalled 431. The reasons for this increase are both that the actual number of construction projects has increased and that a higher proportion of those projects are subjected to regulation through consolidation of site protection policies. Offices providing site protection administration have been installed in each prefectural Board of Education, and as archaeologists began to carry out those policies for site protection, the number of construction notifications was seen to increase abruptly.

Public interest in the results of archaeological projects has grown correspondingly; this is most noticeably reflected in the proliferation of articles concerning archaeological sites in the daily newspapers. During 1981, the *Asahi*, one of the most powerful newspapers, having a circulation of 7,500,000 ran 380 front-page stories on a archaeological sites; these articles covered a total of 240 m of column space and accounted for 0.65% of all stories published.

Archaeologists specializing in rescue excavations and site protection administration numbered 2,145 in 1981. The majority are employed (like Mr. Suzuki in the parable below) in prefectural and local Boards of Education. All 47 prefectures have archaeologists as specialist employees, but out of 3,255 cities, towns, and villages, only 681, or less than 20%, employ archaeologists. Recently, a trend has

developed for prefectural or local governments to set up independent units of excavation specialists rather than integrate them into their own administrative bodies. The reason for this trend is partly economic: since archaeologists' salaries can be incorporated into the budgets to be presented to the developers for funding, the governmental bodies avoid the financial burden of hiring archaeologists as direct employees. This trend is particularly noticeable among prefectural and municipal governments which are short of funds, personnel, and equipment. At present, such units exist in 17 prefectures, and their archaeological employees, plus those attached to local government Boards of Education, number 488, or 23% of the total number of public archaeologists. The average age of public archaeologists is 30.9 years.

There are two ways in which funds for excavation may be secured; one is to obtain grants from the Agency for Cultural Affairs, which are then expended by prefectural or local governments, and the other is to require the developer to provide the funds required for the necessary archaeological work prior to construction. In almost all cases of the former, grants from the Agency amount to 50% of the required funds, the remaining 50% being provided by the prefectural or local government. In 1980, 1,374 million yen were disbursed by the Agency to support 406 archaeological projects, and these funds were matched by the local Boards of Education with 1,364 million yen; the total thus expended was 2,738 million yen.

Despite these substantial sums being contributed by the Agency for Cultural Affairs and local Boards of Education, most of the costs of excavation in Japan are borne by the developer in a system referred to as the 'burden of the initiator'. The sums for 1980 indicate that 2,414 projects were conducted by these developers at an expense of 25,557 million yen; the breakdown of these expenses is shown below, with the contributions of the developer, including governmental bureaux such as the Ministry of Construction or Ministry of Transportation.

Local government	8,945,721,000
Public corporations, local	513,056,000
National government	2,798,409,000
Public corporations, national	8,980,848,000
Private enterprises	4,319,152,000
Total	25,557,186,000

Thus the total amount spent on archaeological rescue investigations in 1980 was 28,295,186,000 yen (nearly £63 million), apportioned among 2,414 projects. As shown above, a mere 10% of this rescue excavation budget is provided through the Agency for Cultural

Affairs and local Boards of Education for the protection of cultural properties. Excavations conducted with these funds consist either of investigations to confirm the extent of sites in order to preserve important ones that are threatened with destruction through land development, or of preconstruction excavations for private or small and medium-sized companies that cannot afford the expenses. So far as the latter are concerned, there is no legal basis for compelling developers to pay excavation expenses, and so the government may choose to provide funds for companies which cannot afford to contribute voluntarily. Nevertheless, excavation expenses provided by the developer on an obligatory basis are required to include the necessary funds for artefact processing, for every kind of record-keeping, and for publication of the final report. Occasionally they also include funds for the scientific preservation of excavated artefacts. In contrast to the number and great size of many rescue excavations, those carried out for purely academic purposes numbered a mere 158 in 1980. Figures are not available for the costs of academic excavations, but the sum probably did not reach 100 million yen.

An interesting point concerning excavated material is that, by law, artefacts belong to the nation, and the national government compensates the discoverer or landowner for the value of objects found. However, there are limitations to the budget for such reimbursement, and usually the artefacts are ceded half to the discoverer and half to the landowner; most of them are then added to prefectural or local museum collections by these individuals.

Almost all rescue excavation and site protection administration is conducted by prefectural and local governments or related offices. The role of the national government - that is, the Agency for Cultural Affairs - is limited to providing advice and guidance to these organs. To fulfil that role, a Centre for Archaeological Operations (CAO) was established within the Nara National Cultural Properties Research Institute in Nara Prefecture; it carries out the following activities:

(1) the training of excavators for prefectural and local governments;
(2) the supervision of rescue excavations by CAO staff members;
(3) the development of new techniques relating to the excavation and preservation of artefacts and sites;
(4) the collection and publicization of information concerning archaeological excavations.

Large rescue excavations result in large site reports, but, as the rate of excavation has increased, there has been a tendency to fall behind on artefact processing and consequent publication. Therefore, many reports are first published in preliminary form, with full reports being delayed until later. Even so, there were 1,033 preliminary and full site reports published in 1979, for example. Most of these were published by the local Boards of Education or the units in charge of site excavation, and many are

limited in distribution and difficult to obtain. The establishment of the CAO as a central depository for local site reports is a step towards the maximum dissemination of information; however, at present CAO only receives approximately two-thirds of the reports published every year. Based on information in the reports it does receive, CAO puts out a bi-monthly newsletter, the *CAO News*, which gives statistics and sums up trends in rescue archaeology.

CAO is also placing great emphasis on information processing technology for research purposes. A system for processing data, consisting of site and artefact information, is being worked out for implementation on a computer, and the various data bases are currently being prepared.

The training of excavators for government work began in 1966 before the establishment of CAO, but the programme offered now at the Centre is advanced in scale and content. 1,232 archaeologists have to date received training under the new programme and, during 1982, 258 government archaeologists are expected to attend eleven training sessions spread over 157 days. Once back on the job in their local offices, these archaeologists also have access to expertise and advice from CAO staff members not only in the field of archaeology, but also in other academic disciplines such as historical architecture, garden history, textual analysis, measurement survey, and the conservation sciences.

Mr. Suzuki: A Parable of an Archaeological Administrator

In order to ensure the reader's understanding of the present circumstances of site preservation in Japan, I shall try in the following parable to portray the realities faced by Japan's modern prefectures by developing Mr. Suzuki as a model of aN archaeological administrator in a certain prefectural Board of Education. Suzuki is the chief technician in charge of the administration of site protection with the Cultural Affairs Division; he majored in archaeology in college but, even after taking up his present job, he has published research papers in academic journals and is a well-known researcher in the archaeological world.

One day in 1981, Mr. Miyazawa of the Japan Highway Corporation visited Suzuki. The Corporation had plans to construct a new expressway in the prefecture, and Miyazawa came to discuss governmental policy towards archaeological sites in relation to the proposed project. Thus began the mechanics of site protection. Suzuki and Miyazawa first scrutinized the site distribution maps prepared by the prefecture's Board of Education for sites which lay along the proposed roadway. More than ten sites would be affected. According to Suzuki's assessment, two of those were very important, and it was agreed that the path of the road should be modified to avoid them. As for the remaining sites, they further agreed that the archaeologists in the Cultural Affairs Division would conduct a fieldwalking survey at those locations over the next few months, and then Suzuki and Miyazawa would

meet again. So ended the first day of negotiations.

After returning to his desk upon parting with Mr. Miyazawa, Suzuki found that documents had been circulated to him from the prefectural Housing Division. Such documents were sent around every day to obtain the comments of the Cultural Affairs Division. Today's material was a planning application form for residential development submitted to the prefecture by a certain house construction and marketing company. Looking at the 20,000 m^2 planned for development, Suzuki saw that there were sites in this area as well. He attached his opinion to the application form stating that pre-construction excavation of those sites would be necessary, and sent the documents back to the Housing Division. Such a judgement meant that not until the excavation was completed could the Housing Division approve the planning application form for the company.

A few days later, a representative of that company, Mr. Kômoto, appeared at the Cultural Affairs Division. As directed by the Housing Division, he hastened to confer with Mr. Suzuki about the handling of the sites. He was sour-faced. 'Not more sites!? Again and again our plans are thwarted,' Komoto objected, 'I can't believe our project is really hitting any sites!' Reluctantly, Suzuki accompanied Mr. Kômoto to visit the location in the afternoon. As expected, there were Jomon pottery sherds scattered on the ground. Mr. Komoto was a veteran of such confrontations and, when faced with such clear evidence, he could do nothing but acquiesce.

According to Article 57.2 of the Law for the Protection of Cultural Properties, the company would have to submit a notification of construction in the site area to the Agency for Cultural Affairs. Complementarily to this, the prefectural Cultural Affairs Division would have to send the Agency the opinion that preconstruction excavation of the area would be necessary. These documents having been submitted, the Agency for Cultural Affairs would most surely recommend implementation of the excavation in line with the report from the prefecture.

Mr. Kômoto's company was in a hurry to develop the residential area, so under the direction of Suzuki the quick implementation of the excavation was requested and activities toward that end were carried out daily. Suzuki checked out the schedules of the archaeologists living in the same prefectural dormitory as himself. Among those who would be in charge of the project, there was no leeway within the next half-year. He persuaded the grudging Mr. Kômoto that the excavation would begin in six months; from then it would probably take three months to completion. Another problem was the project's funding. When Mr. Kômoto's company finally ruled that the excavation budget was an impossible burden in the company's financial state, Suzuki reluctantly contacted in Inspector of Cultural Properties in charge of archaeological sites within the Division of Monuments of the Agency for Cultural Affairs. This Inspector was also an archaeologist and a personal

friend of Suzuki. Suzuki sounded out the possibility of obtaining a grant for the excavation from the Agency, and his friend replied that it was possible. These national funds would account for 50% of the proposed budget, but the rest had to be obtained from the local municipal, town or village level. So Suzuki went over to the prefectural Finance Division and, after an hour's negotiations, the conditions for accepting the national funds were obtained. Finally, there was the work of preparing the funding application forms. Suzuki tackled the clerical work with his head filled with thoughts on a paper on pottery which he was in the midst of writing.

After five months, members of the excavation team began preparations for the project at the housing development site. There were a multitude of things to do: secure the project assistants and labourers, construct the on-site excavation office, establish the datum for survey and measurement recording from the national benchmark, rent the earth-moving machinery for stripping and backfilling the site, and make arrangements with the surveying company for aerial photographs to be taken by helicopter. With the increase in the amount of area excavated in projects during recent years, preparatory activities such as these have become quite hectic.

After a long absence, Mr. Miyazawa of the Japan Highway Corporation visited Suzuki. It had been almost a year since their first meeting over the projected plans for the high-speed expressway construction. During that time, they had communicated by phone frequently, and Suzuki had relayed to Mr. Miyazawa his opinions based on the results of the Cultural Affairs Division's fieldwalking survey of the proposed roadway. Today, indicating the summary of plans for the new highway, Mr. Miyazawa requested that the next stage be initiated. This included managing the sites, establishing the site extents through test excavations, estimating the budgets, negotiating the expenditure to be made by the company, and finally commencing the actual excavation. It would probably take another four or five years before the excavation would begin.

At the housing development site, excavation yielded unexpectedly good results. An unusual kind of dwelling hitherto unknown had been uncovered. The remains would not be allowed to be destroyed by residential construction. The Inspector for the Agency for Cultural Affairs examined the location and expressed his opinion that the site should be protected and given designated status. After exhausting negotiations, the company agreed to exclude the site parcel from the housing development scheme on condition that the government purchased the land at the current real estate value.

After consultations between the mayor of the town in which the dwelling site was located and the head of the town's Board of Education, an application for historic site designation was submitted from the town to the national government. It was decided that the town would implement the purchase, subsequent

consolidation, and maintenance of the site; however, because of the town's financial situation, a grant from the national government to carry out these activities was indispensable. Thus, Suzuki had to continue yet further the long and tedious negotiations between the town authorities and the national Agency for Cultural Affairs.

That, then, is our story of Mr. Suzuki, the archaeological administrator. Of course, his image varies between the many prefectures; and within the prefectures, the roles played by the city, town, and village levels of local government are also more diverse than this example could show. However, activities of site protection administration very similar to this example are carried out continuously in the 47 prefectures of Japan.

The State of Period Research

One of the greatest achievements of Japanese archaeology in the post-war era has been documentation of the settlement of the Japanese archipelago during the Paleolithic period. Beginning with the discovery of the first Paleolithic site in 1949, more than 3,000 Paleolithic sites have now been identified. Most of these, however, fall within the Upper Paleolithic as defined in European prehistory. A major focus in current Paleolithic research is the identification of Middle or Lower Paleolithic sites in the Japanese islands, and there are indications that such sites do exist.

Radiocarbon datings attest that pottery had already come into use in the archipelago by 12,000 BP. For nearly 10,000 years thereafter, the ceramic tradition named Jomon, with several regional and temporal manifestations, characterized the hunting and gathering way of life from Hokkaido to Okinawa, Japan's northern-and southern-most extremities. Currently, the problem attracting the most interest in Jomon period studies is whether or not an indigenous agriculture had developed before the introduction of wet rice technology from the continent in the latter half of the first millennium BC. There is yet no unequivocal evidence for this but, in order to throw light on this subject, the development of environmental studies for the Jomon period has been phenomenal.

Sometime around 200 BC, a new community of people, crossing the straits from the southern Korean peninsula, introduced the cultivation of wet rice into the Japanese islands. This event marks the opening of the Yayoi period and the beginning of the manufacture and use of metal tools, particularly of bronze and iron. Within a few score years, this Yayoi culture of rice cultivation had spread from Kyushu in the west to the central section of the archipelago; then, continuing northward, it reached the top of Honshu island by the second century AD. At a time when environmental conditions were not drastically different from the present, it is a matter of surprise that the rice agriculture of this period should have spread to this northern area, where even today growing conditions cannot be described as very suitable. Not surprisingly, Yayoi culture did not extend even further north into

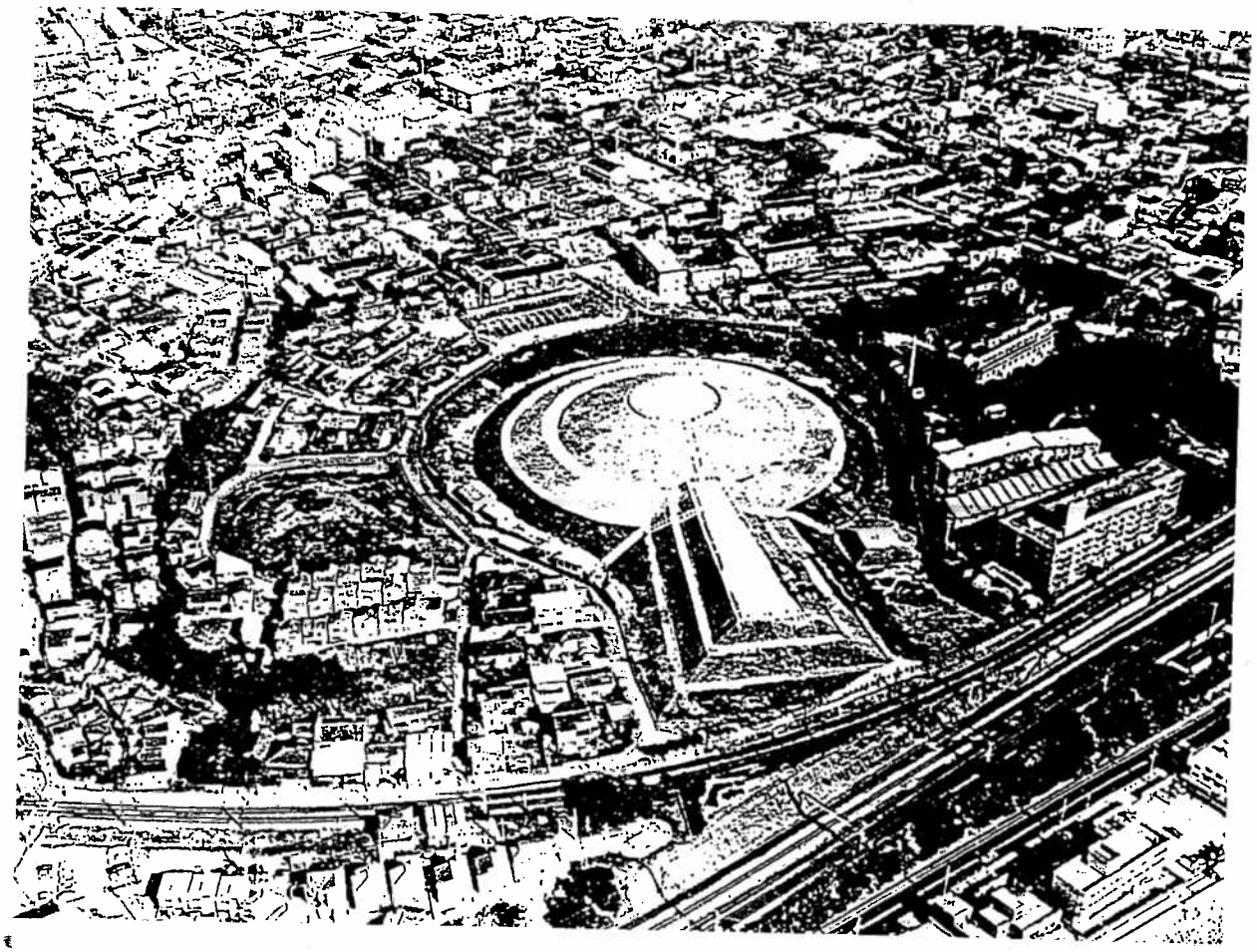


Fig. 1. Goshikizuka Tomb, Kobe, reconstructed to show the original surface treatment of pebble facing, at the same time providing paths for modern residents to explore the tiered, earthen mount. This 4-century AD keyhole-shaped tomb is 197 m in length.

Hokkaido, and we do not at present have any evidence that it spread as far south as Okinawa in this period.

During the 500 years of the Yayoi period, the rice-based economy in this wide area produced a class division in Yayoi society. This strengthened, and finally produced a handful of influential figures who were interred in large mounded tombs (Fig. 1). The largest tumuli of this succeeding Kofun period reached 475 m in length and 300 m in width. Beginning in the fourth century AD, the Kofun (mounded tomb) period is thought by many archaeologists and historians to have encompassed territorial and state-like unification, and the number of scholars is not small who view this period as containing the seeds of the later archaic state which brought about unification of the three central islands of Japan.

This archaic state was established in the latter half of the seventh century and centered in Yamato, present-day Nara Prefecture. Most of the legal precepts employed by this state were learned from the more progressive China, and in the eighth century, China's urban capital was used as a model to build the Heijo capital city in Japan, which is estimated to have accommodated 200,000 people.

A state documents its own history, and the records the Japanese have left behind began in the eighth century. Prior to that, however, the area of Japan had already been documented in the Chinese dynastic histories. The chronicle particularly abundant on Japan is the *Gishi Wajinden*, a section on the inhabitants of the Japanese archipelago in the Wei Dynasty chronicle, the *Sankuochih* (History of the Three Kingdoms). In that narrative, there is mention of the country Yamato (Yamatai) ruled by Queen Himiko and of the fact that she sent tribute to the Wei court of China. Again, in the fifth-century dynastic history of the Sung court, the *Sung Shu*, there are passages telling of the tribute sent by five generations of Japanese kings. Soon after the recording of these histories, the records of the Japanese themselves appeared in the form of the eighth-century *Nihon Shoki* and the *Kojiki*. These chronicles consist mainly of the records of the imperial line of rulers in Japan after the 'Age of the Gods', but in order to utilize these records as historical materials, detailed literary evaluation is necessary to determine how much of the pre-sixth-century data are factual. From the latter half of the seventh century onwards, wooden writing tablets are frequently recoverable from archaeological sites, and after the eighth century, documents other than the official histories have survived. Thus, in the Historical period, literary information increases prolifically through time, giving us diverse resources for the investigation of the development of Japanese society.

Every phase of habitation from the Paleolithic to the pre-modern periods is investigated archaeologically in Japan. As of December 1980, the Boards of Education in the various prefectures had recorded a total of 263,946 sites dating throughout this timespan.

Japan's Archaeological Heritage Endangered

In Japan, an organizational and financial base for conducting rescue excavations is gradually being established. These excavations are ostensibly designed to counter the destruction of archaeological sites through developmental activities. The system of securing excavation funds from the developer, however, is not free from becoming a license to site destruction; there are greater resources from developers to excavate and therefore ultimately to destroy sites than there are funds from the government to preserve and protect sites. This is a cause for a great deal of concern, and it is realized that the abundant materials and reports resulting from rescue excavations, which are being conducted ceaselessly throughout the country, are inherently linked to the obliteration of a great number of sites.

Archaeologists blessed with much more extensive excavation funds than ever before nevertheless feel that the present situation is dangerous for Japan's archaeological heritage. One fear is that the sites, which are the found of archaeological data, are quickly being exhausted as a non-renewable resource. For the year 1980, more than 6,200 sites are included in the official records as having been destroyed or exposed to destruction by developmental activities. This represents an exponential increase over the equivalent number twenty years ago. There are independent indications that 10% of the known sites have already been entirely eliminated. how many will be preserved in the future? Many archaeologists are very fearful.

It is a basic policy in Japan that all sites which will be disturbed by construction activities must be excavated; but among those that are, how much of the historical content of the site is really rescued with today's excavation technology? Many facts will be lost forever; and if one remembers that our archaeological heritage is an important structural component in our historical environment, then site destruction is directly linked to the destruction of that environment.

Many voices mourn the obliteration of historical data and the historical environment, and the movement of researchers and townspeople to secure site protection and preservation continues unceasingly. The fruit of this preservation movement was the first public acquisition of archaeological remains, in 1955 - tombs which were on the brink of destruction from earth-procurement activities. This incident established a precedent for the public purchase of endangered sites. However, even though the preservation of individual sites one by one was ushered in by the citizens' movement, it has not led to the successful establishment of a system which guarantees the systematic protection of sites and the historical environment.

Even with this acknowledged loss, the amount of data being obtained in pre-construction excavations is voluminous and therefore dangerous in another sort of way. Processing of the data cannot keep pace with production, and Japanese archaeologists are operating under a

mountainous backlog of material. Even if it is possible to advance elaborate analyses utilizing just a portion of this huge body of data, it is growing increasingly impossible to process all the data, and the burden of doing so is impeding the ability of individual archaeologists to conduct unfettered research.

Concerning the manipulation of select bodies of data, there is a strong feeling of impatience among Japanese archaeologists that the results of elaborate analytical research cannot be given life within a broader, systematic framework of Japanese protohistory and early history. Several efforts have been made, not only by archaeologists and historians, but also by novelists and literary critics, to paint a picture of early Japanese society, but most of these make opportunistic interpretations of these very small data bodies in an applause-seeking manner. Their interpretations cannot endure the scrutiny of serious researchers; however, the latter are also not free to manipulate the entire body of data to produce more accurate syntheses.

No fresh ideas are likely to occur to archaeologists suffering from endless days of excavation and pressured by mountains of data. And archaeologists who cannot stimulate themselves with fresh new ideas become mere diggers of artefacts when they encounter a site. The thing that Japanese archaeologists should fear the most is that this will most likely become the normal situation in the future. What is now necessary for Japan's archaeological heritage is the establishment of an efficient system for preserving the sources of our historic and prehistoric data - that is sites - from rapid destruction. And this must be a system which can adequately collect and process the information relating to human activities of the past which is being recovered from archaeological excavation at ever-increasing rates.

[English version by Gina Barnes]

Note

1 Current exchange rates specify an average of 450 yen to the pound, so the figure concerned is £16.5 million or $30.3 million.

Urbanization, Nara Palace, and its Excavation

Kiyotari Tsuboi and Migaku Tanaka

Nara Capital, Past and Present

Nara was the capital city of Japan in the eighth century. Its nucleus was the Nara Imperial Palace situated at the capital's north-central extremity. In 1967 the question of the Nara Palace site came up for discussion in the Japanese Diet.

18 April 1967, House of Councillors, Committee on Culture and Education:

MEMBER KOBAYASHI TAKESHI: I would particularly like to make a representation to the chairman as well as the Minister of Education. Concerning the Nara Palace question . . . , as a result of investigation, it now seems certain that Nara Capital's East 1st Column Avenue does not run quite as expected but actually bends off on a separate course, so that the site is different from the hypotheses based on early written sources. . . . When I go to call on the Committee for the Protection of Cultural Properties, I would like to request a detailed explanation on this one point.

22 June 1967, same committee:

MEMBER KOBAYASHI: About this bypass, a question has come up . . . . Through excavation of an area next to the Nara Palace remains, by East 1st Column Avenue, an unexpected new situation has arisen, as you know. I'd like some clarification on this point.

MURAYAMA MATSUO, CHIEF SECRETARY, COMMITTEE FOR THE PROTECTION OF CULTURAL PROPERTIES (precursor of the present Department for the Protection of Cultural Properties in the Agency for Cultural Affairs): The matter of the National Route 24 bypass first came up around 1964. . . . A year or so ago it was decided that, if the bypass had to pass near the Nara Palace remains . . . , the old East 1st Column Avenue along the palace's eastern edge was an important ancient road, so by putting the new bypass there, damage to the site could be kept to a minimum. So the construction plan for the bypass was fundamentally accepted, and we began investigations along the proposed route. The investigations suggested . . . that at a certain time this East 1st Column Avenue might have been used for something besides a road. . . . Nara Palace itself . . . may possibly have spread beyond what is thought to be its original boundary and extended further eastward . . . . As for the bypass, the present situation is that we have not yet definitely decided to change the plan, but investigations will continue, and if a bypass is still to be built, shouldn't we think about which spot would be the least harmful?

KOBAYASHI: . . . As for the Ministry of Construction . . . , what are your

thoughts about the Nara Palace bypass question?

MINOWA KENJIRÔ, CHIEF, ROAD BUREAU, MINISTRY OF CONSTRUCTION: . . . After considering all the proposals, we feel that the route as presently proposed would be the best . . . , and we have decided to go ahead with the bypass. Our present thinking is that we definitely want to be permitted to proceed with this plan.

20 July 1967, House of Councillors, committee on construction:

MEMBER ÔMORI HISASHI: In the case of the Nara bypass, it's already been decided to proceed with construction. So . . . I'd like to know why the Ministry of Construction is still hesitating.

MINOWA: . . . Excavations have led to the supposition that the eastern edge of Nara Palace is not where it was first thought to be, and that the palace may have extended further to the east . . . . We feel that no route other than the proposed one would serve to alleviate the traffic problem, so we would like to get together with the Committee for the Protection of Cultural Properties and get on with the plans as soon as possible.

The present-day city of Nara lies roughly at the geographical centre of the Japanese islands. The Nara Palace site is situated in the western part of the present-day Nara City limits. To the west is Oska, Japan's third largest city (pop. 2.54 million); to the north, Kyoto, the seventh largest city (pop. 1.42 million); both are thirty minutes away by private railway (see map in endpapers). If you get off at Saidaiji Station and walk ten minutes to the east, you will come to the Nara Palace site.

The road from the station runs through the heart of Nara's western shopping district. The neighbourhood of the palace site is also filling up steadily with houses. In 1959, when excavations at the Nara Palace site began in earnest, little besides rice paddies and vegetable gardens lay between the station and the site. The intervening thirty years have seen considerable change (fig. 1). During that period the population of Nara has more than doubled, from 130,000 to 344,000. Lying in the commuter belt of the two large cities mentioned above, the Nara Palace site faces the threat of destruction through modern urbanization. It was in such a context that the preceding discussions took place in the Diet.

The discussions stemmed from plans to build a bypass for National Route 24 linking Kyoto and Nara. Crossing the hills separating Kyoto and Nara Prefectures, Route 24 proceeded southward, grazing the western edge of Tôdaiji, a Buddhist temple founded in the eighth century. Route 24 turned west by another eighth-century temple, Kôfukuji, cutting through modern Nara's central district before continuing further south into the Nara Basin. Only 6 metres wide, the highway was unable to cope with the wave of 'motorization' which had surged over the country since the late 1950s. Bottlenecks and congestion increased. Inevitably, plans were made for the construction of a highway to connect Kyoto and the central Nara Basin directly, bypassing old Nara proper. The plan also called for the reconstruction and

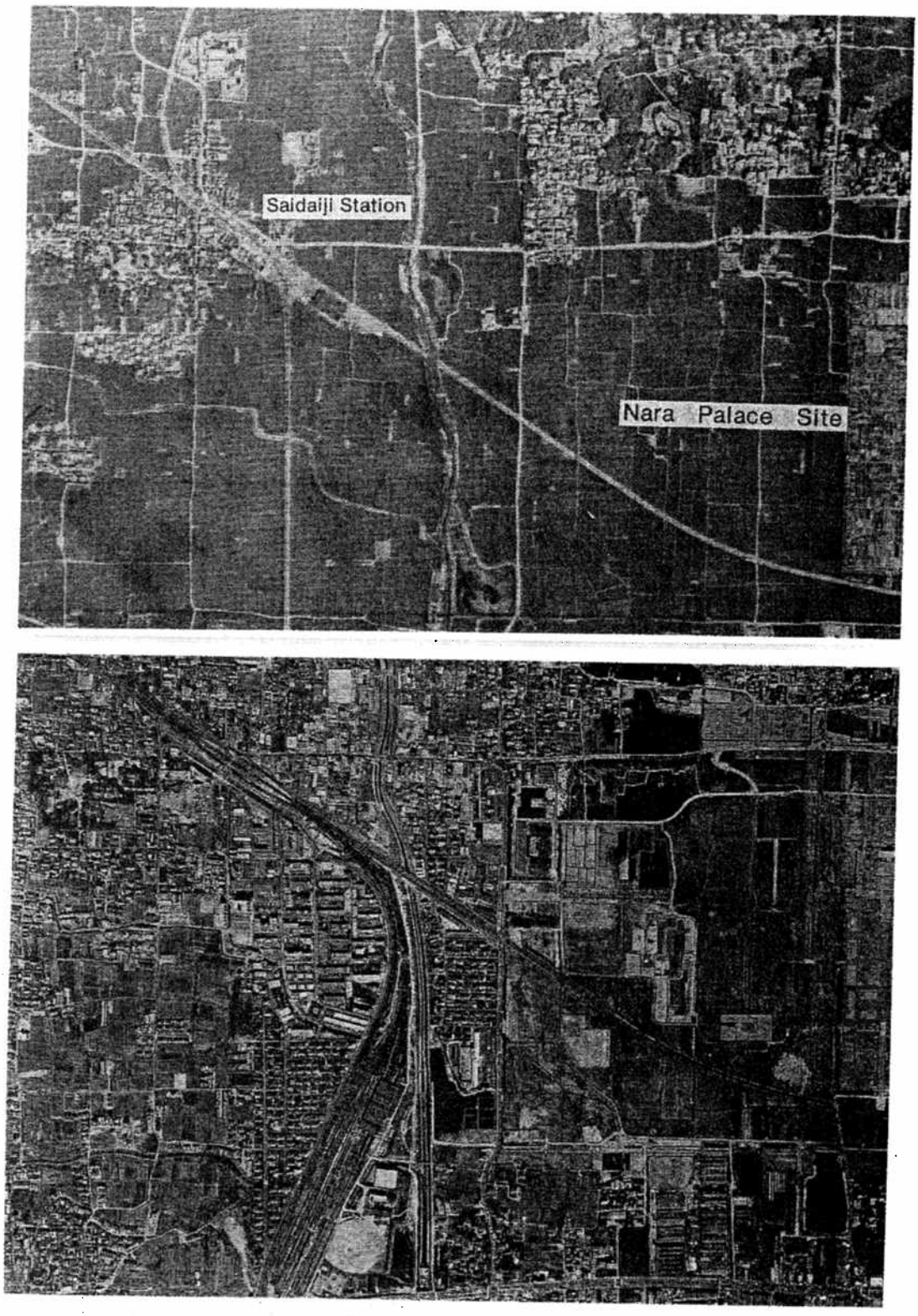


Fig. 1. The conditions of excavation around the Nara Palace site. Top: the Nara Palace site surrounded by fields, 1948; bottom: the NarkPalace site as an island of green within a residential district, 1984.

utilization of the ancient road system of Nara Capital. In the course of archaeological excavation, however, it became clear that the regular grid layout of the roads had been disrupted in one spot. What should have been a road adjacent to the palace was apparently part of the palace itself. If the original bypass plans were followed, the palace site would be sliced in two. In reaction to this, a nationwide citizens' movement demanded the total preservation of the Nara Palace site, and its voice was heard even in the Diet.

The Palaeolithic in Japan yielded to the hunting and gathering culture known as the Jomon, which lasted some 10,000 years. Wet rice agriculture reached the Japanese archipelago in the late fourth century B.C., marking the beginning of the Yayoi period. By the mid-third century A.D., large mounded tombs (*kofun*) had begun to appear throughout the land, giving their name to the Kofun (Tumulus) period. These tumuli were the overt signs of the emergence of powerful regional rulers. Buddhism entered from the continent during the sixth century. In the seventh century, much of Japan was united under the first centralized state, with its centre in Yamato - the ancient name for what is now Nara Prefecture.[1] At the apex of the pyramid of power stood the emperor. The first geographical centre of power was located in the Asuka district in southern Yamato, focusing on the emperor's residence. This residence was called the *miya* - 'honourable house'. Gradually, government and administrative offices grew up around the residence, eventually coalescing with it to form a compound of a much larger scale. In English, such a compound would usually be called 'a palace'; in Japanese, the term used is still *miya*. (Incidentally, *miya* also refers to a Shinto shrine, which is of course also an 'honourable house' for a deity or spirit.)

In 694 Empress Jitô moved to nearby Fujiwara. It is here that we find the first definite evidence of a regular grid pattern of streets, laid out around the palace according to Chinese models. This became the standard layout for ancient Japanese imperial capitals. In 710 the capital moved from Fujiwara to Nara where it remained until 784, except for the years 740-45, when it was moved briefly to three other locations (Kuni, Shigaraki, and Naniwa). Relocated to Nagaoka in 784, the imperial capital finally settled down in Heian ten years later in 794. Heian Capital - later renamed Kyoto - remained the emperor's seat until the move to Tokyo in 1868.

During the eighth century, the Korean Peninsula was under the control of the Silla kings; in China, the Tang empire was at its peak. The Saracen empire which arose on the Arabian Peninsula clashed with the Tang to the east and took control of Spain to the west; their spread into the rest of Europe was blocked by the Byzantine empire and by the Franks under Charlemagne. This was the age of Nara Capital.

Up to now we have been using the terms Nara Palace and Nara Capital. In modern Japanese, Nara Palace is usually called Heijô-kyû

and Nara Capital is called Heijô-kyô. *Kyû* means 'palace' and is written with the Chinese character 宮; *kyô* means 'capital' and is written 京. Encountering the term *kyô* today, one thinks of those ancient quasi-urban capitals which are laid out symmetrically around a north-south axis, with their streets crossing at right angles like a chessboard whose pieces are shrines and temples, houses of nobles and officials, public market places, etc. - all disposed according to a careful plan. In these ancient capitals, the central north-south axis was named Scarlet Phoenix Avenue; the region east of this axis was called the Left Capital, and to the west lay the Right Capital. In Nara Capital, these two regions formed a rectangle measuring 4.8 kilometres north to south and 4.3 kilometres east to west, while east of the Left Capital was a rectangular projection, 2.1 kilometres north to south and 1.6 kilometres east to west, which is today called the Outer Capital. At the northern end of Scarlet Phoenix Avenue lay Nara Palace (fig. 2). The palace occupied an area 1.1 kilometres square with an eastern projection of 0.8 x 0.3 kilometres. Besides the Imperial Domicile, the palace included a Great Supreme Hall; a State Halls Compound for state ceremonials, official negotiations, and the like; and various offices, bureaux, and workshops.[2)]

During the eighth century Heijo-kyô and Heijo-kyu were called Nara-no-miyako and Nara-no-miya respectively, although the former terms are more commonly heard today. The confusion of terms results from the borrowing of the Chinese writing system to express the genetically unrelated Japanese language. Chinese characters (*kanji*, as they are called in Japanese) are largely ideographic, so that pronunciation is not directly specified. A typical *kanji* will be given several readings in Japanese, depending on context. 'Heijo', for example, is written with two characters: 平, meaning 'flat' or 'level', read (among others) *hei*, *hyô*, and *taira*; and 城 ('castle' or 'fortress'), which may be read *sei* (with variant *zei*), *jo*, and *shiro*. *Hyô* and *jô* represent the Japanese attempt to imitate the pronunciation these characters were given in southern China around the fourth and fifth centuries; the Japanized pronunciations of this period are called '*go* 呉 readings'. *Hei* and *sei/zei* represent the Japanized pronunciations of the north Chinese standard language of the seventh and eighth centuries. Such sounds are called '*kan* 漢 readings'. *Taira* and *shiro* are indigenous Japanese words felt to be synonymous with these Chinese words and are thus written with these same characters, although their pronunciations are totally different.

In modern Japanese, it is not uncommon to mix *go* readings, *kan* readings, and/or Japanese pronunciations in a single word, Heijô being one example. During the eighth and ninth centuries, however, such commingling was rare. If we assume that 平城 was read with a Japanized Chinese pronunciation during the eighth century, it should have been either Heizei or Hyôjô. Actually, though, there is no evidence that these characters, when followed by 京 or 宮, were read in Chinese style

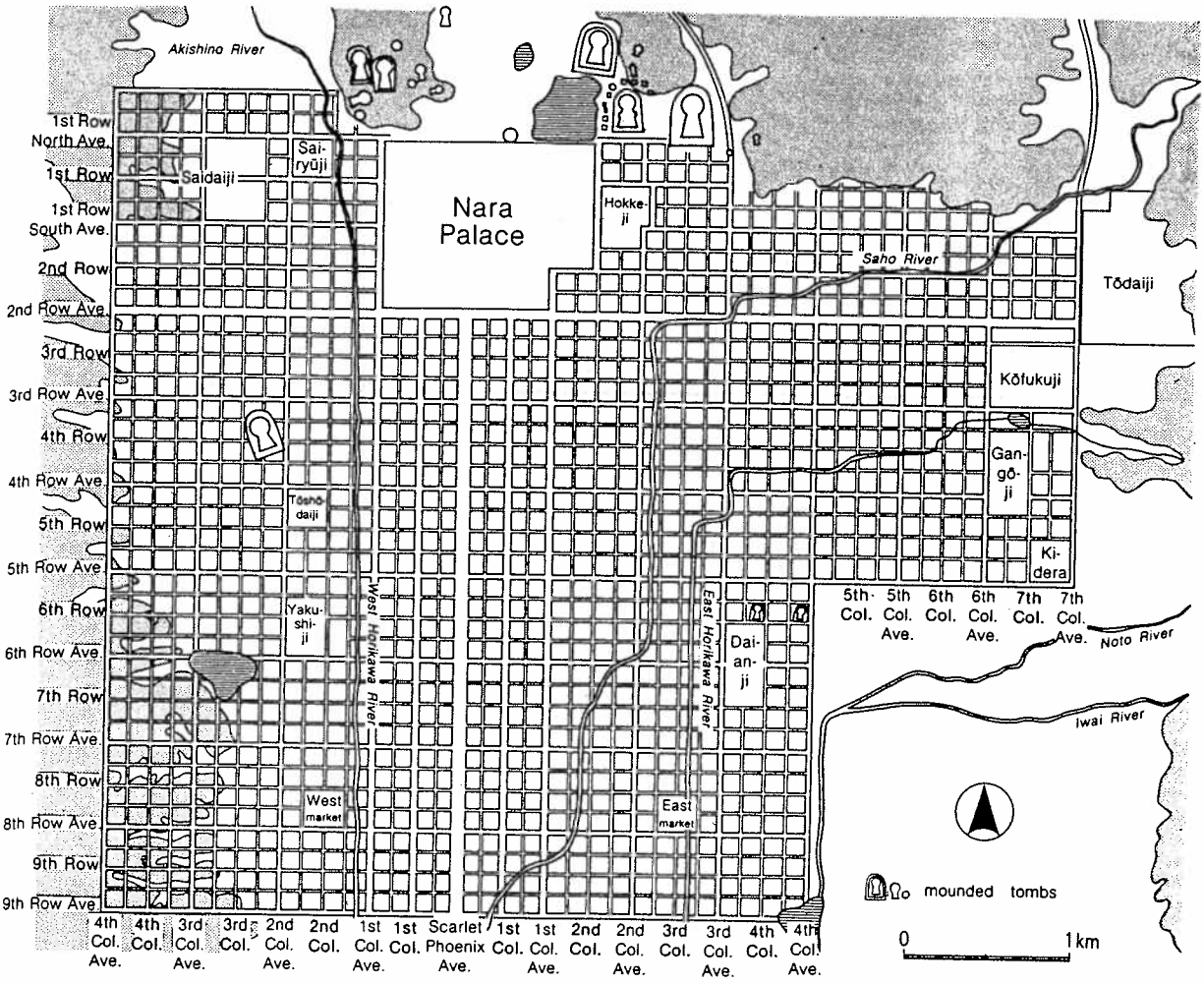


Fig. 2. The plan of Nara Capital and Nara Palace. Nara Capital was constructed in A.D. 710 in the northern Nara Basin, based on the model of the ancient Chinese gridded city plan. At the north central edge of the capital stood Nara Palace, seat of political activity and home of theimperial family.

at all. The Chinese-style readings for these latter characters are *kyo* and *kyu* as in Heijo-kyo and Heijo-kyu. But as we have seen above, they also have Japanese readings, *miyako* and *miya*. The three-character compounds 平城京 and 平城宮 were, it appears, not read *Heijô-kyô* and *Heijô-kyû* at all, but instead were read *Nara-no-miyako* and *Nara-no-miya*. Why the name Nara came to be written with the characters 平城 is not well understood; the etymology of the name Nara itself is still subject to debate. In any case, we adhere to the ancient pronunciation: Nara. Incidentally, in modern Japanese the place-name Nara is written with two other Chinese characters, 奈良, used purely for their phonetic value, in rebus fashion.

The Rise of the Eight-chô-square Theory

In 1959, the year in which the Nara Palace excavations began in earnest, two points regarding the palace were taken for granted: its date and its location. The capital was assumed to have been moved from Fujiwara in 710, four years after the accession of Empress Genmei, and was relocated to Nagaoka in 784, the fourth year of Kanmu's reign. This capital was a square plot of land measuring 8 *chô* on a side,[3] straddling the boundary between Saki-chô and Nijô-chô, two districts of modern Nara City, in the northern part of the Nara Basin.

The fact that Nara was the capital from 710 to 784 is clear from the *Shoku Nihongi*.[4] However, the earliest source for the size and plan of Nara Palace itself is a seventeenth-century document. In 1681 the poet Hayashi Sôho, who lived near the palace site, published a twenty-volume work describing ancient sites in the Yamato region (*Washû kyûseki yûkô*). Around that time, presumably because the custom of making pilgrimages to a series of famous shrines and temples had begun to spread from the nobility to the commoners, there appeared several woodblock-printed guidebooks to Yamato, a province rich in historic religious sites. Hayashi's gazetteer was one of the earliest of these guidebooks, covering in detail the fifteen counties of Yamato. Hayashi not only included existing shrines and temples, he also visited, investigated and reported on sites that had long since vanished under agricultural land. In all, it must be adjudged a superb geography for its time. In volume 5 we read, 'Nara Palace: The palace's eastern half is in Sonokami country and its western half is in Sonoshimo country . . . . Its remains are in the Nijô area of Chôshôji village and are 8 *cho* on a side.' The place-name Nijô survives as the modern district of Nijô-chô, in which the western half of the palace site lies. Hayashi thus provides us with an early impression of the size, plan, and location of the palace.

In the nineteenth century Kitaura Sadamasa (1817-71) conducted the first thorough investigation of the capital, resulting in his reconstructed map of Nara Capital (fig. 3). To supplement his own observations he consulted two other documents: a map of the Right Capital (i.e., the western half of Nara Capital), preserved in Saidaiji

temple not far from the palace site; and a map of Heian Capital (modern Kyoto) included in the *Shûkai-shô*, a fourteenth-century volume of articles on ceremonies, customs, etc. Comparing the Nara and Heian Capitals, Kitaura reached two conclusions: that their overall plans were quite similar; but that Heian Palace was 10 *chô* north to south by 8 *chô* east to west, while the evidence of place-names and topography suggested that Nara Palace was 8 *chô* square.

Kitaura was born in Furuichi village, Sonokami country, Yamato Province (modern Furuichi-cho, Nara City). For several generations his family had worked for the Tôdô clan in the administrative offices of Yamato fief. The Tôdô were based in neighbouring Ise Province, modern Mie Prefecture. Sadamasa himself was employed there in a relatively minor capacity from the age of fifteen. His free time was devoted to research on such topics as imperial mausolea, the ancient agricultural system of the Nara Basin, the layout of Nara Capital, place-names, and what we would now call historical geography. The Tokugawa shogunate found his research particularly useful in carrying out the maintenance and repair of imperial tombs; this was presumably the reason for his official elevation to samurai status in 1863.

With the Meiji Restoration of 1868, Japan took a major step along the road to becoming a modern state. During the Meiji era, Kitaura's research provided a base for Sekino Tadashi (1867-1935) to conduct further on-site investigations and make his own contribution to the scholarly debate over Nara Capital. Sekino graduated from the College of Engineering, Tokyo Imperial University, with a specialization in architecture, and in 1895 he was appointed director for the repair of old shrines and temples in Nara Prefecture. Thus began his involvement with Nara Capital. He kept a diary of developments, according to which in December 1898 he made plans to study the capital and began to purchase reference books. In January 1899 he discovered the apparent remains of the palace's Great Supreme Hall and other structures, and by February he had completed a scale map of the topography of the palace site. In October he completed his manuscript *Observations on the Remains of the Great Supreme Hall in Nara Palace*. His work soon began to reach the public eye through newspaper articles. In 1901 he left Nara to return to his old university as an associate professor. His researches finally appeared in their fullest form in 1907, when *Considerations on Nara Capital and the Greater Palace Enclosure* was published as volume 3 of the *Bulletin of the College of Engineering, Tokyo Imperial University*. Sekino's impressive legacy of subsequent publications centred on architectural history but also extended to archaeology, aesthetic history, and other fields. His investigations were not confined to Japan but took him to Korea and China as well.

Sekino's theories formed the basis for the work of later researchers of Nara Capital, and he shared the opinion of his predecessors that

the palace had been 8 *chô* square: 'The palace lay in the north-central part of the capital . . . , bordered on the south by 2nd Row Avenue, on east and west by the respective 1st Column Avenues of the Left and Right Capitals, and on the north by 1st Row North Avenue. It measured 8 *cho* east to west and 8 *chô* south to north.'

We do not know when the idea that the palace measured 8 *cho* on a side first came into existence. Hayashi Sôhô is the earliest known proponent, but it is unclear whether his claim was based on field investigation or merely on hearsay evidence. Kitaura Sadamasa used a special measuring wagon (converted from a freight cart) and took on-site measurements. The place-names on which he relied are recorded in his reconstructed map of Nara Capital: within the palace grounds are shown such names as Daikokuden (Great Supreme Hall), Ômiya (Grand Palace), Baba (Riding Ground), and Dairi-no-miya (Inner Palace). These are all names evocative of a palace site and all survive to this day as local place-names.

To those familiar with Japanese archaeology, this discussion may recall the existence of several sites located in places named Hôhatchô ('eight *chô* square'). These are most numerous in the Tôhoku region of northern Honshû. One theory is that Hôhatchô marks the former presence of a seat of provincial government of similar complex. Another is that the name indicated a particular type of ancient frontier settlement. Excavations began at one such site in 1976, Hôhatchô site, Ôta, Morioka City, Iwate Prefecture. It is now clear that the site was an ancient administrative centre nearly 1 kilometre square. Current opinion holds it to be the site of Shiwa Castle, build in 803 as one of the important bases for controlling the northern frontier. In the same prefecture, in the Sakuragawa section of Mizusawa City, the remains of Isawa Castle also lie in a neighbourhood called Hôhatchô. This castle was build in 802 to be the principal military centre for the subjugation of the Emishi - the name by which the central government designated the residents of northern Japan who resisted the expansion of its control. Excavations at Isawa Castle in 1954-55 revealed traces of buildings. They also exposed earthworks which interestingly enough limit the site's area to about 650 metres per side, or about 6 *chô*. Despite discrepancies in actual size, these two sites clearly point to a connection between the name Hôhatchô and ancient administrative centres. However, we are still not justified in assuming that *all* places with this name will show such a connection. In some cases, the name might merely have been borrowed from such a centre.

The name Hôhatchô; or other place-names containing the element *hatchô* ('eight *chô*'), do occur, if rarely, outside the Tôhoku region. The name Doi-hatchô has since the medieval period been associated with an area in modern Hôfu City, Yamaguchi Prefecture. This is known to have been the site of the government offices of Suô Province. According to some scholars, the name Hôhatchô in Fukayasu

country, Hiroshima Prefecture, indicates the former government seat of Bingo Province, but the connection is uncertain. The place-name Kuni-hatchô appears in a manorial illustration from the fourteenth of fifteenth century, and the location in question can be linked with the government seat of Tamba Province.

Therefore, although we may be uncertain about the date of origin of this term and the precise degree to which it is linked with the size and function of a site, there is a strong likelihood of its having spread widely through its association with public facilities for local governance. The expression *hatchô-shihô* ('eight *chô* square'), meaning an extraordinarily splendid private mansion and grounds, may stem from such origins. For example, the term *hatchô-shihô* appears in the sacred writings of Tenri-kyô, a 'new religion' born in Nara Prefecture in the mid-nineteenth century; also, in a volume of quotations from the Tenri-kyo foundress, we find the sentence, 'The estate is eight *cho* square.' Tenri-kyô has decreed as sacred ground an area eight *chô* square centred on the foundress's former residence, and the church's headquarters are being built there. The foundress was the wife of a bankrupt rural landlord; it is interesting that the concept and the expression 'eight *chô* square' should have been so widely disseminated as to occur even in the speech of this relatively humble woman.

Such is the historical background of the designation of Nara Palace as 'eight *chô* square'.

Excavations at Nara Palace

Research on Nara Palace and Nara Capital is at present being conducted principally under the auspices of the Nara National Cultural Properties Research Institute (abbreviation, Nabunken). Established in 1952, Nabunken works in co-operation with the Boards of Education for both Nara Prefecture and Nara City. Its purpose is to conduct research into all aspects of Japan's cultural heritage - arts and crafts, architecture, history, etc. - chiefly on the basis of the actual remains of ancient cultural properties which occur so abundantly in Nara. Nabunken's involvement with Nara Palace began at the end of 1953.

The post-war occupation of Japan by the Allied Forces had just ended. Adjacent to the northwest corner of old Nara City proper - the northeast corner of the palace site - there was an Allied military base. South of the base, there was a road running east to west, known to the local residents as 1st Row Road (Ichijô-dôri). Barely able to accommodate an oxcart, 1st Row Road was selected for upgrading and widening to improve the flow of traffic between the military base and Osaka. The work began in 1953. At the point where the road crossed the palace site, some archaeological features were discovered. The prefectural Board of Education carried out emergency excavations at the end of the year, with the result that a nationally administered investigation was begun in January 1954 by the Committee for the Protection of Cultural Properties. This was the first post-war investi-

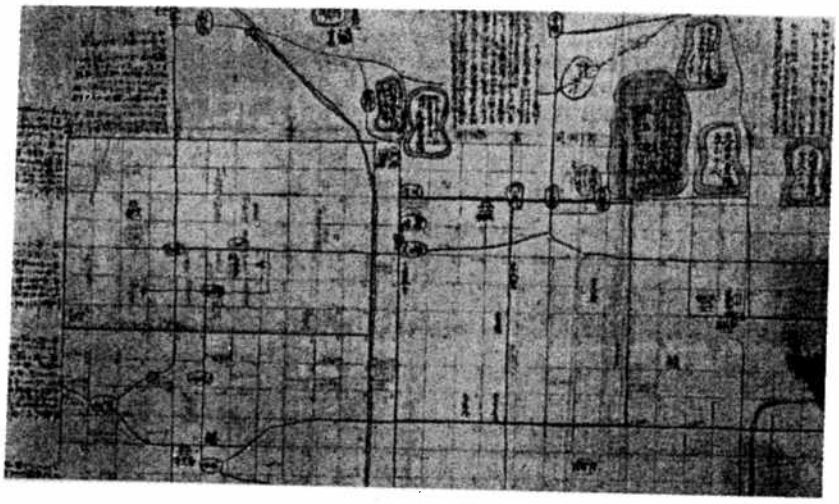


Fig. 3. The street map of Nara Capital drawn by Kitaura Sadamasa. Using evidence from archaeological remains such as burial mounds and temples, from place-names, and from the layout of fields, Kitaura reconstructed the street plan of Nara Capital. This was the first investigation of the Nara Capital site.

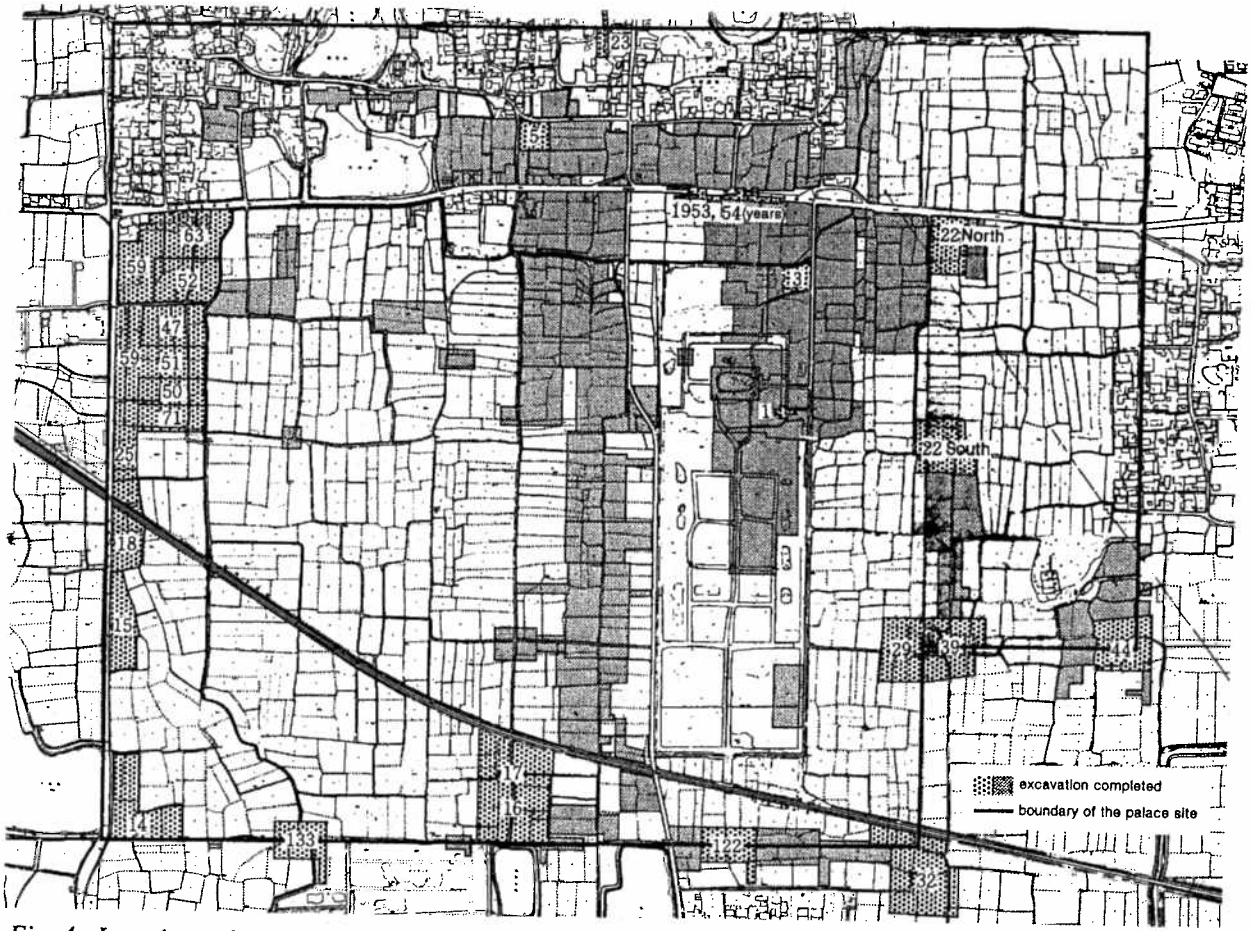


Fig. 4. Locations of Nara Palace excavations. Since gaining momentum in the 1950s, excavation of Nara Palace has extended to 27% of the site`s area. The numbered locations are excavation numbers utilized in this book.

gation within the site of Nara Capital. It was undertaken, not because of an expressed need to clarify particular questions of scholarly interest concerning the palace or the capital, but merely because road construction had led to digging in the area, a set of circumstances which may be considered typical of post-war archaeological investigation in Japan. Nabunken participated in the Nara Palace excavations as the only national research organ in the region.

Subsequently, Nabunken became involved in further excavations in the region, with the intention of providing data to guide the formulation of policies to cope with ever more numerous development projects. During the three years following the first survey of the site in 1955, archaeologists tended to concentrate their efforts on surveying Asuka in the southern Nara Basin; but since 1959 the Nara Palace site has been under continuous excavation. In the thirty years since, the area excavated in more than 200 separate investigations has totalled 35 hectares - about 27 per cent of the entire palace site (fig. 4). Investigations in recent years have tended to move out beyond the palace boundary, so that digging is now in progress throughout the capital.

Since Nabunken began research on the palace, the current state of the site has been well documented through such means as aerial photography and the preparation of 1:1,000 scale topographical maps. For a long while there was nothing to cast doubt on the eight-*chô*-square theory of the palace. In aerial photographs, the former layout of the streets of the old capital is clearly reflected in the long narrow paddies and vegetable gardens: .2nd Row Avenue, passing east to west just south of the palace; West 1st Column Avenue on its western edge; East 1st Column Avenue, supposedly forming its eastern border (fig. 5). What Kitaura and Sekino had noticed on the ground was examined from the air for the first time, and little was found to object to in their conclusions. This is perhaps not surprising, considering that all conclusions were based on the same methodology, that is, observation of the present-day surface topography of the site. Only a new methodology could significantly challenge the *status quo*, and the obvious one was actual excavation. In 1963 a series of excavations, aimed at ascertaining the palace boundaries, was begun. It was these excavations which led to the negation of the *eight-chô-square* theory. The first excavation was conducted in what was thought to be the southwestern corner of the palace grounds. In terms of Nabunken's palace excavations, this was Excavation No. 14.

In typological terms, Nara Palace was a 'triple-nested compound', that is, a set of three fences or walls enclosing progressively more of the grounds. The innermost fence surrounded only the Imperial Domicile, scene of the emperor's daily activities. The second fence enclosed the first fence as well as the bureaux (i.e., offices and workshops) of those responsible for attending to the personal needs of the imperial family. The outer-

most wall enclosed all of this and also the bureaux of public administration and government, and therefore the entire palace precincts. In each of the three walls stood several gates; the gates in each successive wall were known collectively as the Inner, Middle, and Outer Gates. The outermost wall was called the Palace Wall or, since it was the largest, the Great Palace Compound Wall, or simply the Great Wall.

The gates of the two inner walls were provided with registers of the names of those persons permitted entrance. Visitors would state their names before the gate and await confirmation before passing through. In this way access to the two inner enclosures was strictly regulated. There seems, however, to have been no such register for the Outer Gates. Does this suggest that there were fewer restrictions on access to the government bureaux?

Excavation No. 14 succeeded in determining the location of the western end of the southern segment of the Great Wall. The nature of the wall's construction was also revealed. First, a trench was dug, 8.5 metres wide and about 1 metre deep, then a layer of clay was laid as a foundation. Finally, earth of good quality was piled up and tamped down firmly to form the wall itself. At ground level the Great Wall was 2.7 metres thick. Above ground, however, only a small portion of the lower section survives. Excavation along the extrapolated line marking the southern boundary turned up a large quantity of roof tiles, making it clear that the top of the wall was tiled.

This information about the Great Wall at the palace's southern boundary also led to doubts about previous research approaches to early capital sites. The Great Wall's basal width was 2.7 metres (9 *shaku*), and the distance between the wall and its outer moat was 10.5 metres (35 *shaku*). By contrast, the Engi Shiki (Procedures of the Engi Era), a collection of laws and by-laws published in the early tenth century, notes that the Great Wall of the later Heian Palace was 7 *shaku* thick and stood 25.5 *shaku* from the moat. Thus the scale of Nara Palace's outer defences seems to have been somewhat more grandiose than the Heian capital's.

Prior to full-scale excavation, assumptions concerning the layout and structure of the Nara Palace buildings rested chiefly on what was known of Heian Palace. Built in 794 after the move from Nagaoka, Heian Palace survived unscathed until 960, but during the next 122 years, fourteen major fires are recorded. Each time the palace was rebuilt or repaired, the intention was to reconstruct the original form of 794. To do this, it was first necessary to clarify that original form and recover the palace's exact dimensions. The research and resulting scale drawings from the tenth and eleventh centuries were in answer to the practical need for accurate reference materials in rebuilding palaces destroyed by fire. We also have access to a rich body of depictions of Heian Palace in picture scrolls and descriptions in contemporary literature. Thus it is possible to feel quite confident in our understanding of even very minute details of the palace's

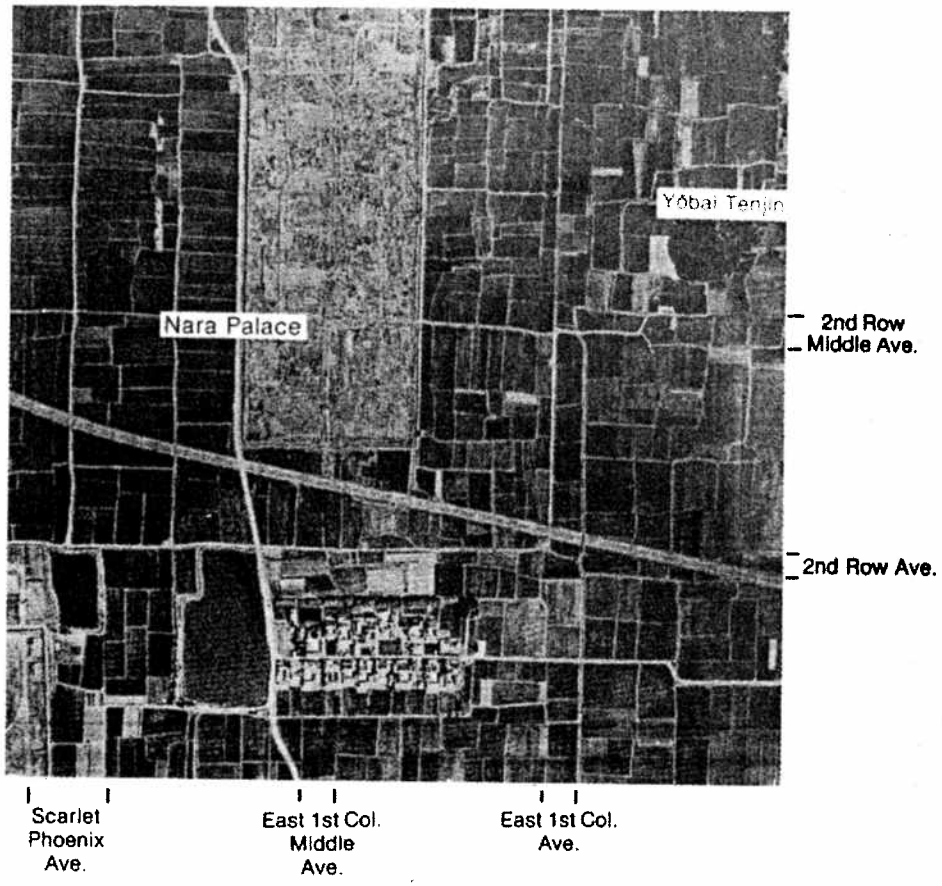


Fig. 5. Nara Capital street plan as visible in the modern paddy-field layout. Nara Palace is at top center.

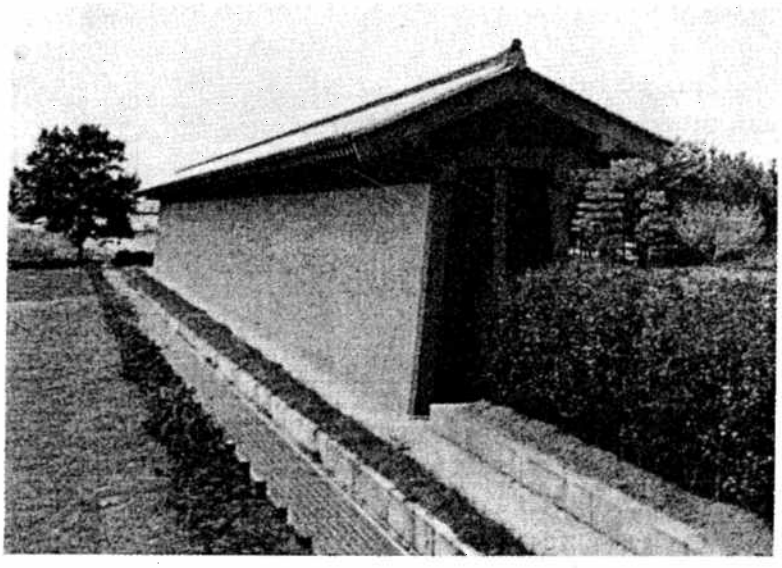


Fig. 6. Reconstruction of a portion of the Great Wall surrounding Nara Palace. The Great Wall was 2.7 m thick and probably more than 6m high.

structure.

Virtually no such documentation is available for Nara Palace. It was therefore only natural to relay on information about Heian Palace, although in fact there was no way of knowing to what degree this information was actually applicable to Nara. With excavation, it gradually became apparent that there were both similarities and disparities between the two palaces. For example, we have noted that both have a Great Wall surrounded by a strip of open land and then by a moat, but that there is a difference in their dimensions. We must therefore recognize the limitations in thinking about Nara Palace in terms of Heian Palace.

Since only the base of the Great Wall at Nara survives, we can only guess at its height. The Engi Shiki state that a wall 6 *shaku* thick shall stand 13 *shaku* tall, while a wall 4 *shaku* thick shall be 8 to 9 *shaku* tall. Extrapolating from these figures, a wall 9 *shaku* thick such as at Nara would have had a height of some 20 *shaku* - about 6 metres. There is now no way to confirm this hypothesis; however, when a portion of the Great Wall was to be 'restored' in 1982, scale drawings were made on the assumption of a thickness of 9 *shaku* and a height of 20 *shaku*; the result, especially if roof tiles were added on top of this seemed to be slightly too tall and somewhat unbalanced aesthetically. It is no easy matter to reconstruct standing structures solely on the basis of their subsurface remains, so in restoring the wall, it was therefore decided to use the 9-*shaku* thickness revealed by excavation but to limit the height to the largest figure given in the Engi Shiki for such tamped-earth roofed walls. Thus the height for reconstruction was set at 5.6 metres (fig. 6).

Portions of the south Great Wall were first excavated in 1963. Later in that year and in 1965 the west Great Wall was dug, and the north Great Wall in 1964. By 1965, then, three borders of the palace complex had been delimited. They were found to accord with the *eight-chô-square* theory. More detailed data about the south Great Wall were also added by the 1964 excavation of the Scarlet Phoenix Gate, which was the principal entrance for the whole complex, and the unearthing in 1978-79 of the eastern and western gates and their immediate surroundings.

An enormous number of roof tiles were excavated in the vicinity of the Great Wall. The arrangement of the tiles, lined up as if they had just slid off a roof, makes it clear that they had been set on top of the wall. In traditional Japanese architecture each of the tiles along the eaves generally has a design on its edge. Interestingly enough, of the eave tiles excavated along the southern portion of the Great Wall, more than half have designs also found on tiles recovered from the immediately preceding palace at Fujiwara (fig. 7 *left*).

At Fujiwara a wide range of different eave-tile designs was found, and several of these occur at Nara. It may be that the eave tiles used at Nara were not manufactured specially for that particular palace but were 'recycled' from Fujiwara Palace. Nara is not the only such case: a

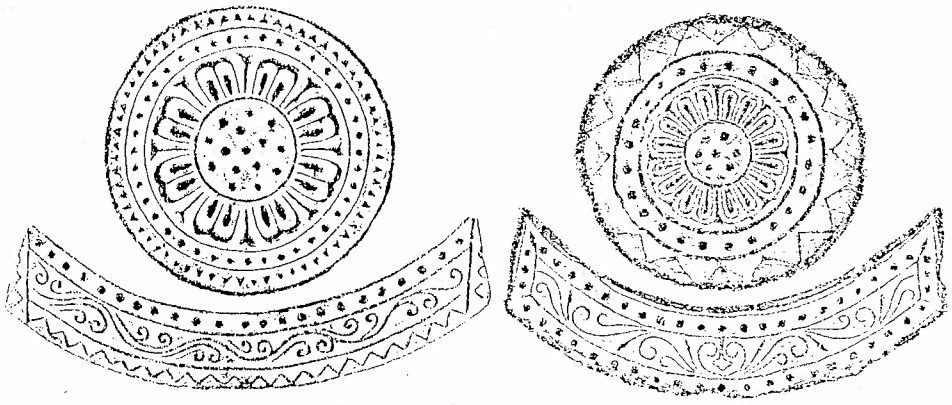


Fig. 7. Nara Palace roof-tile designs. During the first stage of palace construction, many tiles were brought from the buildings of Fujiwara Palace (694-710) and reused (left); later, tiles were manufactured specifically for Nara Palace (right).

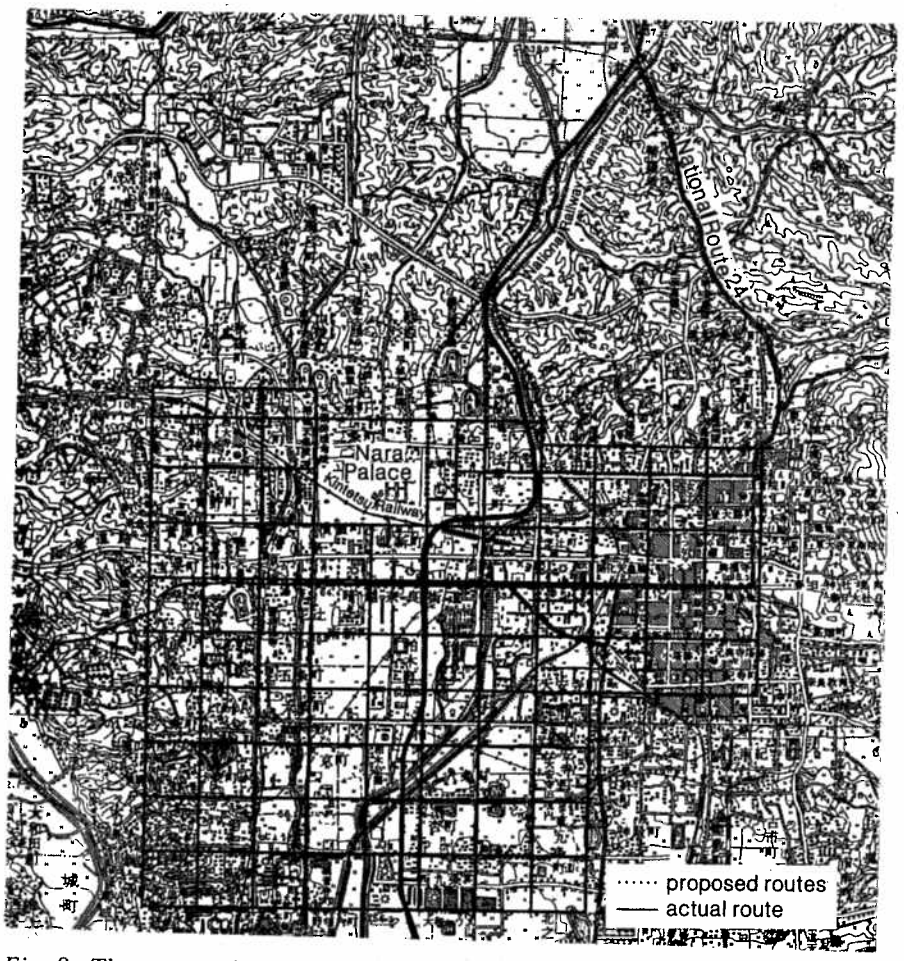


Fig. 8. The proposed and actual routes of the Nara Bypass. Excavations from 1964, accompanying the planning of the Nara Bypass, obtained data which thoroughly overturned the 'eight-cho-square' theory widely held until that time to account for Nara Palace`s shape.

similar phenomenon had already been observed at the Nagaoka and Heian Capitals. It appears to have been common to tear down some of the buildings of a capital at the time of its abandonment and to transport the materials for use at the new site. Excavations at Nara to date have shown that Fujiwara-style eave tiles are particularly concentrated along the south Great Wall and around its gates. On the inner palace buildings, however, new tiles with unique designs were used (fig. 7 *right*). Perhaps we can assume the following scenario. There was presumably a desire to complete the south Great Wall, which was the front facade for the entire palace compound, as quickly as possible, along with the palace's central buildings. Such new tiles as could be quickly manufactured were used on the central buildings, but it was necessary to use some lumber and tiles from Fujiwara on the south Great Wall and its gates. The rest of the compound could be completed at a more leisurely pace after the move to Nara, which meant that there was time to manufacture a sufficient quantity of new tiles.

From south to west to north, the boundaries of the palace grounds were gradually revealed through direct observation of the features themselves. The *eight-chô-square* theory, accepted since the time of Hayashi Soho, seemed to have been confirmed beyond doubt. Then came the Nara Bypass.

The Nara Bypass and Nara Palace

According to plans drawn up by the Ministry of Construction beginning in 1961, the Nara Bypass was to be 26 metres wide and accommodate 30,000 vehicles per day. It would slice the northern Nara Basin in half along a north-south line. There were three proposals for its location: it would run along the reconstructed path of East 1st, 2nd, or 3rd Column Avenue of the ancient capital (fig. 8). The final choice was East 1st Column Avenue, which had supposedly run along the eastern boundary of Nara Palace. From the Ministry's point of view, this choice had several advantages. Aside from giving the bypass the additional function of separating the palace site from the central district of Nara City, it made sense in terms of city planning, that is, it was in a high-priority location for a new thoroughfare, it would minimize the risk of destroying cultural remains, and it would require almost no relocating of houses. Lastly, it was the most economical option in terms of construction costs.

The committee for the Protection of Cultural Properties (CPCP) agreed to this plan but attached the following four stipulations:

1. The road should be routed so as to run east of the palace's outer moat rather than overlap it.
2. Care should be taken not to interfere with the preservation of the site, by methods such as the use of overpasses and the maintenance of open space surrounding archaeological features.
3. The CPCP should be consulted as the planning proceeded.
4. Where the existence of archaeological features was suspected, pre-construction excavations

should be conducted at the expense of the government contractors.

Thus harmony was achieved between the Ministry of Construction and the CPCP, and the East 1st Column Avenue scheme was launched.

The need for a bypass was generally recognized. Given the considerable awareness of cultural history in Japan, nearly everyone favoured a plan leading to the reconstruction of the street grid of the ancient capital. However, although the course of East 1st Column Avenue could be discerned clearly on the surface from present-day agricultural field patterns, there had as yet been no excavation in search of subsurface features. If the bypass was to lie east of the palace moat, it would first be necessary to find the moat. The archaeologists were in accord: 'There is no choice but to do some pre-construction excavating. Since we have been investigating the other three edges of the palace grounds, we might as well get around to the eastern edge!'

Excavation was to begin at four points: the presumed locations of the three gates of the east Great Wall and the southeast corner. Expenses were borne jointly by the Ministries of Education and construction; administrative responsibilities fell to the prefectural Board of Education; and the excavations were directed by Nabunken. Investigation started first at the presumed northern and middle east gates, respectively 250 metres and 500 metres south of the presumed point of the northeast corner of the palace grounds. Counting from the first dig in 1955, this was Excavation No. 22; the two simultaneous excavations were referred to as No. 22 North and No. 22 south (see fig. 4).

The first step in an excavation is removal of the topsoil, and this began at Excavation No. 22 North on 30 November 1964. The entire research area of 33 ares consisted of paddy, with a depth some 20 centimetres of cultivated soil. Paddy topsoil is of no real value to the archaeologist, since it rarely contains any artifacts and is so regularly disturbed by ploughing and planting. Once it has been cleared away, the soil below is searched rigorously for artifacts and features, and the location and condition of any finds are recorded carefully. To aid in measurement, wooden surveying posts are driven into the ground. At the Nara Palace site, the entire area was marked off by such posts into sections 3 metres square, which were the minimal units for recording finds. These squares were given four-character addresses in a matrix consisting of two alphabetical characters and a two-digit number. Each of these matrices was further identified as to its location in Nara Palace as a whole, by an address consisting of a number plus three letters. The resulting eight-digit combinations indicate where on the Japanese archipelago each 3-metre-square ($9m^2$) section is located. Take the address 6AAC PU18, for example. 6AAC identifies an area some 200 metres east to west and 70 metres north to south. This code includes the site of Excavation No. 22 North. PU18 indicates the northwest corner of 6AAC. These local four-character addresses are

written directly onto the surveying posts. If you stand at any point on the excavation site and face south-east, the figure on the nearest post in that direction is your address.

The task of removing the dug soil continues. Layers of soil differing in colour and quality lie one atop the other. Items found in the upper strata should be newer, that is, younger than those found further down. What artifacts occur in which strata? Which strata contain traces of building activity? Such important questions pertaining to the *stratigraphy* can be answered only at the excavation site. However, it is no easy task, even for the experienced investigator, to discern minor changes in the nature of the soil; and it is sometimes necessary to be able to re-examine the soil stratigraphy after excavating an area. For that reason, some strips of soil are left unexcavated, criss-crossing the site like the raised paths between rice paddies (see fig. 9 *top left*). At the Nara Palace site, such strips were left every four to five sections; in other words, every 12 to 15 metres. Except for these strips, the entire site is excavated. At this stage the soil is dug with hoes and spades and carried away on a conveyor belt.

Immediately below the topsoil is the so-called 'paddy base'. In most paddies this is an artificial, tamped-earth layer which often contains artifacts from the medieval and early modern periods. Of course, artifacts of the ancient period may also be found. At Excavation No. 22 North, the paddy base was some 20 centimetres thick. Immediately below was a dark brown layer rich in organic matter, containing many artifacts from the Nara period. Within this layer differences in soil quality and colour were, on the whole, so minimal as to elude detection. Below this dark brown layer, that is, some 60 to 70 centimetres below the surface, the excavators began to discover postholes and other evidence of buildings. The first posthole was identified on 24 December 1964, the twenty-fifth day of excavation. Since this discovery was made just as the year was ending, further investigation was postponed until after the New Year holidays.

When excavation resumed in January 1965, many features began to emerge, principally in the southern half of the site. Most immediately noticeable were the numerous postholes for the erection of vertical 'embedded pillars' (fig. 9 *bottom left*). These postholes were about a metre square and a metre deep; within each posthole a round pillar with a diameter of 30 centimetres or so had once been embedded. In most cases, the pillars had been removed or had rotted away. Occasionally a portion of its base remained in the posthole. This portion is called the 'pillar root'. The postholes found in this area were no different from those found in other parts of the palace grounds. Postholes could be detected by slight difference in colour and compactness of the soil which had eventually filled them. When such postholes lay at regular intervals in straight lines, the obvious assumption is that they formed part of a building or wall.

Postholes were not the only

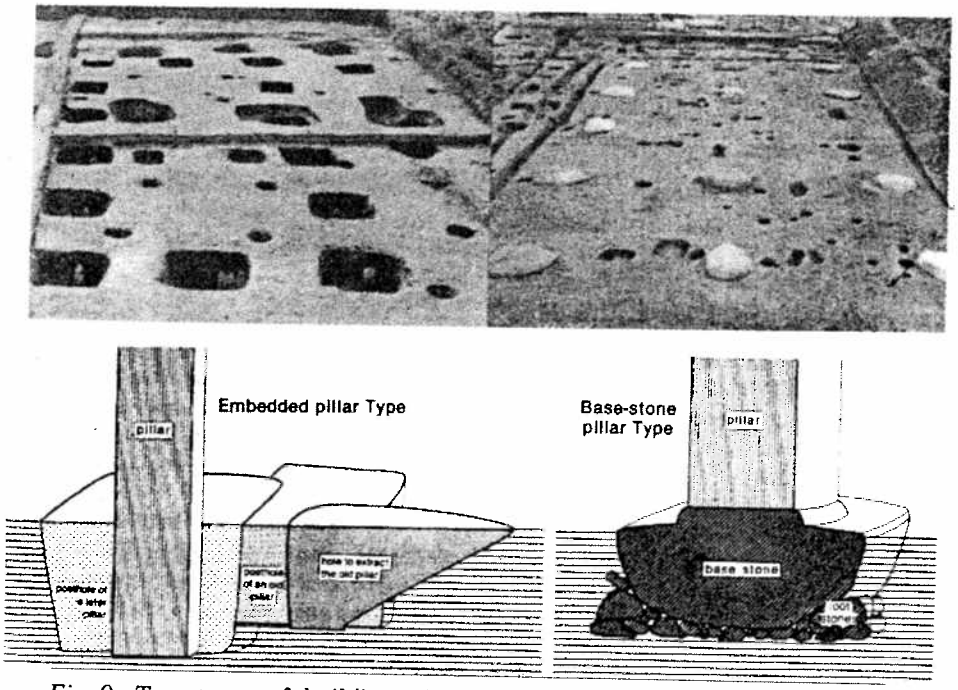


Fig. 9. Two types of building. In the Nara period, there were buildings constructed with pillars embedded in the ground (left) and those whose pillars rested on base stones (right).

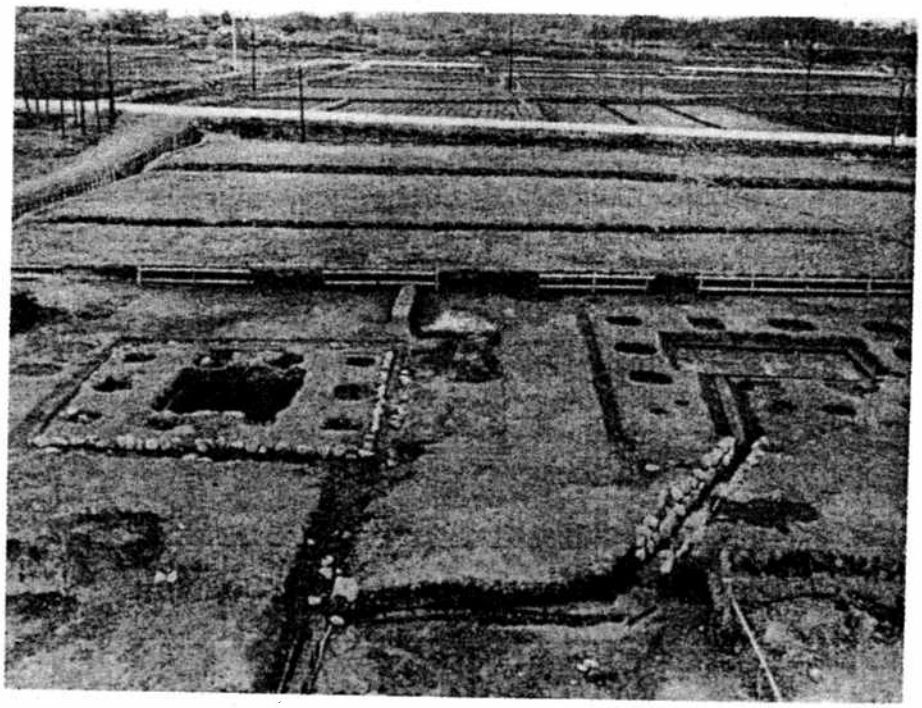


Fig. 10. Two well locations at the Sake-making Bureau. At a location hypothesized to sit astride East 1st Column Avenue, the remains of sizable wells and buildings were discovered, revealing that this was no avenue but instead lay inside the Nara grounds.

finds. In late January a ditch was found slightly to the south of the centre of the excavation site. The bottom and sides of the ditch were lined with spherical stones each about the size of a human head. Another ditch demarcated a raised platform some 7.5 metres square, the first such feature found on the palace site. Then at the end of January a well was found in the centre of this platform (fig. 10 *left*). It was enclosed on the surface by a board frame some 2.8 metres square (inner dimensions). A double layer of boards remained, each about 30 centimetres high. The well shaft extended only 1 metre below the surface, and its floor was covered with gravel. East of this well stood yet another well with a frame 5.4 x 3.0 metres (fig. 10 *right*).

Around each well were ten postholes, whose distribution suggests that both wells were roofed and that the east well may have been enclosed within a small hut. Only the lowest course of panels of the frame remained around the east well. A hole pierced the frame in its southwestern corner, from which a wooden conduit led away from the well. The conduit was a 5-metre-long timber with a 30-centimetre-square cross-section. A trough, some 15 centimetres deep and in the shape of an inverted trapezoid, had been dug out of its upper surface and was completely covered with a wooden lid. As a result, only about 10 centimetres of water would stand in this well: any excess would flow down the conduit. This is a feature not normally found in wells. The conduit led to a drainage ditch; this in turn flowed into another ditch extending southward from the ditch surrounding the west well and its platform. From that juncture, the water continued to flow southward. The reconstructed situation is shown in figure 11.

This area lies in one of the shallow valleys which lead between the numerous low ridges extending like fingers southward from the hills to the north of the palace site. The valley floor is 3 to 4 metres below these ridges to its east and west, and falls away further as it continues to the south. As can be gathered from the presence of the artificial Minagami Pond at its northern end, this valley would have been a logical place to build wells. Even today, if one digs down a little into the soil near by these two wells, there will be a continuous seepage of subsurface water into the hole. In areas with such a constant supply of subsurface moisture, conditions are ideal for the preservation of artifacts. In less ideal regions, shallow subsurface preservation can be affected by surface temperature and humidity. Even at greater depths, cyclic changes in the moisture content can not only result in the loss of organic remains through decay but also affect even such objects as pottery and roof tiles. Perhaps because of the need to manufacture them in vast quantities, the Nara Palace roof tiles were fired at low temperature, with the result that many were literally half-baked. So weak were they in some cases that they seem to have returned almost to their original clay curing centuries of burial. This is often true of the pottery as well. Such damage to ceramic and organic artifacts is

minimized in soil where the moisture content is constant, as it is near these two wells.

Among the numerous well-preserved artifacts exhumed from the area south of the wells were over three hundred wooden tablets (*mokkan*) inscribed in China ink. They bear inscriptions such as the following (fig. 12 *left*):

- *front surface*: Order from *Sake*-making Bureau; To Production Chiefs: Wakayue Sukunakama, Inukai Nakoto, Hiki Kusuri
- *back surface*: Come to work on the days specified on the Directive.

The *Sake*-making Bureau was charged with the manufacture of *sake* (the Japanese traditional brewed rice wine) and vinegar. Another tablet (fig. 12 *right*) reads:

- *front*: Request from clerks of Auditing Bureau for 1 or 2 [a few] *go* [180 ml.] of *sake*.
- *back*: Supplied as requested and recorded.

The notation on the back was written in a different hand from that on the front.

Numerous other tablets make direct or indirect reference to *sake*. There are tablets which were affixed to bales of rice for *sake* making; assignment charts for the workers who hauled the water; a tablet recording the number of large storage jars. Apart from tablets, excavation also turned up pots bearing written references to *sake*-making and the corresponding bureau. It is thus not surprising that the two large wells should have been situated here, since water, along with rice, is an indispensable ingredient in *sake*. A reasonable supposition is that the *Sake*-making Bureau itself, or one of its breweries, stood on the site. The large pots whose sherds and abundant nearby were presumably used as containers for water or *sake*.

West of the wells, in the area which had been assumed to be the site of the Great Wall's eastern section and that section's northern gate, no evidence of such structures could be found through excavation. According to old diagrams, at Heian Palace the *Sake*-making Bureau and the *Sake* Brewery (Sakadono) were located *within* the palace walls. Is it not likely that the same was true of Nara Palace? If so, where were East 1st Column Avenue and the palace's eastern border?

Another, slightly different interpretation is possible. Perhaps the palace grounds were originally square, with the wall and gate positioned as anticipated by researchers. Later in the century, the palace was expanded eastward and the *sake*-making facilities were built, at which time the wall was completely razed. When might this expansion have occurred? The bulk of the pottery in the area seems to originate in the early Nara period; at least on the grounds of morphology and technique of manufacture, it appears to predate a ceramic style which has been dated confidently to the 760s. In addition, several of the excavated wooden tablets have Japanese era dates written on them. In Western terms, the earliest date is 724 and the latest is 770.[5] If there was indeed an eastward expansion of the palace, the logical conclusion involving the construction of wells and other facilities is that it occurred quite soon after the

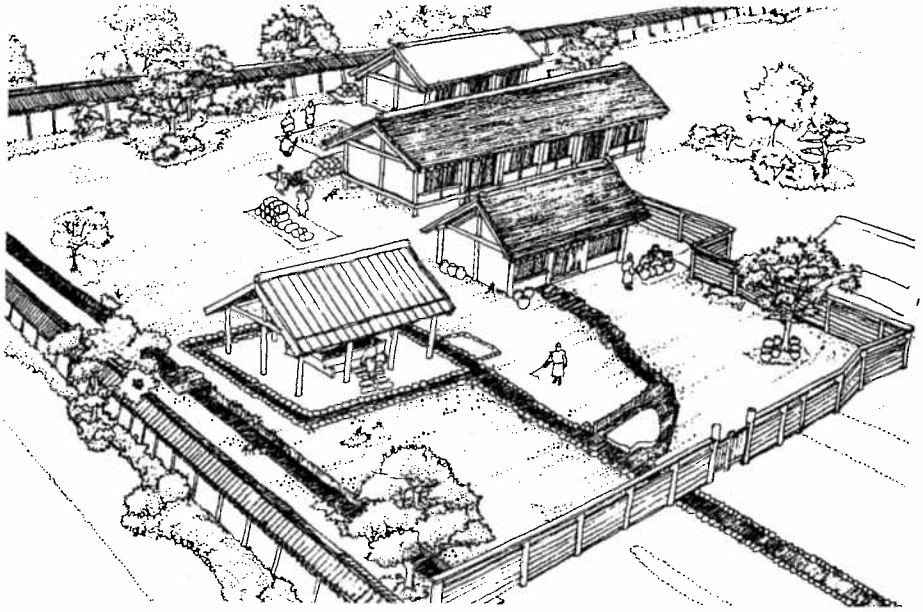


Fig. 11. Reconstruction of the area around the Sake-making Bureau wells. In manufacturing rice wine and rice vinegar, the Sake-making Bureau utilized immense quantities of water. The two large wells were to supply water for these purposes.

Fig. 12. Wooden tables unearthed from the Sake-making Bureau remains. The discovery of wooden tables (mokkan) recording the Bureau employees' work attendance (left) and of a sake requisition table from a different bureau (right) confirmed that this had been the site of the Sake-making Bureau.

original construction of the palace in 710, and the facilities would thus have been in use throughout almost the entire period of occupation of the palace.

Photographs were taken, scale drawings made, and finally the excavated earth was returned to its source. On 15 May 1965, after five and a half months, Excavation No. 22 North came to an end.

Simultaneously with this excavation, work was proceeding some 250 metres south on Excavation No. 22 South. The investigation was to cover an area of 43 ares. It was expected that an excavation of that size at that location would lay bare the remains of the Great Wall's middle east gate, a stretch of the wall to the north and south of the gate, a portion of East 1st Column Avenue running north to south just outside the wall, and the T-junction where 1st Row South Avenue flowed into East 1st Column Avenue from the east (fig. 2 gives street locations). Excavation, however, revealed no sign of the middle east gate or the wall. Instead, there was only a row of postholes for embedded pillars and several ditches. These postholes suggest the presence of nothing more than a simple board fence or palisade. If East 1st Column Avenue had been where it was thought to be, the ditches and fence would have blockaded it completely. Moreover, several pillared buildings also lay across the expected road site. Had the middle east gate stood where predicted, access from the outside would have been hindered by a well with a 2-metre-square frame and by a network of pebble-lined ditches (fig. 13).

As with Excavation No. 22 North, there was no sign of the expected gate nor any direct evidence of the expected avenue. On the other hand, if one was of a mind to, it was not impossible to propose that among the network of ditches there were two which had once bordered East 1st Column Avenue. The distance of 23 metres between them also seemed a reasonable width for such an avenue. Nevertheless, even if the road had indeed once lain here, from the existence of overlapping remains of buildings, wells, and the like in the vicinity of the road's surface, we may assume that the palace was rebuilt at least three times. Therefore, even if this area formerly functioned as a thoroughfare, we may be certain that the road was soon transformed into a living space containing buildings and wells, which continued to be used for a relatively long period of time.

The length of time during which the site as a whole was in use can be gathered from dates on some of the more than five hundred wooden tablets recovered. The earliest is dated 709, and others span the years from the Tempyo era (729-49) through the Jingo Keiun era (767-70). Names of various palace buildings are found on the tablets: the Sewing Bureau, the Palace Hall, and Confessionals. In terms of the people and objects mentioned, this assemblage of tablets does not differ significantly from others found *inside* the palace ground.

Other objects unearthed in the No. 22 South area also closely resemble those found within the palace. The researchers' attention

was drawn in particular to the sherds of beautiful green-glazed bricks (cf. pl. 9), concentrated especially in the southeast corner of the site. In the eighth century, glazing occurred on pottery, on roof tiles, and on these bricks, which were used primarily for decorating interior walls and floors. The basic glaze consisted mainly of lead and feldspar and came out white or transparent; adding coper produced a green glaze, while adding iron yielded a yellow or brown colour. Two or three of these glazes could be used on one object. Glazed items formed a minuscule proportion of the total ceramic output: in Nara Palace, less than one piece in ten thousand was found to be glazed. It can therefore be assumed that glazed pieces were highly valued. Oddly, these green-glazed bricks had not previously been found in Nara Palace. The general opinion was that their presence here indicated that a particularly splendid building, probably the most impressive in the palace grounds, had stood on or near the spot.

At Nabunken it is the practice that a summary of the results of each year's investigations is published in the following year's *Annual Bulletin of the Nara National Cultural Properties Research Institute*; a full report is issued a few years later. The investigations on the eastern edge of the palace, conducted during 1964 and early 1965, were reported in the 1965 *Bulletin*. The following paragraph concludes the article, "A Brief Report on the Excavations and Explorations in the Nara Palace for the Year 1964":

This year's investigations concentrated on determining the boundaries of the balance grounds. The southern and western borders were found to have remained relatively stable. On the eastern edge, however, it seems that the boundary was moved on occasion and that several buildings related to the palace were actually constructed outside the palace grounds. It remains for the future to interpret this unexpected situation. At the same time, it is necessary to consider the preservation of these feature the palace.

Today, some twenty-five years later, one may wonder why we, the investigators, did not simply point out that the data from the excavation conflicted with previous suppositions concerning the location of East 1st Column Avenue and the eastern palace boundary, and conclude that the palace grounds extended further east than expected. Perhaps we were still under the powerful spell of the eight-*cho*-square theory to the extent that it never occurred to us that the palace grounds could have assumed another shape. The gathering of archaeological data through excavation may seem to be a highly objective process; but in the interpretation of such data, it is often difficult to break free of the spell of accepted theories. Even more so in the present case, when not only scholarly issues but also the 'practical' matter of the construction of the Nara Bypass were at stake. The results of the year's excavations were not persuasive enough to help form a new hypothesis that could both refute the conventional theory and make the bypass construction plan unfeasible. The closing para-

graph of the report would perhaps serve as a warning light to the bypass construction, but further investigations would be necessary before a serious challenge could be offered to a construction plan based on the eight-*cho*-square theory.

The Fall of Eight-chô-square Theory

Two more years and three further excavations, covering a total of 140 ares, were required to break the spell of the *eight-chô-square* theory. Excavation No. 32 lasted from December 1965 to December 1966, No. 29 from July 1966 to May 1967, and No. 39 from December 1966 to May 1967. These excavations revealed that only the southernmost quarter of the eastern palace perimeter lay where expected, with East 1st Column Avenue running just outside the Great Wall. However, at the point where East 1st Column Avenue should have formed a T-junction with 2nd Row Middle Avenue, it unexpectedly came to an end, forming instead an L-shaped junction. At the meeting point of these two roads, it had been predicted that the southernmost gate of the east wall would open to the east; instead, a gate was found blocking East 1st Column Avenue, opening to the south (fig. 14 *bottom*). To the inside of the gate stood Nara Palace.

The discovery of this gate with its southward orientation provided the *coup de grâce* to the eight-*chô*-square theory. From this southern east gate,[6] there were ditches which ran south from the palace grounds. These ditches ran along the east and west borders of East 1st Column Avenue. They had been modified on several occasions. Both ditches held numerous artifacts, including wooden tablets. Judging from these objects, it appears that this gate was built at the time of the original construction of the palace. In other words, from the very beginning the upper three-fourths of the eastern boundary was situated further east than allowed for by the eight-*cho*-square theory.

It was now clear that the proposed Nara Bypass would cut through the Nara Palace grounds, and there was widespread demand for a change in the bypass plans. Parliamentary discussions ensued, but they did not result in a change of plans:

9th November 1967, House of Councillors, Committee on Education:

MEMBER SUZUKI RIKI: . . . from the standpoint of the preservation of Nara Capital, we feel that the bypass plan must be changed. . . . I'd like to inquire about the state of the government's deliberations on the matter.

FUKUHARA MASAHIKO, CHIEF SECRETARY, COMMITTEE FOR THE PROTECTION OF CULTURAL PROPERTIES (CPCP): If the palace site extends to the east, then we must respect the integrity of the site. As it stands, the bypass would run right through the site. The CPCP did agree to the Ministry of Construction's plan; however, the situation has changed since then . . . , and we have only recently arrived at the conclusion that this must be prevented at all costs. . . . I would like to meet personally with the

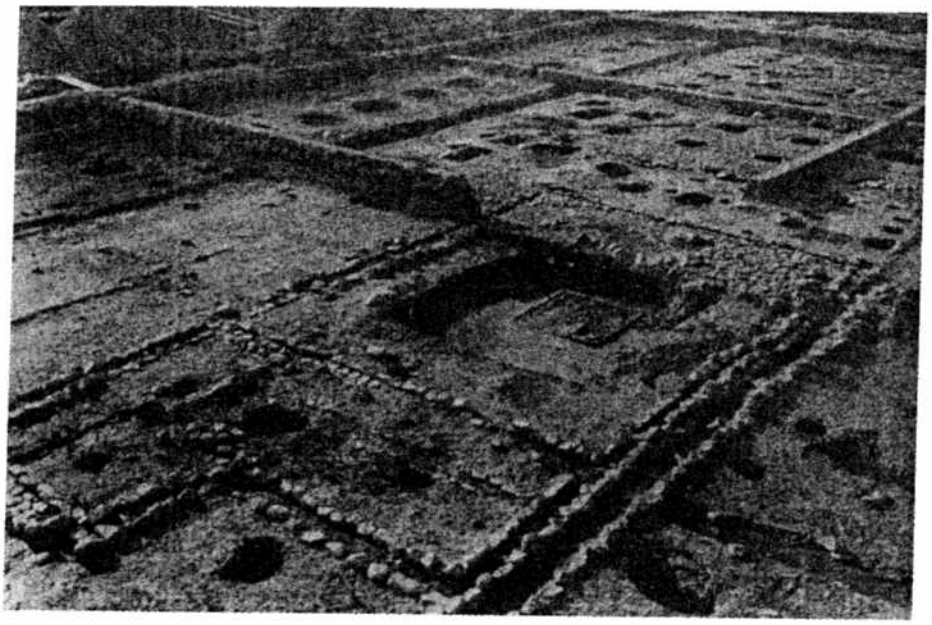


Fig. 13. The well and pillar holes excavated at the hypothesized location of East 1st Column Avenue. The abundance of features recovered from this location -- supposedly outside the palace compound--confirmed that Nara Palace extended further east than the accepted theory allowed.

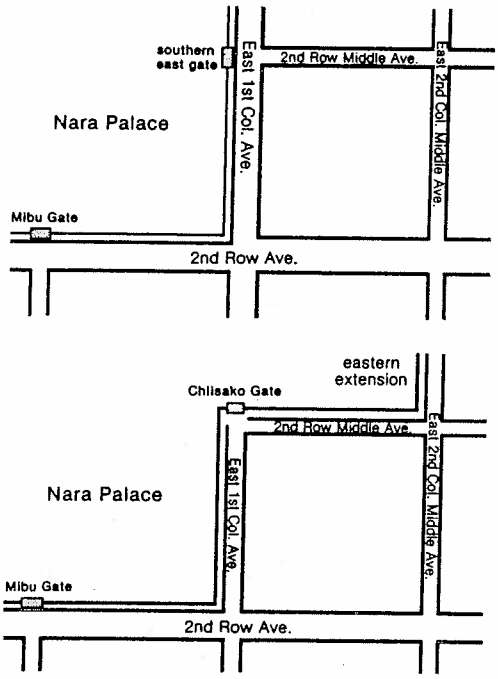


Fig. 14. The vicinity of the southeastern corner of Nara Palace. Before excavation (top), East 1st Column Avenue was supposed to have run directly north along the eastern edge of the palace; as a result of excavation (bottom), the Avenue was seen to run north only 270 m before terminating at a palace gate.

Minister of Construction and explain the situation thoroughly. . . . The CPCP definitely wants to have the plans changed.

21st December 1967, House of Representatives, Committee on Education, Sub-committee concerned with protection of cultural properties:

REPRESENTATIVE MITSUBAYASHI YATARÔ: I would like to ask about the state of your negotiations with the Ministry of Construction . . . concerning the re-routing of the Route 24 bypass in order to preserve the Nara Palace site.

INADA SEISUKE, CHAIRMAN, CPCP: . . Concerning the location of Route 24 . . . , we had visits from the Nara prefectural governor, the mayor of Nara City, and many other local people, and we were strongly urged to proceed with the plan as originally approved - the reconstruction of East 1st Column Avenue - because any change in the planned route would mean that the bypass couldn't be completed in time for the opening of Expo '70 [in Osaka] . . . . As for us . . . , any damage to the Nara Palace site would cause "five hundred, a thousand years of regrets," so we have requested that a change of route definitely be considered.

At the time of this debate, excavations had made it clear that Nara Palace had extended much farther east than formerly believed, but it was not yet known how much farther, or exactly where the eastern boundary lay. Even if the Nara Bypass were to be moved, *how far* would it need to be moved? Further excavations would be required in order to locate the eastern edge. But where to dig?

East of the palace lay Hokkeji temple. In 738 Kômyô, wife of Emperor Shômu, founded Hokkeji by converting her father Fujiwara Fuhito's mansion. To build a Buddhist temple inside the palace grounds would have been unthinkable. Therefore, Fuhito's mansion must surely have stood outside the palace grounds. The road just west of Hokkeji, running north to south, should have been East 2nd Column Middle Avenue. Previous investigations had named 2nd Row Middle Avenue as the southern limit of the eastward palace extension. Proceeding from these facts, it seemed highly probable that excavation at the intersection of these two roads would reveal the southeast corner of the eastward extension.

Thus the location and purpose of Excavation No. 44 were determined. Lasting from late November 1967 until May 1968, it confirmed the expectation that the Great Wall of the palace, running from the west, would turn north at that point. The eastern border of the palace was indeed East 2nd Column Middle Avenue. Nara Palace extended nearly 270 metres further east than originally thought. In 'eight-*chô*-square' terms, the extension measured 6 *chô* north to south and 2 *cho* east to west, and the palace grounds as a whole were 10 *chô* east to west.

At the same time, the section of the grounds just inside the southeastern corner was excavated. Among the features revealed were an irregular-shaped pond demarcated by fist-sized natural rocks, with a small island and decorative garden rock formations; a curving ditch paved

with rocks 20 to 30 centimetres in size; a pillared building which extended partly over the pond; and, just inside the corner of the wall, a singular octagonal structure facing the pond (figs. 15, 16). The pillars of this octagonal building were set much more firmly than usual, suggesting that it was more than one storey high.

This pond-and-garden area yielded many green-glazed bricks identical to those found during Excavation No. 22 South, Excavation No. 39 which revealed the Great Wall's southern east gate, and Excavation No. 43 which was later carried out in the region between No. 22 South and No. 39. Some green-glazed and three-coloured roof tiles were also recovered. As elsewhere, most roof tiles at Nara Palace were unglazed - in fact, these are the only glazed ones to be found there. A passage for the year 767 in the *Shoku Nihongi* chronicle of the period comes to mind: 'The Jewelled Hall of the East Precinct was completed. This building was roofed with lapis-lazuli roof tiles, so people called it the Jewelled Palace.' Presumably we can equate the 'lapis-lazuli roof tiles' with the green-glazed and three-coloured roof tiles mentioned above. The monarch at this time, Empress Shôtoku (reigned 764-70), sometimes held ceremonies and banquets in the East Precinct. It would hardly be surprising that it did indeed have such a garden. Thus we are presumably safe in concluding that Nara Palace's eastward extension - at least its southern portion - contained the East Precinct. A banquet was held in the East Precinct in the first month of the sixth year of Tempyô Shôhô era (754).[7] *The Man'yoshu (Collection of Ten Thousand Leaves)*, a poetry anthology compiled in the eighth century, contains a poem read on that occasion and refers to the banquet's location as the East Palace. The East Palace was the residence of the crown prince. The East Palace of Nara Palace can be traced back to 714 in written records, and was presumably occupied by successive crown princes. Later it was also called the Mountain Plum Palace.

Thus the facilities in the south-eastern corner of the eastern extension seem to have changed name from East Palace to East Precinct to Mountain Plum Palace as well as undergoing some physical alterations. In any case, their importance continued throughout the eighth century. The garden pond, which was only partially exposed during Excavation No. 44, was completely uncovered during subsequent investigations. This pond was found to have undergone extensive alteration during the mid-eighth century and to have continued to exist until at least the early ninth century. Judging by a name inscribed on a wooden tablet found nearby, this garden may also have been called the East Garden.

The determination of the eastern boundary and of the presence of important buildings in the area led inevitably to the necessity for reformulating the bypass plans. A nation-wide preservation movement sprang up in 1966, led by the Council to Oppose Routing the Nara Bypass through the Nara Palace Site. This movement combined with parliamentary pressure to

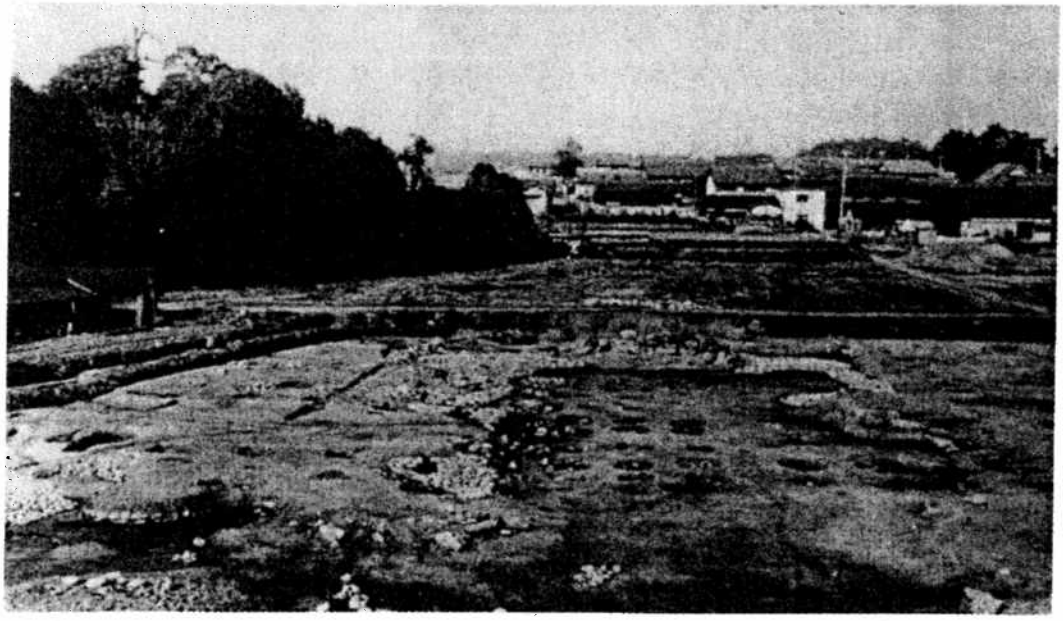


Fig. 15. The excavation at the East Precinct of Nara Palace. The East Precinct and its garden stood in the southern half of the eastern projection of Nara Palace.

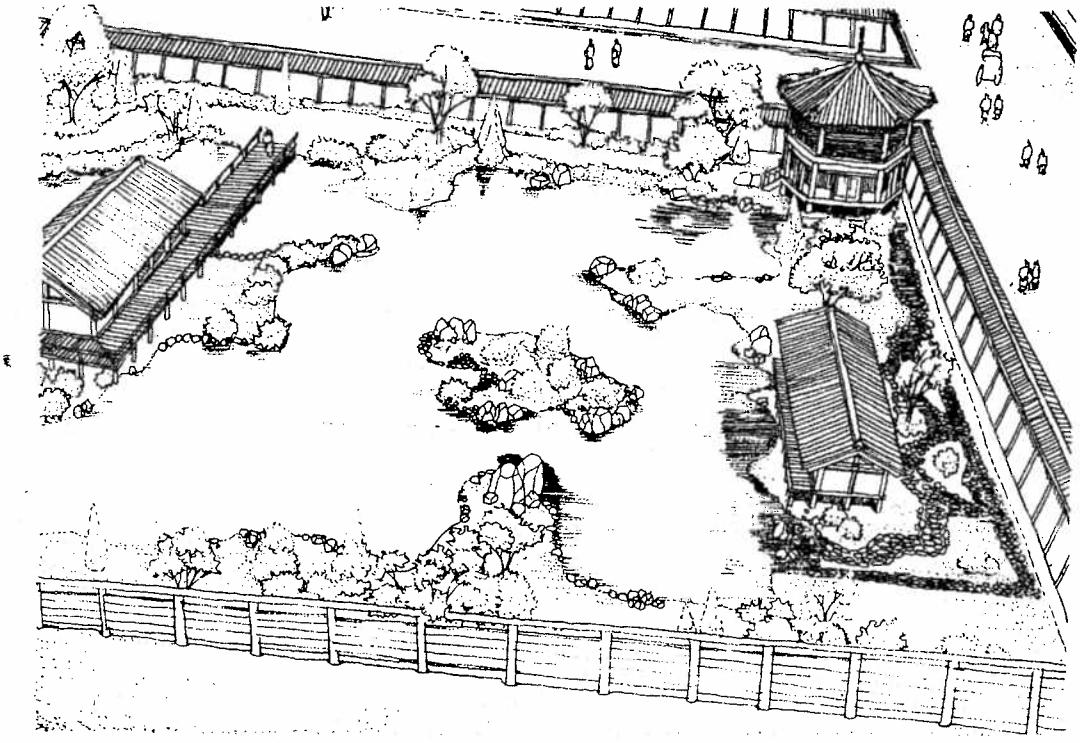


Fig. 16. Reconstruction of the East Precinct garden at Nara Palace.

accelerate the pace of deliberations between the CPCP and the Ministry of Construction.

9th March 1968, House of Representatives, Committee on Budget:

REPRESENTATIVE HASEGAWA SHOZO: I think we must rapidly change the Route 24 bypass plans and guarantee the preservation of the Nara Palace site . . . .

HORI SHIGERU, CONSTRUCTION MINISTER: . . . We don't intend to force anything through . . . . A historic site isn't something that can be replaced, so I have given an order that there must be sufficient consultation with the CPCP, and that there will be no construction without everyone's consent.

4th April 1968, House of Councillors, Committee on Construction:

MEMBER ÔMORI HISASHI: . . . Because of plans to build a bypass, the Nara Palace site was excavated with funding from the Ministry of Construction and from local sources. The investigations unexpectedly turned up the East Precinct. This suggests that both the Ministry of Education and the scholars involved have until now been very sloppy in their investigations. The palace, a site of great importance, had of course been investigated extensively even before the construction question arose. It had been researched for two years. Then, when the bypass issue was taken up . . . , for the first time we learn that they have found the East Precinct. Such unreliable investigation and research causes great trouble to us local residents. . . . I'd like to ask whether you will be able, sincerely and responsibly, to revise the route and complete construction in time for Expo '70 in Osaka.

CONSTRUCTION MINISTER HORI: . . . The significance of the Route 24 bypass, with the opening of Expo '70 as a target, is very great . . . . The government is determined to finish in time somehow, removing all hindrance, so we must earnestly request the fullest local co-operation.

24th April 1968, House of Representatives, Committee of Education:

REPRESENTATIVE HASEGAWA SHÔZÔ: . .

Concerning the preservation of Nara Palace . . . , I'd like to ask for a report on the course of events.

FUKUHARA MASAHIKO, CHIEF SECRETARY, CPCP: . . . It has been decided that the bypass will not pass through the Nara Palace site. At present, the Construction Bureau is considering alternative routes. (Applause.) I would like to express my sincerest gratitude.

The new route, decided in September 1968, approached the northeast corner of the palace from the north and ran parallel to the National Railway's Kansai Line. As it entered the territory of the ancient capital, it headed south along the former East 3rd Column Avenue, bending sharply to the west as it crossed the former 2nd Row Middle Avenue. Near the southeastern corner of the palace grounds it once again bent south and continued, as originally planned, down East 1st Column Avenue (see fig. 8). The bypass, avoiding the Nara Palace site, was opened in the autumn of 1971 - one year after the end of Expo '70.

Since the seventeenth century, or perhaps even earlier, Nara Palace had been believed to measure eight

cho square. Modern research since the late nineteenth century continued to support this theory. Then in a span of four years, through excavation of a mere 3 hectares, the bottom dropped out of this theory. In reality, what had been accepted as historical fact was no more than a hypothesis based on written sources, contemporary topography, and comparison with other ancient capitals. The hypothesis could only be evaluated through excavation. Confronted with the harsh reality of the threat to the Nara Palace site and the changes in the bypass plans, we researchers were forced once again to mull over this elementary fact: archaeology, indeed, all sciences, had to live with hypotheses.

Notes

1) With the establishment of a centralized state, pre-existing territorial divisions were regularized into an administrative system divided into *Kuni*('province') and again into *Kori* or *gun* ('counties'). The number of these units changed from time to time. For example, there were fifty-eight *kuni* in the early eighth century, sixty-six in the early ninth century; and the 550 *kori* of the eighth century had grown to 631 by the eighteenth century. At the time of the Meiji Restoration in 1868 the *kuni-kori* system was replaced by the modern prefectural system. Modern Nara Prefecture corresponds to the earlier Yamato Province, which contained Nara Capital as well as 15 counties. Osaka Prefecture has incorporated three of these provinces: Kawachi, Izumi, and half of Settsu; this territory comprised 25 counties during the eighth century.
2) Further details of the layout of the capital, including the principles behind the naming of blocks and streets, will be found in the opening pages of Chapter 4.
3) In 1959 Japan officially adopted the metric system and abandoned the earlier system of measurement. This earlier system, which is still used in certain special circumstances, had its origins in Chinese practices imported during the sixth century and was officially adopted in Japan in the seventh century. Undergoing slight modifications, it survived unchallenged until the metric system was made a legal alternative in 1891. The unit of length called the *shaku*, although approximating the Western 'foot', varied somewhat in different eras. Archaeological evidence shows that the *shaku* hovered around 29.7 cm during the eighth century. Over the centuries, however, it gradually lengthened until it was fixed as 30.3 cm in the nineteenth century. A *shaku* contains 10 *sun* or 100 *bu*; there are 10 *shaku* in a *jo* but 6 *shaku* in a *ken*. 1 *cho*=60 *ken* = 360 *shaku* = ca. 109 metres. the length of a city block in Heian Capital was also called one *cho*; but in that case the distance in question was approximately 130 metres. The same term could indicate surface area as well as length, as we shall see in Chapter 4.
4) The *Shoku Nihongi (Continued Chronicle of Japan)*, completed in the year 797, covers events of importance to the court from the year 697 to 791. Unlike the two earlier 'chronicles', the *Kojiki (Record of Ancient Matters)* and *Nihongi* or *Nihonshoki (Chronicle of Japan)*, it is considered highly reliable in terms of historical accuracy.
5) Era dates have been in use since the mid-seventh century. (Previously, years were counted according to a 60-year cycle.) The government would declare a new era on the occasion of an imperial ascension, or at other times when the need was felt for spiritual renewal or for special cele-

bration. In the eighth century alone, fifteen different eras were proclaimed, each resulting in a re-starting of the counting of years. The two dates given above correspond to the first year of Shinki and the first year of Hoki; Since 1868 eras have been re-named only on the occasion of an imperial succession; for example, the year 1989 corresponds to the 64th year of Showa (until 7 January) and the first year of Heisei (from 8 January).

6) In designating locations of gates, we shall adopt the convention that the second direction mentioned indicates the wall and the first (which will always have the suffix *-ern*) indicates the position of the gate in that wall. Therefore the 'southern east gate' is the southernmost gate of the eastern wall.

7) It must be remembered that the traditional East Asian 12-lunar-month calendar lags variably behind the Gregorian by an average of about a month; thus, the first day of the first month falls somewhere between about 15 January and 15 February.

Issues in Japanese Archaeology

Kiyotari Tsuboi

I. Liberation from the Militarist View of History

With defeat at the end of the Second World War in the summer of 1945 Japan was liberated from the dogma of mythological history which had been enforced by frenzied nationalism since the end of the 1930's. In a complete turnabout, there was a desire to rewrite history using the research methods of other sciences such as archaeology. Symbolic of this was the excavation of the Toro site in Shizuoka city, discovered on the site of an aircraft parts factory at the end of the war, carried out by a group of archaeologists from around Tokyo. Pictures of this second century A.D. late Yayoi period settlement and the paddy fields constructed by its inhabitants were broadcast widely all around Japan by the media resulting in a greatly increased awareness about archaeology. Organizing this excavation, however, confirmed that there was only a very small number of archaeology specialists in the country. At that time two specialist journals published articles about archaeology: the *Kôkogaku Zasshi* (*Journal of the Archaeological Society of Nippon*), published by the office of the Tokyo National Museum, and the *Jinruigaku Zasshi* (*Journal of the Anthropological Society of Nippon*), published by the Anthropology Society of the Faculty of Science at Tokyo University, the members of which were not necessarily professionals.

The Japanese Archaeologists Association was founded at this time, which comprised only of specialists who had published research articles in the past, and whose members were given voting rights on the Japan Science Council. The association had 81 members at the time of its inauguration in 1948. In 1991 the membership had increased to 2,601, and at present the association holds an Annual General Meeting in the spring and a conference in the autumn, as well as publishing the *Nihon Kôkogaku Nempô* (*Archaeologia Japonica*), a yearbook of Japanese archaeology.

II. The Present State of Development Related Site Destruction

In 1950, along with the Law for the Protection of Cultural Properties, a system of applying for permission to excavate sites from the Committee for the Protection of Cultural Properties was established. The government authorities concerned could not evaluate the competence of the applicants and, using the membership list of the Japanese Archaeologists Association, they instructed people who were not members to accept guid-

ance from those who were, a policy which gave rise to trouble over the need for advice from members throughout the country.

The Chairman of the Archaeologists Association, Fujita Ryôsaku, was requested by the Sites and Monuments Division of the Cultural Properties Protection Committee (now the Agency for Cultural Affairs) to quickly prepare, for the first time, a list of what kinds of sites existed and a complete inventory of sites throughout the whole country. Receiving this directive, and with some assistance from the government, he undertook the investigation of the distribution of sites in all of the prefectures in Japan. Between 1960 and 1962 record cards were prepared for some 35,000 sites, from which distribution maps were compiled by plotting the locations of the sites on 1:50,000 scale maps of the Geographical Survey Institute. By 1967 the Cultural Properties Protection Committee had published the *Zenkoku iseki daichô* (*National Sites Inventory*) for all the prefectures. By 1989, following a fresh survey, new editions had been published by the Agency for Cultural Affairs, in which a total of 290,000 sites were registered. Since then, however, the discovery of sites has continued and at present they are thought to number some 400,000.

In the years from the end of the war through to the 1960's, economic development began to get up steam accompanied by widespread construction, resulting in the phenomenal destruction of archaeological sites throughout Japan. Realizing the situation, archaeologists across the country protested, leading to a flourishing movement for the preservation of sites. An opportunity for action at the national level came in 1955, with the threatened destruction, for the construction of building land, of the Itasuke moated keyhole-shaped mounded tomb, part of the Mozu tomb group in Sakai city, Osaka prefecture. Then, in 1962, one third of the land on the west side of the Heijô place site in Nara city (the palace of the eighth century capital, which included the palace of the emperor and offices of each of the administrative sections of the central government within one square kilometer) was going to be developed as train sheds by a railway company. Written petitions from all over the country demanding the preservation of the site gained support in the Diet, and the matter was taken up by the National Assembly. The result was that the government bought up the whole area (which was at that time under paddy) using national funds. In addition, at about the same time the destruction of the Kasori shell midden site in Chiba prefecture (the largest Jômon shell midden site in the country) was threatened in order to build an industrial park. The preservation of this site was achieved when Chiba city bought the land with financial assistance from the national government.

The preservation of these two large sites in eastern and western Japan was symbolic of the preservation movement and stimulated the setting up of a national system for site preservation and research to face the new circumstances. From 1965 the Cultural Properties Pro-

Table 1. Number of Archaeological Specialists Employed, 1991

(as of May 1, 1991)

Type / Prefecture	People Working for Urban & Rural Prefectures								People Working for the Municipalities								Total
	Urban & Rural Prefectures		Affiliated Organizations		Independent Excavation Units		Future Projections	Total	Municipalities which Employ Archaeologists	Municipalities		Affiliated Staff		Independent Excavation Units		Future Projections	Total	
	Salaried Employees	Contract Employees	Salaried Employees	Contract Employees	Salaried Employees	Contract Employees				Salaried Employees	Contract Employees	Salaried Employees	Contract Employees	Salaried Employees	Contract Employees			
Hokkaido	8		6		23	6		43	56	46		40	5				91	134
Aomori	4		19					23	9	14		6					20	43
Iwate	4		3		36	12		55	24	33	8	12					53	108
Miyagi	28		11					39	17	56		11					67	106
Akita	1		17	5				23	7	14							14	37
Yamagata	9	4	1	6				20	9	10	1	1					12	32
Fukushima	4		7		46	3		60	20	27	1	8	3	44	3		86	146
Ibaraki	3	5	4		28			40	27	38	2	3	1	3			47	87
Tochigi	4		3		50			57	17	28	2	9					39	96
Gunma	10	2	5		70	2		89	41	92	4	4					100	189
Saitama	7		16		60			83	74	133	2	19					154	237
Chiba	11		8		78			97	62	61		22		106	2		191	288
Tokyo	15				55			70	40	60	18	15	1				94	164
Kanagawa	2		36					38	19	44	4	8	2	2			60	98
Niigata	32	2						34	24	29		4					33	67
Toyama	3		14		11			28	11	16		2					18	46
Ishikawa	2		30	2				34	24	42	3	2	1				48	82
Fukui	1		18					19	15	18	2	3					23	42
Yamanashi	2		27					29	23	26		1					27	56
Nagano	6				85	1		92	38	64	11	15	6	7			103	195
Gifu	3				9			12	15	24	4	3	1				32	44
Shizuoka	7				27	2		36	31	81	5	28	7				121	157
Aichi	3		7		26	4		40	29	25	6	32	3				66	106
Mie	2		49	2				53	16	35							35	88
Shiga	3		3	2	31			39	40	71	2	7	1	7			88	127
Kyoto	6		11		35			52	26	34	3	1	1	49			88	140
Osaka	43				54	2		99	39	83	6	33	7	61	6		196	295
Hyogo	4		44	1				49	47	97	7	14					118	167
Nara	3		27	3				33	18	30	1	17		14	1		63	96
Wakayama	3		2		12			17	7	9				2			11	28
Tottori	2		6		14			22	13	19	5	1	3				28	50
Shimane	36				3			39	33	45	5	2					52	91
Okayama	2		47					49	17	33		8					41	90
Hiroshima	6		10		35	7		58	13	23		4		10			37	95
Yamaguchi	3		15		6			24	8	15	7						22	46
Tokushima	6	16	3		37	5		67	4	5	1						6	73
Kagawa	3				28	7		38	7	9	4						13	51
Ehime	4				20	5		29	7	6		3	26				35	64
Kochi	4				13	2		19	1	1							1	20
Fukuoka	28	1	8					37	49	121	7	15	14	14			171	208
Saga	24	2	4					30	30	57	4						61	91
Nagasaki	10	2	2					14	8	8	2	4	1				15	29
Kumamoto	24	10						34	12	18	4	3	1				26	60
Oita	20	13	3	1				37	14	26	2	7	1				36	73
Miyazaki	12	2	2	1				17	24	27	2						29	46
Kagoshima	22	4	1					27	17	17		5					22	49
Okinawa	9		2					11	14	21	1						22	33
Total	448	63	471	23	892	58		1,955	1,086	1,791	136	372	85	319	12		2,715	4,670
	511		494		950			1,955	1,086	1,927		457		331			2,715	4,670

tection Committee exchanged protocols with bodies such as the Japan Highway Public Corporation, the Japan Housing Corporation and Japan National Railways in regard to the excavation of sites prior to their development. Incorporated into these protocols was the principle of the obligation of the instigating party to facilitate the investigation of the extent of the site preceding development. In cases where the destruction of sites could not be avoided the expenses incurred in excavating the site, processing the finds and preparing the report would be borne entirely by the developer. This represented the promise of the establishment of organised research, the principle of the administration of cultural properties. In 1965 there were only eight people with experience of archaeological research in local government offices across the country. The Sites and Monuments Division of the Cultural Properties Protection Committee encouraged the employment of specialists in excavation methods by prefectural governments, and in 1968 there were 35 archaeologists working in local government, and at present in 1991, a total of 4,670 (Table 1).

In 1950, as specified by the newly established Law for the Protection of Cultural Properties (clause 57), applications to excavate sites had to be made to the Sites and Monuments Division of the Cultural Properties Protection Committee. In 1964 excavations were divided into those conducted for research (clause 57.1) and rescue excavations accompanying development (clause 57.2). Accordingly in 1964, out of a total of 547 excavation permits, 169 were for research and 378 for rescue excavations. After that there was a huge increase in the number of rescue excavations. Fifteen years later, in 1979, as opposed to 225 permits for research excavations, 8,694 out of the total of 8,919 were for rescue excavations. In 1990, while there were 313 for research excavations, 25,827 of the total 26,140 excavation permits were rescue (Figure 1.). One result that accompanied the subsequent expansion of the system of prefectural and municipal structures for the investigation of buried cultural properties, was that a sufficiently watchful eye was now kept on the destruction of sites, which had until then been overlooked. It should be noted, however, that over 25,000 excavations were not in reality carried out in 1990, as this total included many cases in which expedient methods were used, such as watching briefs where officials observe work involving the replacement and new construction of electricity poles, buried gas pipes, waterways and road ditches through previously recorded sites. Approximately 15% of the total investigations resulted in actual excavation.

In the protocol about the liability of the developer, the first item was consultation with the Sites and Monuments Division of the Committee for the Protection of Cultural Properties concerning excavation and, in the case of the discovery of particularly important sites and features, the degree of preservation. Especially important sites were designated as National Historical Monuments and various measures have been implemented

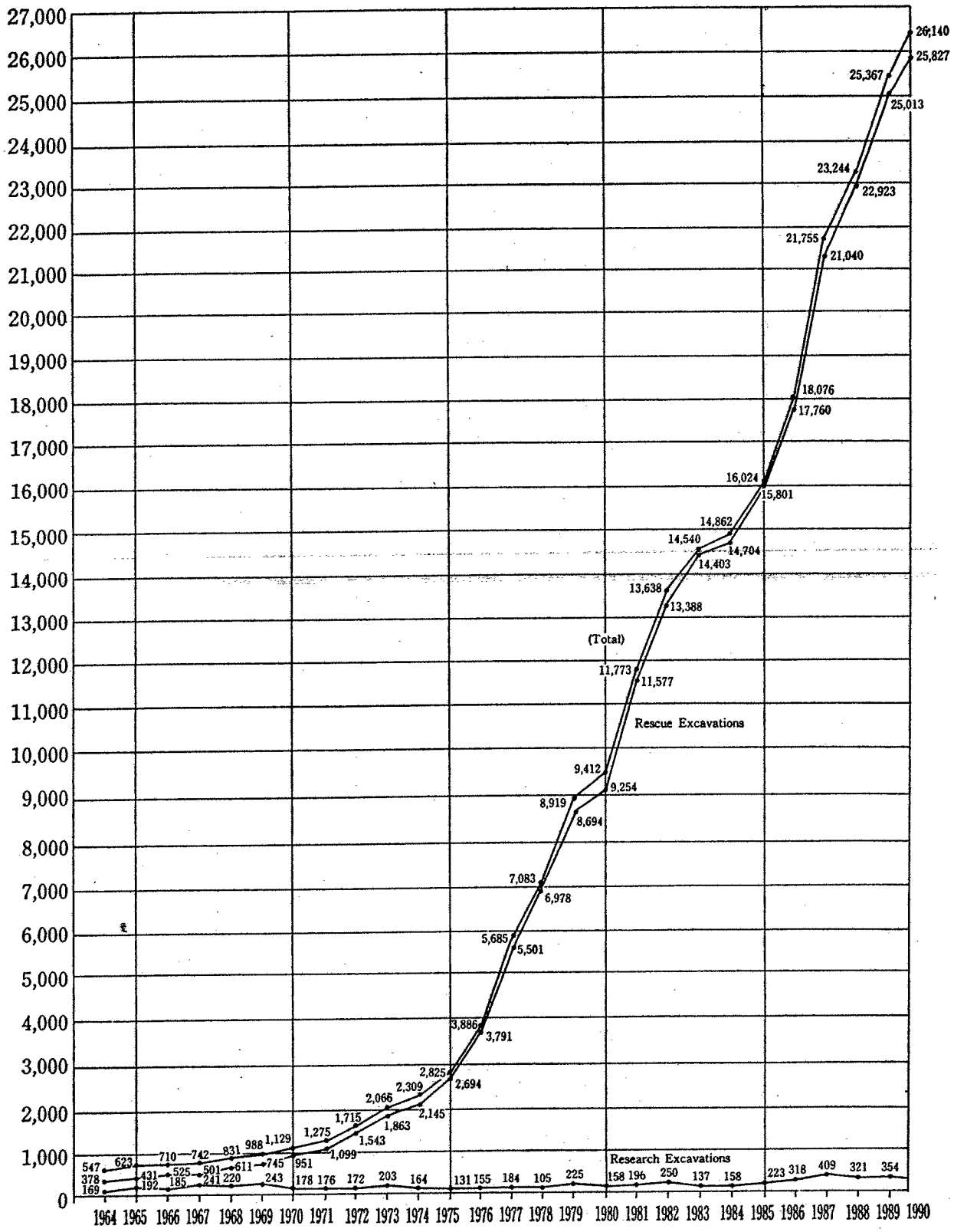


Fig. 1. Changes in Numbers of Archaeological Excavations.

for their conservation. These include sites that were preserved from road construction by tunnelling beneath the site as at the Arayashiki shell midden in Chiba prefecture and the Tsukahara group of mounded tombs in Kumamoto prefecture. At the site of Akyû in Nagano prefecture some excavation was avoided by altering the gradient of the road under construction. At the Ikegami site in Osaka prefecture the surface of the site was protected so as not to affect underground features. At the site of the Ano Temple in Saga prefecture total excavation was prevented by elevating the road on legs located in the parts of the site where there were no features. Sites of cemeteries, settlements and mounded tombs which have been preserved from agricultural and industrial development can be seen all over the country. In addition, there are examples where the features themselves have had to be moved away from construction, as at the Maruyama mounded tomb group in Saga prefecture and the site of the Hannokihara roof tile kiln in the city of Otsu. However, 99% of the sites and features excavated prior to development are destroyed, leaving only the records of their investigation. This "recorded preservation", where some kind of publication concerning the site is considered as an absolution for its destruction, is regarded as unacceptable by intellectuals.

In terms of expenditure on rescue excavation, while 60 million yen was spent in 1965, the amount increased to 25.5 billion yen in 1980 and 83.8 billion yen in 1990 (Table 2). The breakdown of 1990 expenses was: prefectural governments - 19.0 billion yen; municipalities - 12.0 billion yen; regional self-governing public corporations and public companies - 1.9 billion yen; government ministries and agencies - 9.5 billion yen; national public corporations and public companies - 23.3 billion yen; individual and private enterprises - 17.9 billion yen. Among these, public road and housing corporations took responsibility for 19.4 billion yen. Looking at this in terms of separate enterprises, road construction topped the list with 28.5 billion yen, followed by housing and land construction - 13.7 billion yen; work on rivers, dams, harbours and airports - 7.9 billion yen; town planning - 7.0 billion yen; gas, waterworks and electricity - 1.5 billion yen; factories and shops - 4.8 billion yen; agriculture related development - 4.1 billion yen; golf courses - 2.1 billion yen; quarrying - 0.4 billion yen; schools - 4.3 billion yen. The advance in site destruction resulting from the amazing rate of development can be read off from this data.

Against this increase in the destruction of sites is the protection of other sites, those designated as historical monuments by the Agency for Cultural Affairs and local government. Although the scheduling of National Historical Sites did happen before the Second World War, there being a total of 579 in 1945, by 1991 they had increased in number to 1263 (Table 3). 25% of these are accounted for by mounded tombs of which 338 have been scheduled from the tens of thousands across the country whose

Table 2. Expenditure on Rescue Excavation, 1990 (According to Type of Development)

(unit: Thousand yen)

Type / Prefecture	Roads	Railways	Rivers, Dams, Ports and Airports	Schools	Housing	Town Planning	Other Construction	Gas, Electricity, Drainage, etc.	Shops and Factories	Agriculture	Golf Courses	Quarrying	Other	Total
Hokkaido	858,356		729,767	28,036	93,225	5,300		28,000	10,536	236,742			26,859	2,016,821
Aomori	338,437			3,702	3,460		34,729	27,141		40,154	8,329		6,000	461,952
Iwate	922,709		34,690	23,310	87,598	25,561	46,880	2,637	15,584	49,679		1,997	48,787	1,259,432
Miyagi	208,006		14,929	37,383	37,682	28,871	17,849		6,385	13,584		4,024	2,829	371,542
Akita	135,996			30,462				7,000	9,761	—			57,000	240,219
Yamagata	1,210		5,240	8,280	755				3,539	150,030	584		11,797	181,435
Fukushima	773,287		129,782	102,711	78,918	78,595	114,079	293,565	245,816	169,840	1,426	443	6,401	1,994,863
Ibaraki	417,368	—	160,880	45,008	42,335	619,916	91,095	172,460	155,966	—	215,528	27,523	40,835	1,988,914
Tochigi	369,838		11,113	14,498	1,121,167	16,925	29,695	2,603	190,314	35,442	42,351		83,498	1,917,444
Gunma	3,257,561	182,401	161,000	51,402	120,200	233,302	150,424	60,230	298,423	188,498	13,142	935	95,297	4,812,815
Saitama	874,979		82,313	99,132	423,472	429,662	347,378	11,171	260,146	77,411	166,588	2,816	183,116	2,958,179
Chiba	1,355,437	48,599	110,505	316,132	1,249,489	854,844	321,801	152,780	536,307	36,662	1,119,096	192,503	131,985	6,426,140
Tokyo	817,895	224,415	115,221	636,475	4,984,672	1,166,994	1,031,670	165,649	615,606	2,900			113,542	9,875,039
Kanagawa	840,920		240,842	1,804,267	843,599	1,249,105	458,956	65,140	374,929	8,501		1,800	40,200	5,928,259
Niigata	57,052		12,112	4,680	8,831	33,724	10,097	1,543	19,242	86,459	44,552	172	37,499	315,963
Toyama	843,610	—	—	8,181	4,766	22,248	31,160	182	12,154	21,329	14,863	227	8,415	967,135
Ishikawa	337,797		71,830	42,510	60,015	114,697	38,953	9,896	147,170	64,817	82,243		8,105	978,033
Fukui	200,308		6,137	13,117	953	19,025	100		12,286	—	551		4,713	257,190
Yamanashi	65,428		23,151	32,841	3,110	12,512	2,208		39,442	47,197	46,289	24,162	60,945	357,285
Nagano	2,992,589		11,606	47,698	53,521	45,856	51,962	17,058	227,923	267,007	7,819		21,839	3,744,878
Gifu	66,213		51,357	6,280	5,735	36,708	4,595			41,200	8,321	13,209	8,418	242,036
Shizuoka	1,113,310		180,039	142,861	595,576	213,069	137,399	5,601	200,014	61,092	83,080	5,962	195,071	2,933,074
Aichi	639,908		103,548	12,016	24,628	175,978	265,234	6,077		52,695	8,320	4,160	9,736	1,302,300
Mie	577,239		4,728	17,421	151,011	8,797	15,838	1,119	67,322	125,506	48,000	6,919	14,353	1,038,253
Shiga	398,544		321,476	45,810	166,607	47,971	69,689	17,842	140,645	252,302			21,041	1,481,927
Kyoto	532,398	67,156	78,364	81,845	906,511	7,060	414,035	79,217	143,827	157,119	8,474	2,476	22,753	2,501,235
Osaka	1,749,262	91,453	4,309,052	126,203	863,378	409,157	1,940,626	145,677	525,489	196,900	2,892		144,273	10,504,362
Hyogo	1,115,948		170,851	292,903	590,434	345,986	296,764	27,591	41,049	506,774	95,389	28,203	66,080	3,577,972
Nara	95,369		70,813	55,927	184,469	191,983	166,384	29,781	73,115	85,342	14,364	3,994	30,117	1,001,658
Wakayama	213,023	23,732		15,718	28,813		1,135		13,006	30,928			19,555	345,910
Tottori	232,699		25,723		5,804	2,778	14,255	499	66,474	31,785	11,049		24,242	415,308
Shimane	265,601		97,582	1,762	4,616	12,910	30,857	1,945	443	50,935		6,200	23,533	496,384
Okayama	936,987		117,468	112,405	13,196	3,818	27,000	7,247	38,712	22,702	23,955	4,859		1,308,349
Hiroshima	206,592		30,734	12,880	137,045	37,930	38,930		82,196	98,883			50,534	695,724
Yamaguchi	145,402		7,094	5,050	25,872		794	1,018	37,373	80,940	186		189	303,918
Tokushima	945,403		30,830	18,799			38,242	32,539	58,709	21,160			1,356	1,147,038
Kagawa	1,368,402		46,059			14,000	2,700	435	400	11,067			1,469	1,444,532
Ehime	407,313			5,309	59,421		53,962	92,700	4,523	24,067	10,298		9,874	667,467
Kochi	12,400		62,105		8,000		6,786			6,184				95,475
Fukuoka	784,253		98,636	15,258	472,913	415,320	243,423	5,962	38,006	256,190	33,639	34,104	2,000	2,399,704
Saga	164,805		16,517	8,189	36,333		32,403	14,412	99,010	206,576	8,672	9,432	1,564	597,913
Nagasaki	27,617			4,070	107,100	3,773	33,142	138	385	25,519			1,823	203,527
Kumamoto	116,108		63,706	4,529	14,858	7,980	26,852		76	101,875	54,482			390,466
Oita	340,465		49,234	35,406	25,124	18,000	13,324		6,799	23,760	4,217	1,749	7,061	525,139
Miyazaki	40,459	17,703	32,411	4,066	9,801	9,488	31,583	418	47,707	110,033	13,276	3,264	10,040	330,249
Kagoshima	312,204	—	4,200	11,860	36,879	19,355	29,619	15,029	520	47,939	328	—	13,023	490,956
Okinawa	22,638		14,152		6,871	52,176	131,672	64,471		—		8,534	55,596	356,110
Total	28,499,345	655,459	7,907,797	4,386,392	13,698,763	6,991,374	6,846,274	1,566,773	4,867,329	4,125,725	2,192,303	389,667	1,723,363	83,850,564

mounds are visible above the ground. Settlement sites, among which the increase in the progress of site destruction in recent years has been particularly conspicuous, comprise 109 national historical monuments, along with 56 shell middens (mainly Jômon with some later examples from Hokkaido). Thus the 547 prehistoric sites make up 43% of the total. The others are 274 sites of the early historic period (7th-10th centuries A.D.), 195 medieval sites (1192-1603 A.D.), 233 early modern sites (1603-1868 A.D.) and 14 modern sites (after 1868 A.D.).

The necessity of buying land prior to scheduling has become something of a problem in the designation of historical sites over recent years, and the sudden jump in land prices has meant that it has become a major obstacle. The Agency for Cultural Affairs provides assistance in the case of land occupied by National Historical Monuments. Until 1972 it provided half of the purchase price of the land, but from 1973, the Treasury took responsibility for 80%, leaving the remaining 20% for the local government involved, thus halving their burden. However, the total amount of that assistance available was only 8.0 billion yen, which could not possibly satisfy demand nationally. On the other hand, some means were needed to the ends of actual preservation, as valuable sites were in reality being destroyed through the lack of understanding of regional self-governing bodies and for financial causes - the outlook for local funding being poor. Results can be said to have been achieved to some degree, in that it has become a principle that the administration of cultural properties by the regional self-governing bodies is modelled on what the nation does, and so the designation and preservation of traditional arts and crafts and natural monuments is being carried out by local government in various ways. The scheduling of sites, however, especially prehistoric, protohistoric and early historic settlement sites, involves the preservation of a wide area. The trend of normally purchasing land at the time of designation causes many problems for the regional self-governing bodies and there are no signs of any improvement in the situation. The expression "Destruction unless the Nation buys Designation" has become the lament of those involved.

In 1966, after a review that found the administrative structure for large scale historical sites to be insufficient, the Sites and Monuments Division of the Committee for the Protection of Cultural Properties (the present-day Agency for Cultural Affairs) initiated the establishment of the "Fudoki no Oka" administrative facilities located at historical sites. One scheduled historical monument of particularly large area was chosen in each prefecture, at which a site museum was build for the management of the site and so that the significance of the site could be understood by visitors. The expenses involved in purchasing the designated land (which through being bought by prefectural and metropolitan governments was taken into public ownership) were partly defrayed by a special budget for the

purchase of historical sites, and the management of these areas that were thus taken into public ownership was consolidated, giving due consideration to the convenience of visitors. This program has been completed in 12 prefectures and is underway in 2 prefectures.

During consolidation work at the Inariyama mounded tomb at the Sakitama Fudoki no Oka, Saitama prefecture, an iron sword was excavated from the stone structure around the coffin, in the top of the circular rear section of the mound. This sword bore a gilt inlaid inscription of 115 characters, from which it was understood that a chief of the Kantô region had been buried in the mounded tomb in the latter half of the fifth century, and that the interred had served as a commander of the Imperial guard of Emperor Wakatakeru at the Yamato court. This discovery had a great impact on the study of ancient history.

After the start of the designation of historical monuments in the 1920's, the basic principle followed was to preserve the scheduled site in the same condition as it was at the time of designation, except for something to mark the site, such as an explanatory board, or a stone post bearing the name of the site marking the boundary of the area concerned. Dr. Kuroita Katsumi, the leading figure in the problem of how to preserve historical monuments at that time, though that the first consideration should be given to a kind of "frozen" preservation, in which the condition of the monument at the time of scheduling was not changed, thus preserving the historical reality. The government treated these recommendations with the utmost respect, the remains of buildings and structures stayed underground and the forests and paddies on the scheduled land were duly neglected. In the 1950's and 60's, during the period of reconstruction following the war there was considerable concern that the general public did not understand why such land needed to be preserved, except for some of the mounded tombs and so forth, and throughout the country there were demands that designations be rescinded and the land be turned over for general development. In response to this, work was carried out to consolidate preserved historical monuments so that the public could understand what kind of features they were. From 1965, the first such projects were the reconstruction of the twin pagodas, the main temple structure, lecture hall and general layout at the Kudara-dera Temple in Hirakata city, Osaka prefecture, and the restoration of the stone paving of Goshikizuka, a 194-metre-long keyhole-shaped mounded tomb in Kobe, the consolidation expenses of which were 11,300,000 yen. Work was completed at Kudara-dera after 3 years and at Goshikizuka after ten years. These sites gave the lead for gradual progress in the restoration of historical monuments throughout the country.

Following this, the consolidation preservation of the land purchased at the above-mentioned Heijô Palace site was begun in 1968, by Nara National Research Institute of Cultural Properties (Nabunken), associated with the Sites and Monu-

Table 3. Breakdown of National Historical Sites by Type
(As of 1 October 1991)

Class of Site \ Period	Prehistoric	Early Historic	Medieval	Early Modern	Modern	Total
Shell Middens	56					56
Artefact Bearing Strata	8	1				9
House Sites	109 (3)	2				111 (3)
Mounded Tombs	338 (7)					338 (7)
Defensive Walls	9					9
Others of this Class of Site	20 (1)					20 (1)
(Sub Total)	540 (11)	3				543 (11)
Castle Towns		12 (3)				12 (3)
Palaces		6	12	2		20
Dazaifu		1 (1)				1 (1)
Provincial Centres of Government		16	1			17
Castles		15 (4)	93 (1)	60 (9)		168 (14)
Earthen Fortifications		1 (1)	2	1		4 (1)
Battle Fields		1	3	2		6
Other Sites Related to Government		2	4	12	2	20
(Sub Total)		54 (9)	115 (1)	77 (9)	2	248 (19)
Temples and Shrines		152 (12)	25	6		183 (12)
Sutra Mounds		3				3
Cliff Buddhas		16 (2)	3			19 (2)
Other Religious and Ritual Sites		8	10	2		20
(Sub Total)		179 (14)	38	8		225 (14)
Confucian Temples				2		2
Schools for Samurai Children				7 (1)		7 (1)
Village Schools				2 (2)		2 (2)
Private Schools				5		5
Libraries				2		2
Other Sites Related to Education		1	1	2	2	6
(Sub Total)		1	3	20 (3)	2	24 (3)
Medicinal-Herb Gardens				3		3
Charitable Institutions			3		3	6
(Sub Total)			3	3	3	9

Class of Site \ Period	Prehistoric	Early Historic	Medieval	Early Modern	Modern	Total
Barriers		1		6 (1)		7 (1)
Mile Stones				17		17
Tree-Lined Highways				2 (1)		2 (1)
Banks				2		2
Kilns	2	21	7	4		34
Other Industry, Engineering and Transportation Related Sites	5	9	11	33	6	64
(Sub Total)	7	31	18	64 (2)	6	126 (2)
Old Houses				31 (1)		31 (2)
Parks and Gardens		3	14	25 (3)		42 (5)
Wells		1				1
Trees and Rocks		1				1
Special Historical Regions		1	6			7
(Sub Total)		6	20 (2)	56 (4)		82 (6)
Sites Associated with Foreign Countries and Foreigners				5	1	6
(Sub Total)				5	1	6
Total	547 (11)	274 (23)	195 (3)	233 (18)	14	1263 (55)

Table 4. Table Showing the Percentage of Total Excavations Per Period in Four Prefectures from 1989-1990

Period \ Prefecture	Miyagi		Chiba		Osaka		Fukuoka	
	1989	1990	1989	1990	1989	1990	1989	1990
Palaeolithic	4.38	3.75	6.39	5.51	0.41	0	0.54	0.45
Jōmon	12.28	12.03	25.89	24.82	1.64	1.86	18.47	13.12
Yayoi	3.50	1.50	8.25	6.51	12.34	11.80	40.76	35.29
Kofun	8.77	16.54	23.42	22.29	18.51	23.32	17.39	28.50
Early Historic	54.38	51.87	20.12	21.63	28.39	27.32	10.32	4.97
Medieval and Post-Medieval	16.66	14.28	15.88	19.75	38.68	35.10	12.49	17.63

ments Division of the Committee for the Protection of Cultural Properties. Various architectural features were clarified through excavation, notably two types of building, one using Chinese-style stone pillar bases, the other using Japanese-style pillars which were directly embedded in the ground. The former type were reconstructed above the preserved original features, namely the earthen foundation platforms and the stone pillar bases, on top of which earth had been piled. The extent of the latter type of building was demarcated by a 20-30 centimetre high platform of earth placed above the original features in the same way as above. Round post-hole shapes were cut out in the position of the posts, in which trees were planted, thus suggesting posts embedded directly in the ground. By these methods the actual form of the original features was retained and displayed in the reconstructions. Two further techniques for displaying the shape of the original features were adopted, the use of plastic replicas on the surface at the location of the original features, supplemented by reconstructions of large buildings. Two approaches were taken to the building of roofed mud walls, the first reconstructing the whole feature using only traditional *hanchiku* techniques, and the second only using traditional materials for the outer (visible) sides, the inner part consisting of contemporary structural materials. Considerable expense was incurred by the reconstruction of these large features and moreover, while some 7th-8th century architecture still survived in Nara, there was none extant from earlier periods, and so the plans for the reconstructions depended on the opinions of the restorers, as a result of which many questions remain. Pit houses of the Jômon, Yayoi and Kofun periods, however, were only a few metres in diameter and on account of their small size, full scale reconstructions have been built around the country. The buildings at the Toro site in Shizuoka city were the first such buildings to be reconstructed, immediately after the war. Not only were the excavated floors of the pit houses used, but building materials that had been excavated about the same time at the site of Yamagi at Nirayama in Shizuoka prefecture were also taken into consideration in the reconstructions of the raised-floor store houses. At the site of Yoshinogari, Saga prefecture, which has received national attention recently, knowledge gained from materials recently excavated throughout the country has formed the basis for the reconstructions of the upper structures of buildings and of buildings with floors flush with the ground surface.

Along with the beginning of this sort of consolidation of historical sites, the National Association for the Municipal consolidation of Historical Sites was established in 1946 by those municipalities that had historical monuments. At present 545 cities, towns and villages participate, and the Association has played a major role in the acquisition of funding for purchasing and consolidating historical sites.

With the beginning of the 1970's, along with the establishment of a system for archaeological

research all over the country, the collecting and custody of the burgeoning amount of archaeological materials became a national problem. In response to this situation the Agency for Cultural Affairs instigated the construction of Archaeological Cultural Properties Centres in each region and gave some financial assistance for these facilities. These centres had large storehouses attached and were designed to be used to facilitate the operation of systems of excavation, rather than as just warehouses for the collection and custody of archaeological material. At present, there are 44 such centres under the direct management of the municipalities and 48 are auxiliary organizations under prefectural control. In 1974 the Centre for Archaeological Operations (CAO) was established at Nabunken which rather than performing the kind of research carried out by regional specialists, was intended as an advisory body for excavation techniques and so forth. As a result of this, many good results have been obtained through rapid improvements in excavation techniques, the conservation of artefacts and sites, and methods for consolidating historical sites (see CAO News).

Table 4 shows the percentage of excavated sites per period over two years (1989-1990) for four prefectures (Miyagi, Chiba, Osaka and Fukuoka. Figures for the whole country are not available due to inadequate data). Differences can be seen in the density of site distribution, and it is clear that Jômon period sites are most numerous in eastern Japan, while the greatest number of Yayoi sites are in Kyushu. Before 1970 most sites in eastern Japan were Jomon, most of those from the Kansai region were Kofun and most from Kyushu were Yayoi. Since then, however, with the development of historical archaeology, the number of early historic, medieval and post-medieval sites excavated in all areas has clearly become a very large percentage of the total.

III. The Development of Environmental Archaeology

In recent years various results have been achieved through the introduction of a number of scientific techniques into archaeological research.

(1) Site Survey

Despite the fact that boring has been widely used as a method of investigating sites prior to excavation, the use of what are known as physical surveying methods can barely be said to have begun at present (Nishimura 1989, 1991). The most widely used methods of physical survey are: (a) resistivity, (b) magnetic prospecting and (c) ground radar. Others are accumulating, although still partly experimental, such as (d) electromagnetic methods and (e) the Rayleigh wave method.

Resistivity was first tried out in the 1950's, but with the introduction of small machines especially for archaeological use which allow a broad area to be surveyed in a short time, the investigation of settlement sites prior to excavation and, in cases where a portion of the features on a site is discovered,

surveys to confirm the total extent of a site have been enthusiastically undertaken throughout the country. The great potential of magnetic prospecting was demonstrated during research on sites such as kilns following the introduction of the proton magnetometer in the 1970's. Most recently, the introduction of the flux gate gradiometer has remarkably improved the speed of surveying, as the survey can be conducted by one person walking with the apparatus.

Since the information produced by ground radar was confirmed by excavation at the Kofun-period settlement site of Kuroimine in Gumma prefecture, a site which had been covered by over a metre of ash in a volcanic eruption in the sixth century, it has been used throughout the country in the investigation of shell middens. Ground radar surveys have usually been undertaken by specialists prior to excavation.

Electromagnetic survey is very efficient in metal detection. The year after the excavation of 358 bronze swords at the Kôjindani site in Shimane prefecture, an electromagnetic survey was undertaken of the area around the site. A remarkable response from an adjoining area led to further investigation and the excavation of 16 bronze halberds and 6 bronze bell-shaped *dôtaku*. In Europe and America metal detectors are often used by people looking for metal objects. Although they are still not often used in Japan, this year an amateur is reported to have discovered a *dôtaku* using such a machine and so such occurrences can be expected to increase in the future. Sonic radar should be mentioned in terms of (e) the Rayleigh wave method. While methods (a) to (d) can only survey up to a limit of a few metres deep, sonic radar can reach depths of between 10-15 metres. Early results include the survey of paleotopography tens of metres beneath the ground surface at the site of Odawara Castle, Kanagawa prefectures.

These survey techniques incorporate more than one method and it is important to be aware of their weaknesses, although these may be remedied by using a combination of methods (a) and (b) or (a) and (c) in order to obtain reliable information.

(2) Photogrammetry

(a) The Archaeological Use of Aerial Photography

There are basically two types of aerial photography used in reconstructing topography oblique and perpendicular. Oblique aerial photography was used in 1925 in the Japanese survey of surface sites associated with courtiers tombs of the Han dynasty commandery at Lolang in the suburbs of Pyongyang on the Korean peninsula. Researchers also obtained oblique photographs of the excavations of the Fujiwara Palace site and the Ishibutai mounded bomb taken from a newspaper company aircraft in 1930. Extending this coverage, Suenaga Masao boarded an Asahi Newspaper plane and photographed mounded tombs in the area centred on the Kinki district, resulting in the publication of *Sora kara mita kofun* (*Mounded Tombs seen from the Air*) (1955), *Kofun no kôkû taikan* (*The Aerial Survey of Mounded Tombs*) (1975) and *Kofun no kôkûshashin-*

shû (A Collection of Aerial Photographs of Mounded Tombs) (1980). It was Suenaga who proposed the theory of enclosures surrounding the moats around mounded tombs, which could be discerned in the aerial photos.

The perpendicular aerial photography of sites began in 1926 when the Shimoshizu military flying school photographed the Ubayama shell midden site, Chiba prefecture, in 1926. However, the formal archaeological use of perpendicular aerial photos began after the war with the civil air survey in 1952. The excavation of the Heijô Palace site began at the end of 1953 and a long term excavation project was deemed necessary. Large scale topographic maps were essential for this project and at the request of Fujita Ryôsaku, a member of the Third Special Investigation Committee (Historical Sites Section) of the Committee for the Protection of Cultural Properties, under the direction of the staff of the Maruyasu Laboratory of the Department of Building and Civil engineering at the Institute of Industrial Science of Tokyo University (hereafter referred to by its acronym, Seiken), a topographic map at a scale of 1:1,000, covering an area of one kilometer north to south and 1.4 kilometres east to west was complied, using the nascent aerial photographic survey. Good results were gained from the subsequent use of this map in the excavations of the summer of 1955. The outcome was that in 1955 aerial photographs at a scale of 1:6,000 were taken of 182 square kilometres of the southern part of the Nara basin, and from part of this coverage 1:1,000 scale topographic maps were compiled by Seiken. These maps were used during excavation in the Asuka region of Nara prefecture in 1956. After this, aerial photographs of 400 square kilometres of the northern part of the Nara basin were taken by Nabunken, from which every year since several sheets of 1:1,000 scale topographic maps, covering areas one kilometer north to south by 700 metres east to west, have been produced. At present 174 sheets have been completed. These topographic maps have not only been used in the excavation of site such as temples and palaces in the Asuka region, but have also been used in various types of research such as the reconstruction of features associated with the *Jôri* system in the Yamato basin (a system of land allotment and the arrangement of agricultural land into paddy fields in the seventh century) and *shôen* manors from the tenth century. The use of aerial survey maps accompanying large-scale development has come into general usage throughout the country since the 1960's. Topographic maps at large scales including 1:500 have been compiled, as well as the 1:1,000 scale maps. Moreover, through the endeavours of the Civil Aerial Survey Society and Nabunken, site plans at scales of 1:20, 1:50 and 1:100 have been drawn up with the use of balloons, helicopters, cranes and ropeways. Recently a situation has arisen with tens of small-scale companies in business nationwide, conducting photographic survey by balloon. The increase in businesses using radio-controlled helicopters manu-

factured for the exclusive use of aerial photography and the development at Nabunken in 1985 of the *hanetsurube* type of photography (in which a camera is mounted on to one end of a shaft set on a pivot, at the other end of which is a weight) which produces images of about the size of a single pit house (i.e., about 10 square metres), have also helped aerial photography come into general usage in rescue excavations nationally.

(b) Photographic Interpretation

Following the establishment of a methodology for site survey by Crawford in 1929, the interpretation of aerial photographs spread throughout Europe and America. But in Japan a proper system for collecting information about what has been discovered through aerial photography has still not been set up. Remarkable examples of sites that have been discovered included the houses at the Nanbori shell midden site in the city of Yokosuka in 1955, the Inoue Chôja outer bailey in Ibaraki prefecture in 1962 and razed mounded tomb in the Sakitama tomb group in 1969. Infrared rays and heat sensitive imaging have been tried out in Japan, put the successes achieved in America and Europe with these methods have not been matched in Japan as the conditions of the agricultural land are different, in that the units of land are small, and even within these small units different crops are planted together. Site survey using satellite imagery is not used either.

(c) Above Ground Photogrammetry

Good results have been obtained from the photogrammetry of artefacts and sites (Tsuboi et. al. 1964 and 1969). In 1959 the seated outdoor Great Buddha in the city of Kamakura, Kanagawa prefecture, was photogrammetrically surveyed by the Tokyo University Seiken (Kôtokuin 1961). Measuring the total weight, the weight of the head and the location of the centre of gravity, it was possible to attempt the repair of the damage to the back of the head. The utility of the photogrammetric method was demonstrated as the values for surface measurements derived from the photogrammetric elevation were within an error margin of only two percent of the values derived through subsequent physical measurement. Many results have been obtained, such as the photographic survey of sculptured Buddhist images effected through the cooperative effort of Nabunken and Seiken, which proved that the ancient seated statues of Buddha from the eighth century main image at Yakushiji to the eleventh century main image at Byôdôin, were constructed according to canons which specified, for example, standardized knee widths (Hasegawa 1971). Unfortunately, however, no progress was made with this technique during the 1980's. Photographic surveys have been made of Buddhas carved into cliff faces from around Japan, including those at Ôya, Tochigi prefecture and Usuki, Ôita prefecture, as well as at the cave temples at Bamiyan in Afghanistan, where the panoramic view was surveyed at a scale of 1:200 and two large Buddhas at a scale of 1:20 (Kyoto Daigaku

1984). The photographic survey of the reliefs on the cliff face at Taq-i-Bustan in Iran in 1976 also produced great results (Tôyô Bunka Kenkyûjo 1983).

As well as sculpture, another field that has made active use of photogrammetry has been architecture, where Nabunken has also played a role in developing research. In 1973 Nabunken engaged the Austrian Dr. Hans Foramitti under whose technical guidance a plan of the layout of the 17th-18th century town of Imai, in Kashihara city, Nara prefecture, was produced in 1973-4. Following this, under the Agency for Cultural Affairs' policy for the designated preservation of groups of traditional buildings, the photogrammetric survey of town plans was carried out by civil photogrammetric survey companies all over the country. Photogrammetric surveys of individual buildings were also carried out, such as that of the Sanjô post-office in Kyoto city in 1973. From 1963 to 1968 annual surveys were carried out of gradual structural changes since repairs following the collapse of the five storied pagoda at the Kaijusenji Temple in Kyoto (Nabunken 1969) and in 1969 the degree of warping of the edge of the roof eaves was surveyed prior to repairs to the Hall of the Great Buddha at Tôdaiji Temple in Nara. Remarkable examples of the photogrammetric survey of architecture include a survey of Delhi and its environs and the Taj Mahal in a cooperative venture between the Tokyô University Mission for Indian History and Archaeology and Seiken, carried out between 1959 and 1962, a survey of the wooden architecture of the Royal Palace in Nepal by Tokyo Institute of Technology from 1981 to 1986, and a survey of the dome of the Ayasofya or Hagia Sophia (St. Sophia) in Istanbul in 1991 (Nippon Institute 1981, 1985, 1986).

(d). Underwater Photogrammetry

In 1986 NHK (Japan Broadcasting Corporation) retrieved 1,000 12th-early 13th century amphorae from a sunken ship on the seabed at a depth of 30 m, 2 kilometres off the coast of Markiyeh in the northern part of Tartous in Syria, and used underwater photogrammetry to record their in situ distribution (Operation Committee 1985-7). In the future this attempt will be seen to have proven the efficacy of this method in underwater archaeology.

(3) Conservation Science

The undertaking of research into conservation in Japan began very late compared with Europe and America. In 1916 a group set up to research into methods for preserving the wall paintings of the main temple structure of Hôryûji Temple in Nara prefecture, and in 1939 synthetic resins were used to begin to prevent them from peeling. Following this, in 1947 a conservation technology laboratory was established at the Tokyo National Museum, and in 1952, accompanying the founding of the Tokyo National Research Institute of Cultural Properties (Tôbunken), the Conservation Science Department became independent of the National Museum. The staff, including chemists, physicists, biologists, engineers

and agriculturalists conducted research into three themes concerning: materials, structures and techniques; the environment for conserving cultural treasures; and treatments for conservation and repair. Then, in 1971, the Conservation Techniques Laboratory of the Department for Conservation Science became a separate Department for Conservation Technology. Thus Tôbunken focused mainly on museum objects and produced great results in the restoration of paper and lacquer objects such as containers, the prevention of peeling of votive pictures, paintings on sliding screens and wall paintings. On the other hand, at Nabunken, the excavation of wooden tablets (*mokkan*) at the Heijô Palace site in 1960 necessitated a conservation procedure for excavated wooden items, and in 1970 the head of the conservation science department of the Danish National Museum, Dr. Christian Christensen, was engaged. Under his guidance the methods of PEG treatment and freeze-drying were introduced, which are now used in a number of laboratories around the world set up for the treatment of water-logged wood. In response to the need for the treatment of the increasingly large amount of water-logged wood excavated since the 1970's, a conservation science department was opened at the Gangôji Institute for Research into Cultural Properties in the city of Nara, separate from the two national cultural properties research institutes mentioned above as conservation science restoration centres. This department was charged with the PEG treatment of large wooden objects, including dugout canoes, from all periods excavated on sites from around the country. At this institute in 1978, during the conservation of an iron sword excavated at the Sakitama mounded tomb, X-ray photographs showed up a long gilt-inlay inscription of 115 Chinese characters on both sides of the sword, a discovery which has had a great impact on the history of 5th century Japan. By the same X-ray method, a lacquered sarcophagus from the Abuyama mounded tomb in Osaka prefecture was photographed in 1934. Public attention was seized when, during the conservation of these pictures fifty years later, the condition of the injuries to the corpse showed that death had occurred several weeks after the injuries had been incurred. The state of the interior of the tomb and contents of the sarcophagus, which had been reburied after the original photographs were taken, were also clearly visible. The contents included an inner cap worn with a crown embroidered with gold thread, glass beads and a jade pillow bound with silver thread. In 1978, in a further example of the use of image enhancement, NHK (Japan Broadcasting Corporation) inserted a fiberscope into the Kitora mounded tomb in Asuka village and traced out on the rear wall a painting of a *genbu*, a snake paired with a turtle, symbolic of one of the four cardinal directions. On enhancing this image the conditions inside the stone chamber could be seen (Sakata 1991). By inserting a very thin pipe (2.6 cms in diameter), the interiors of unexcavated mounded tombs can be observed and greater

use of this type of device is planned for the future. The use of infrared is expected to give similar results to the various X-rays.

Infrared television was used in the decipherment of black ink marks on *mokkan*, on which photogrammetric survey had been used. Other examples of its use include the decipherment of *baichiken*, land purchase tickets (ceremonial placards of a type that originated in China concerning the rights of the interred over the cemetery, which had been granted by the gods of the place) and lead plaques bearing writing in black ink from the 9th century, excavated from Dazaifu city, Fukuoka prefecture in 1979.

Although there are examples of the use of fluoroscopic methods using isotopes on gold containers, the results are not particularly remarkable.

The general use of chemicals by modern conservation science to prevent paintings from peeling and to control the worsening effects of weathering and exposure has been referred to above. A further chemical process involves the use of polyurethane epoxy resin to produce "peelings" of site sections, a technique that has been used throughout the country. Some of these peelings are very large, up to 20 metres long and two metres deep, including one of a very long north-south section from the foundation of the Palace Main Hall of the Heijô Palace site. The use of these peelings include displaying them in front of fragile sections, allowing the stratigraphy of the site to be easily understood by visitors, as at the site of Iwajuku in Gumma and Ibusuki in Kagoshima prefecture.

(4) Proveniencing

Determining the place of origin of artefacts is clearly important in archaeology. A lot of mineralogical research has been conducted for stone tools, especially concerning obsidian from the Palaeolithic and Jômon periods which is known to have been transported for up to hundreds of kilometers from sources in the central mountains and offlying islands. Sources can be ascertained for pottery through the analysis of clay, in which energy dispersive X-ray fluorescence analysis has been particularly effective (Mitsuji 1989). This involves the detection of rare trace elements and the analysis of neutron emissions in atomic reactions.

Through the analysis of lead isotope ratios of Yayoi and Kofun period bronze objects, the ore used in the manufacturer of early bronze *dôtaku* has been shown to have come from the Korean peninsula, while that used in middle and late period *dôtaku* came from north China. The ores used in the manufacture of bronze mirrors with protruding triangular rim cross-sections depicting sacred animals (*sankakubuchi shinjûkyô*), which figure in the debate over Yamatai, are also understood to have come from different sources in north China and the lower reaches of the Yangtze River, which has raised the question of whether this type of mirror was imported or made in Japan copying Chinese models (Mabuchi 1989).

(5) Dating

The dating of artefacts and sites

is obviously important for archaeology but although relative dates can be decided using stratigraphical methods, absolute dating is more difficult. After World War Two, various physical dating methods appeared, amongst which the radiocarbon method is the most widely used. There has been some controversy over the degree of accuracy of this method, but in recent years cross-checking, as well as the introduction of dating by Tandetron accelerator have overcome some of the limits of its use and have resulted in increased credibility (Nakai 1989). In addition, dating estimates have also been produced by methods such as fission track and dendrochronology.

There have been considerable success in dendrochronology, and there is now a confirmed sequence extending back to 317 BC and floating sequences that are useful for dating the Jômon period (Mitsutani 1990). In addition, volcanos have provided a further archaeological dating method. Large scale volcanic eruptions produce fallout over a wide area and the determination of absolute dates for these eruptions can play a major role in the dating of artefacts above and below volcanic ash layers. Japan is a country of volcanos and volcanic layers have been used to date sites and artefacts, from the 20,000 year-old Aira pumice to the 6,000 year-old Akahoya pumice and the ninth century AD Towada pumice (Machida, Arai and Moriwaki 1986). Although not really volcanic archaeology, evidence for earthquakes may also play a role in dating (Sangawa 1989) and results are starting to appear in many areas, showing that Japan is a country of earthquakes as well.

(6) The Reconstruction of the Ancient Environment

Although the two pillars of environmental reconstruction are well-known, namely pollen analysis, which plays an important role in the reconstruction of ancient environments, and for which many research results have been announced, and excavated faunal and macro-floral remains, recently other methods have come to be widely used. These include the analysis of remnant fatty acids from which explanations for the use of stone tools and pottery can be deduced, and the reconstruction of dietary behavior from the recognition of animal species from bones (Nakano 1989). The development of research fields in paleoenvironmental analysis in recent years has been also remarkable, including the reconstruction of the diet of ancient people from carbon and nitrogen isotopes in skeletal material (Akazawa and Minagawa 1989), the discovery of rice paddies from the plant opals of rice (Fujiwara 1989) and the development of new activities in zooarchaeology (Joint Study 1991).

References:

Akazawa Takeru and Minagawa Masao, 1989. "Tanso chisso dôitai ni motozuku kodaijin no shokuseikatsu no fukugen" (Reconstruction of the diet of ancient people based on carbon and nitrogen isotopes). Dai Sankai Daigaku to Kagaku Kôkai Shinpojyûmu Soshiki Iinkai (*ed.*): *Atarashii kenkyûhô wa kôkogaku ni nanio motarashitaka* (What have new research methods brought to

archaeology), Kubapuro.

Fujiwara Hiroshi, 1989. "Puranto opâru to suiden" (Plant opals and paddy fields). *Atarashii kenkyûho wa kôkogaku ni nanio motarashita ka*, Kubapuro.

Hasegawa Makoto, 1971. "Sôkenki Tôdaiji Daibutsu no hireiteki kenkyû" (Comparative research into period of the foundation of the Tôdaiji Giant Buddha). *Nabunken Nempô* 1971.

Kôtokuin, 1961. *Kôtokuin kokuhô dôzô Amida Nyorai zazô shûrikôji hôkokusho* (Report on the restoration of the national treasure, the bronze seated statue of the Amida Buddha at the Kôtokuin temple).

Kyôdô kenkyû "Dôbutsu kôkogaku no kisoteki kenkyû" (Joint study on the fundamental study of zooarchaeology). *Kokuritsu Rekishi Minzoku Hakubutsukan Kenkyû Hôkoku* No. 29, 1991.

Kyoto Daigaku Chûô Ajia Gakujutsu Chôsa Hôkoku I-III, *Bâmiyân*, Dôhôsha, 1984.

Mabuchi Hisao, 1989. "Namari dôitai hihô ni yoru seidôki gensanchi no suitei" (Estimates of the sources of bronze objects through lead isotope analysis). *Atarashii kenkyûhô wa kôkogaku ni nanio motarashitaka*, Kubapuro.

Machida Hiroshi, Arai Fusao and Moriwaki Hiroshi, 1986. *Chisô no chishiki - Dai yonki o saguru* (Knowledge about stratigraphy: Searching the Quaternary). Kôkogaku Series 8, Tokyo Bijutsu.

Mitsuji Riichi, 1989. "Kagaku bunseki ni yoru doki no sanchi no suitei" (Estimates of the sources of pottery through chemical analysis). *Atarashii kenkyûhô wa kôkogaku ni nanio motarashitaka*, Kubapuro.

Mitsutani Takumi, 1990. *Nenrin ni rekishi o yomu - Nihon ni okeru konenringaku no seiritsu* (Reading history in tree rings: The establishment of ancient tree ring studies in Japan) *Nara Kokuritsu Bunkazai Kenkyûjo Gakuhô* 48.

Nabunken, 1969. *Nabunken Nenpô* 1969.

Nakai Nobuyuki, 1989. "Kôkando hôshasei tanso nendai sokuteihô no kaihatsu" (The development of high precision radiocarbon dating). *Atarashii kenkyûhô wa kôkogaku ni nanio motarashitaka*, Kubapuro.

Nakano Masuo, 1989. "Zanryû shibôsan ni yoru kodai fukugen" (The reconstruction of ancient times from remnant fatty acids). *Atarashii kenkyûhô wa kôkogakuni nanio motarashitaka*, Kubapuro.

Nippon Insitute of Technology Research Mission 1981. *The Royal buildings of Nepal*. 1985 *The Royal Buildings and Buddhist Monasteries of Nepal* 1986 *The Royal Buildings and Religious Remains of Nepal*

Nishimura Yasushi, 1989. "Hakkutsu shinaide iseki o shiru" (Knowing sites without excavation). *Atarashii kenkyûhô wa kôkogakuni nanio motarashitaka*, Kubapuro.

Nishimura Yasushi, 1991. *Iseki no tansa-hô* (Site surveying methods) *CAO News 71*, Nara Kokuritsu Bunkazai Kenkyûjo .

Operation committee of the Syrian Coastal Archaeological Excavation, 1985-87. "Amphorae." In *The Excavation of a Sunken Ship off the Syrian Coast: An Interim Report*, 1991.

Sangawa Akira, 1989. "Jishin no konseki o iseki de sagasu" (Searching for the remains of earthquakes on sites). In *Atrashii kenkyûhô wa kôkogakuni nani o motarashitaka*, Kubapuro.

Sakata Toshio, 1991. *Haiteku kôkogaku* (High technology archaeology), Kubapuro.

Tokyo Daigaku Tôyô Bunka Kenkyûjo, 1983. *Taq-i-Bustan jissokuzu shûsei* (Taq-i-Bustan III: Photogrammetric elevations).

Tsuboi Kiyotari, Ushigawa Yoshiyuki,

Hasegawa Makoto, Itô Daisaku and Tsukuda Mikio, 1964, 1969. "Shashin sokuryô no bunkazai chôsa e no ôyô (Practical applications of photogrammetry to research into cultural treasures, I & II) *Nabunken Nenpô* 1964, 1969.

Books on Historic Garden

Kenkichi Ono

Supplement to Landscape Gardening in Japan
Josiah Conder
Kelly and Walsh, Limited; 1893

This album contains many Japanese garden photographs with a brief notice of each and forms a supplement to 'Landscape Gardening in Japan.'

The Garden of Japan - A Year's Diary of Its Flowers -
F. T. Piggott
George Allen, Ruskin House., London; 1896

Shown as the sub-title, this book is a kind of essay about four-season flowers in Japan.

Japanese Gardens
Matsunosuke Tatsui
Maruzen Company, Tokyo; 1934

This book is one of the "Tourist Library." It introduces Japanese garden history and explains Japanese garden parts and accessories. It also guides the Japanese gardens still existing.

Art of the Landscape Garden in Japan
Tsuyoshi Tamura
Kokusai-Bunka-Shinkokai; 1935

The members of the American Garden Club visited Japan for the first time in 1935. This book was published to memorize their visit. Tamura, a noted garden historian, explains general characteristics, history, design and materials of Japanese gardens. Still existing Japanese gardens from Muromachi period to modern times are also introduced.

Gardens of Japan
Tatsunosuke Matsui
The Zauho Press; 1935

Matsui, a well-known garden historian, briefly introduces the history, materials and techniques of Japanese gardens. This book includes 11 surveyed maps of famous Japanese gardens, pieces of the photographs of excellent Japanese gardens.

Rocks - Their Meaning and Use in Japanese Gardens (Gardens & Gardening)
Jiro Harada
The Studio Ltd., London; 1938

The author examines the garden stones, which play an important part in Japanese gardens. Stone composition of *Karesansui* garden, shore protection stones, stone islands, stepping stones are closely introduced.

Gardens of Japan
Mirei Shigemori
Nissha; 1949

This book was published as the

first volume of "ART OF JAPAN" series. The author divides Japanese garden into three styles; pond gardens, *Karesansui* gardens and gardens for tea ceremonies.

The Landscape Painting of China and Japan
Hugo Munsterberg
The Charles E. Tuttle Company of Ruthand,
Vermont & Tokyo, Japan
First Edition; 1955, Second Printing; 1956, pp.144

Writing for scholar and layman alike, the author carefully traces the evolution of the art throughout its long history. He discusses the major artistic personalities against their cultural backgrounds, and systematically describes the development and forms of the landscape. It thoroughly illustrates the text with over a hundred carefully selected plates and a colored frontispiece.

Gardens of Japan
Tetsuro Yoshida
Verlag Ernst Wasmuth, Tubingen, Deutche
English Edition: First Publishing; 1957
Second Impressing; 1963, pp.186

This is the English edition of "DER JAPANISCHE GARTEN."

Der Japanische Garten
Tetsuro Yoshida
Verlag Ernst Wasmuth, Tubingen, Deutche; 1957, pp.187

The author analyzes in detail the simple basic elements traditionally used throughout the country - trees and shrubs, rocks, stone and water - defines their symbolic significance, and the accepted rules and canons for the arrangement; he deals with the various design details such as ground coverings in grass, moss, paving and cobbles; and with plants and photographs he reveals the way in which Japanese designers, preoccupied as they are with the pursuit of harmony between man and nature, achieve a perfect marriage of house and garden. This detailed analysis is followed by over 100 full-page illustrations of Japanese gardens.

Japanese Traditional Gardens
Yoshinobu Yoshinaga
Shobunsha; 1958, pp.218

This book introduces the famous old gardens of Japan. It clearly shows the excellence of their traditional beauty with text and photographs. It contains 20 most famous traditional gardens in Japan. They contain Katsura Imperial Villa Garden, Saiho-ji temple garden, Jisho-ji temple garden, Shugaku-in Imperial Villa Garden, Ryoan-ji temple garden and Rokuon-ji temple garden, and so on. At the end of this volume, there gives an outline of Japanese Gardens.

A Thousand Years of Japanese Gardens
Samuel Newson
Tokyo News Service, Ltd., Tokyo, Japan
First Edition; 1953, Fourth Edition; 1959, pp.318

This has been designed as a comprehensive introduction to Japanese landscaping, covering everything from "Architecture-Garden" to "Wells" and more. The showing of the component parts of gardens and the comparing of these

parts' one with another is a novel approach. The chapter on the use of stones opens wide vistas for the western garden designer.

It contains

1) Historic Influences in Japanese Garden Design
2) Use of Stones in the Japanese Garden
3) Garden Elements and Materials
4) Planting and Maintenance
5) Representative Japanese Gardens and, "A Brief List of Trees and Plants Used in Japanese Gardens."

Japanese Gardens
Kanto Shigemori/Samuel Newson
Tokyo News Service, Ltd.; 1960

This book explains Japanese garden history from 12th - early 20th century together with the historical background. It especially focuses on the symbolism of Japanese gardens.

Typical Japanese Gardens
Osamu Mori
Shibata Publishing., Co., Ltd.; 1962

Mori, a prominent garden historian, explains the characteristics, history and design of Japanese gardens and shows how to make Japanese gardens. He also refers to some recently constructed and some over-sea Japanese gardens.

Composition and Expression in Japanese Traditional Gardens
Yoshinobu Yoshinaga
Shobunsha; 1962, pp.195

This book deals with the comprehensive essence common to the Japanese garden as a whole. It explains elements, composition and expression in Japanese traditional gardens, such as *Karesansui*, *Tsukiyama-sansui* garden, and so on.

Japanese Garden for Today
David H. Engel
Charles E. Tuttle Company, Tokyo, Japan
First Edition; 1959, Fourth Printing; 1962, pp.270

This book explains some characteristic of Japanese gardens through with its theory, elements and techniques.

Japanese Gardens
Brooks E. Wigginton
Marietta Collage; 1963

The author appreciates the tradition of Japanese gardens. He divided Japanese garden history into 4 periods;

1) Before 14th century
2) 14th - 17th century
3) 17th - middle of 19th century
4) After middle of 19th century

He explains the garden style of each period.

A Japanese Garden Manual for Westerners
Samuel Newson
Tokyo News Service, Ltd.; 1965

This book is written for the westerners who are interested in Japanese gardens. It introduces parts and accessories of Japanese gardens, such as stones, hills, ponds, waterfalls, plants and so on. It also explains how to make Japanese gardens.

Japanese Gardens
Osamu Mori
William Morrow and Company, Inc.; 1979

The author explains Japanese gardens in 5th - 19th century with many surveyed maps, photographs and antique drawings. He also refers to the study method and controversial points on the excavated ancient gardens.

Sakuteiki -The Book of Garden-
Translated by Shigemaru Shimoyama
Toshi-Keikaku Kenkyusho; 1985

Complete translation of "Sakuteiki", the splendid garden book described in Heian period (11th century).

Themes, Scenes, and Taste in the History of Japanese Garden Art
Wybe Kuitert
J. C. Giben, Publisher, Amsterdam; 1988

In this book, Kuitert, a rising garden historian, explains the Japanese garden history from ancient times to early modern times. He closely describes the gardens of aristocrats and temples in Heian period, gardens of warriors and *Karesansui* gardens of Zen Buddhism temples in medieval times, tea gardens and temple gardens in early modern times with many historical materials.

Gardens As Nature and As Symbols (The World Heritage of Gardens)
Dusan Orgrin
Thames and Hudson; 1993

The author explains several styles and garden elements of Japanese gardens.

Authors and Sources of the Selected Papers

Masaru Sekino
The Preservation and Restoration of Wooden Monuments in Japan,
In *Preserving and Restoring Monuments and Historic Buildings.* Paris; Unesco, 1972, pp. 207-230

Masaru Sekino
Principles of Conservation and Restoration Regarding Wooden Buildings in Japan,
In *International Symposium on the Conservation and Restoration of Cultural Property - Conservation of Wood.* Tokyo; Tokyo National Research Institute of Cultural Properties, 1978, pp. 127-142.

Nobuo Ito
On Tsugite Shikuchi and Woodworking Tools,
In *International Symposium on the Conservation and Restoration of Cultural Property - Conservation of Wood.* Tokyo; Tokyo National Research Institute of Cultural Properties, 1978, pp. 143-150.

Masaru Sekino
Aspects of Japanese Wooden Buildings,
In *International Symposium on the Conservation and Restoration of Cultural Property - The Conservation of Wooden Cultural Property*, Tokyo; Tokyo National Research Institute of Cultural Properties, 1983, pp. 1-11.

Kakichi Suzuki
Restoration of Wooden Buildings,
In *International Symposium on the Conservation and Restoration of Cultural Property - The Conservation of Wooden Cultural Property*, Tokyo; Tokyo National Research Institute of Cultural Properties, 1983, pp. 167-171.

Nobuo Ito
Present Condition of the Training of Specialists in the Conservation of Cultural Properties in Japan,
In *International Symposium on the Conservation and Restoration of Cultural Property - The training of Specialists in Various Fields Related to Cultural Properties*, Tokyo; Tokyo National Research Institute of Cultural Properties, 1988, pp. 21-25.

Eizo Inagaki
Training of Architects as Conservators in the Course of Higher Education in Japan,
In *International Symposium on the Conservation and Restoration of Cultural Property - The training of Specialists in Various Fields Related to Cultural Properties*, Tokyo; Tokyo National Research Institute of Cultural Properties, 1988, pp. 143-149.

Kakichi Suzuki
Training of Conservation Specialists for Cultural Property Buildings,
In *International Symposium on the Conservation and Restoration of Cultural Property - The training of Specialists in Various Fields Related to Cultural Properties*, Tokyo; Tokyo National Research Institute of Cultural Properties, 1988, pp. 159-171.

Eizo Inagaki
Authenticity in the context of Japanese wooden architecture,
In *The World Heritage Newsletter* No. 6. Paris; Unesco World Heritage Centre, 1994, pp. 6-7.

Migaku Tanaka
Rescue Excavation in Japan,
In *Approaches to the Archaeological Heritage - A Comparative Study of World Cultural Resource Management Systems* - Cambridge; Cambridge University Press, 1984, pp. 82-87.

Kiyotari Tsuboi and Migaku Tanaka
Urbanization, Nara Palace, and its Excavation,
In *The Historic city of Nara - an archaeological approach.* Tokyo; The Centre for East Asian cultural Studies / Unesco, 1991, pp. 1-31.

Kiyotari Tsuboi
Issues in Japanese Archaeology,
In *ACTA ASIATICA No. 63*, Tokyo; The Institute of Eastern culture, 1992, pp. 1-20.