

CHINESE ARCHITECTURE AND METAPHOR

Song Culture in the
Yingzao Fashi Building Manual

spatial
habitus



Jiren Feng

Chinese Architecture and Metaphor

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University of Hawai'i Press, Honolulu
Hong Kong University Press



香港大學出版社
HONG KONG UNIVERSITY PRESS

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First published in North America by University of Hawai'i Press
ISBN 978-0-8248-3363-3

Published in China by Hong Kong University Press
ISBN 978-988-8139-01-9

Printed in Hong Kong, China
17 16 15 14 13 12 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

Feng, Jiren.

Chinese architecture and metaphor : Song culture in the Yingzao fashi building manual / Jiren Feng.
p. cm.—(Spatial habitus)

Includes bibliographical references and index.

ISBN 978-0-8248-3363-3 (hardcover : alk. paper)

1. Architectural writing—China—History. 2. Architecture—China—History—Song-Yuan dynasties, 960–1368. 3. Li, Jie, 1035–1110. Ying zao fa shi. 4. Architecture, Chinese—Early works to 1800.

I. Title. II. Series: Spatial habitus (Series)

NA2540.F38 2012

720.951—dc23

2011032949

Printed on acid-free paper and meets the guidelines for permanence and durability of the Council on Library Resources.

Designed by Carrie Yu

Printed and bound by Paramount Printing Co., Ltd., Hong Kong, China

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Acknowledgments

Writing this book has been both exciting and challenging. I plunged into this research with immense zeal, yet I faced many challenges, from writing in a second language to tackling the difficulties in translating each piece of historical and technical Chinese text, from making up for the lost time caused by a severe femur fracture to struggling with the distractions from several international moves. This book would not have been accomplished without tremendous help from so many people.

I am much obliged to Professor Maggie Bickford for her guidance and encouragement throughout the period of my writing, and I thank her for her critical comments and insights on my work. I learned a great deal from each of her comments. Her meticulousness and sensitivity to Chinese texts significantly helped improve the general quality of my translations of them. I benefited greatly from her constructive advice of reading various sources of literature in connection with my argumentation.

Professor Nancy Steinhardt deserves my deep gratitude. With her great expertise in Chinese architecture, she offered extremely important advice on my work. She has been consistently encouraging and strongly supportive. I will never forget that she invited me to talk about my research at the Society of Architectural Historians' annual meeting in 2004, the first ever conference presentation that I gave in English in my life. Her confidence in my capability and enthusiastic comments on my work indeed have given great inspiration to my writing.

Dr. Dagmar Schäfer has been important in helping me extend my research to the field of the history of technology, reviewing Chinese building manuals from a perspective of technical knowledge transmission, with further explorations of the interplay between literati and craftsmen. Thanks for her great support in going to many international conferences presenting my research and receiving feedback from peers.

I would like to express my heartfelt gratitude to Professor Francesca Bray for her guidance and input. Her comments on the Song architectural knowledge presented in the *Yingzao fashi* and her insights into the entanglement of scholar culture and practical culture were truly enlightening. It was also she who recommended my work to the editors of the Spatial Habitus series.

I am very thankful to Professor Richard L. Davis for his advice and guidance for investigating historical materials in relation to my research. I am also indebted to Professor Kikuko Yamashita for kindly helping me read and understand Takeshima Takuichi's work on the *Yingzao fashi*.

At Max Planck Institute for the History of Science, I benefited from active interactions with scholars from different institutions and different academic fields. I would like to thank all the other members of Schäfer Research Group, especially Dr. Martina Siebert, Dr. Martin Hofmann, Gina Grzimek, and Chen Wan, for their help. I am also very grateful to Professor Nathan Sivin for his guidance and kind support. In addition, I thank Professors Susan Naquin, Joachim Kurtz, Zhang Baichun, and Sun Xiaochun, as well as Dr. Matthias Schemmel for their comments and suggestions on my work.

I would like to acknowledge all scholars who raised insightful questions when I presented my research at conferences. In particular, I am thankful to Professor Dorothy Ko (Barnard College) at the 12th International Conference on the History of Science in East Asia 2008; Dr. Simona Valeriani (London School of Economy) and Dr. Marco Formisano (Humboldt University), both at the Society for History of Technology's annual meeting in Lisbon 2008; Dr. Qiong Zhang (Southern Illinois University) at New England Association for Asian Studies' annual meeting 2007; and Professor James Millward (Georgetown University) at the Association for Asian Studies' annual meeting 2008. Their questions and comments were thought-provoking and helped me improve my research or clarify my arguments in this book. I wish to give a special thanks to someone who, at the Society of Architectural Historians' annual meeting 2004, raised the question relating the architectural metaphor of bracketing in my presentation to the

Greek orders. His (unfortunately I do not know his name) insight is very enlightening and I hope to be able to respond in a separate article in the near future.

I must acknowledge the Samuel H. Kress Foundation for offering me an Art History Travel Fellowship, which supported my field trip to several areas of Henan and of Hebei in 2002. In Henan, many local archaeologists and scholars in the field of cultural-relics conservation helped me in my survey of Song architectural remains. They include Mr. Qiu Gang and Li Hequn (Kaifeng Cultural Relics Bureau), Mr. Han Shunfa (Director of Kaifeng Museum), Mr. Sun Xinmin (Director of the Archaeology and Cultural Relics Research Institute of Henan), and so on. In Jiyuan, I was completely exhausted due to heat stroke and many thanks to Director of Jiyuan Cultural Relics Bureau Mr. Zhang Yongan, who kindly received me and arranged for a free one-night lodging. I also would like to thank Professor Su Bai (Beijing University) for offering his support for my field trip by writing a referral letter to Mr. Sun Xinmin.

I am really grateful to Professors Ronald G. Knapp and Xing Ruan, editors of the *Spatial Habitus* series, for having been very encouraging ever since they first evaluated my manuscript. I appreciate their keen interest in and full affirmation of my work. They have been patient with my procrastination many times. They also kindly offered much advice to help me get going and get through this entire process of production.

So did Ms. Patricia Crosby. She has been very patient, and it was very kind of her to try to understand my situation and offer grace periods for my submissions. She also offered her professional advice on many aspects of my book. Thanks to Cheri Dunn for her help as well.

I would like to thank Mr. Mike Ashby, Ms. Susan Richter, and Professor Paul Turner for reading through my entire manuscript, correcting my English, and editing my writing at different stages. They also offered helpful comments on my work. Professor Turner even read different versions of the introduction and helped me revise it. I am truly indebted to him for his great kindness and generosity. I am very grateful to Mr. Ashby for his highly skilled editing and constructive comments throughout my manuscript. His help has improved my writing, argumentation, and clarifications. I am also thankful to Dr. Benjamin Olshin for correcting my English on some pages of the introduction at an earlier stage.

I would like to acknowledge the main libraries of Brown University, University of Toronto, Max Planck Institute for the History of Science, and Victoria University of Wellington for the use of their collections and

assistance to locate research materials. I thank the staff of the British Library for their help as well. In particular, I am grateful to Okayama Oriental Museum and Okayama University for allowing me to use their libraries when I was an independent scholar in Japan. Many people offered individual help to get materials that I needed for my research, and I wish to especially thank Mr. Wang Weihua and Ms. Bai Yan for always being ready to help.

There are still many people to whom I owe thanks for their kind help in various ways. I am deeply indebted to those who kindly took care of me and helped me recover from my femur fracture years ago. Professor James Wrenn and his wife, Harriet, took great care of me at their house and cooked nourishing hematic meals for me for a week. Professor Dore Levy and her whole family visited me many times with their sincere concern. Professor Joan Lusk visited me at the hospital several times and greatly comforted me when I was in great pain. Professors Hugh Boyle and Lung-Hua Hu, Ms. Paula Abedon, Chen Luying, Bai Yu, Dr. Ye Chuang, and many others helped me during this difficult time as well. It would have been more difficult for me to get back to my research without their help.

I would like to thank Professors Lothar Ledderose, Dieter Kuhn, Taniichi Takashi, and Liu Heping for having been encouraging and supportive. I also thank Mr. Archie McConnell for his inquiries about Chinese carpentry in relation to the *Yingzao fashi*. Thanks to Patricia Connally for suggesting the adding of “Chinese” to the title of this book.

Most especially to my mother, words alone cannot express what I owe her for the many sacrifices she made so that I could focus on my work. Special thanks also need to be given to Nobuko for her quiet support. The whole process of my writing was a time of great excitement, gratification, and perseverance, as well as anxiety and frustration at times. I thank her for being the one to talk to when I was in a difficult situation. In the past few years, she has turned out to be an excellent assistant to my work.

Introduction

Between the carpenter's weight strings and marking lines [is something] close to government order and enlightenment (繩墨之間鄰於政教).

Li Hua, "Hanyuandian fu"¹

When the Tang (618–907) scholar Li Hua 李華 (715–766) composed his poetic essay dedicated to the Enfolding-Vitality Hall (Hanyuandian 含元殿, built in 663), the most magnificent building in the imperial palace compound in Chang'an 長安 (modern Xi'an), he lent a special meaning to the construction of architecture. The hall was where the court handled state affairs and held grand ceremonies. While eulogizing the virtues and deeds of Emperor Gaozong (高宗 628–683, r. 649–683), the patron of the hall, Li Hua emphasized the importance of the "grand scope and magnitude" (宏模廓度) and "majestic structure" (壯麗棟宇)² for the imperial palaces because these concerned state policy and moral edification. Using two fundamental carpenter's tools, *sheng* 繩 (weight strings or plumb lines) and *mo* 墨 (ink-marking lines), to represent the process of the construction of buildings, he expressed a remarkable idea: that the activity of the carpenter was in some way parallel or relevant to ideals of government. Specifically, the craftsmen's regulating process could be seen as embodying government order and virtue.

This notion reflects, more generally, the way that ancient Chinese literati perceived architecture and the built environment. From early times, many Chinese writers sang the praises of the “imperial virtues” by describing the process of the construction and striking architectural features of the majestic buildings patronized by a king or an emperor, with the implication that the architecture itself proclaimed or symbolized the ruler’s wisdom and virtue. Like Li Hua, Chinese men of letters recognized the construction of architecture as representing state politics, regulations, and indoctrination. Thus, they must have been concerned about how architecture should be properly designed and built in order to conform to the standards of government.

However, few Chinese literati during and before Li Hua’s time wrote about detailed technical procedures for the construction of buildings, although such a book must have been in demand in building practice. In fact, in the long history of China, works on building methods and government standards for them were not produced until the Northern Song period (960–1127). During that period, practical knowledge of architectural technology was summed up in the form of specialized monographs or building manuals, and such knowledge became available to architectural professionals and learned society alike.

This book investigates the historical tradition of Chinese architectural writing from antiquity to the Song dynasty (960–1279), with a focus on the cultural connotations of the imperially commissioned Northern Song building manual *Yingzao fashi* 營造法式 (Building standards; hereafter *YZFS*), published in 1103. The *YZFS* was written by the imperial official in the Directorate of Construction Li Jie 李誡 (1035?–1110, courtesy name Mingzhong 明仲) as a handbook of government standards for building methods, materials, and manpower. Not only the earliest but also the most comprehensive Chinese treatise on architectural technology to survive in its entirety, the *YZFS* is the most important primary text for the study of ancient Chinese architecture.

Circulated to officials in charge of public construction projects around the empire, the *YZFS* was intended to provide them with authoritative guidelines for precise architectural procedures and effective budget management. As modern scholarship has recognized, the standards set out in it were meant by the central government to reduce waste in materials and expenses and prevent peculation in the construction practices of local administrations. But this was not the only objective of the *YZFS*. By providing officials professional knowledge, it was also intended to instruct

the craftsmen who worked under the supervision of officials. Li Jie recognized the age-old problems of even a skilled craftsman making mistakes in his work and a talented official applying outdated building technology and leading construction activity in a laggardly, inefficient way.³ Thus, it was Li Jie's intention to disseminate correct, useful building knowledge to a targeted audience, the officials and craftsmen in the construction practice. Whether craftsmen themselves actually read this work or not, it must have been Li's expectation that, by being instructed in the detailed, official standards for their individual work, they would gain the necessary knowledge from their official superintendents. Beyond such a goal, Li systematized and set down in written form practical knowledge of architecture and made it accessible to the whole of society.

After being distributed nationwide, the *YZFS* was used as an authoritative reference in official building practice for at least twenty years before the Northern Song was overturned by the Jurchen,⁴ a nomadic tribe in northern China. Song texts record that some local government administrators indeed referred to the standards in the *YZFS* in the construction of public buildings. The construction projects in the imperial palace city and in the state capital Bianliang 汴梁 (modern Kaifeng 開封) administered by the Directorate of Construction, including those supervised by Li Jie himself, must also have been carried out in line with the state standards set in the treatise.

Along with the demise of Northern Song power, the *YZFS* was lost for some time. When the Southern Song (1127–1279) court promoted a nationwide search for books of the previous emperors of the Song, a copy of the text was found, and based on this copy, the *YZFS* was republished at least twice during the Southern Song period, in 1145 and during the Shaoding 紹定 period (1228–1233). None of these three Song editions has survived, except for fragments of a repaired Shaoding edition of the Yuan period (1271–1368) that were found in the storehouse of the imperial Qing (1644–1911) in the twentieth century (figure I.1). Yet the complete text has been transmitted to us through handwritten copies from the late imperial period. Indeed, the *YZFS* established an authoritative and orthodox reference not only for contemporary construction practices but also for contemporary and later-period scholars who wrote about architecture or appreciated architectural tradition. Not only was it included in large-scale imperial compilations—the *Yongle dadian* 永樂大典 (Great encyclopedia of the Yongle period, 1403–1424) and the *Siku quanshu* 四庫全書 (Complete library in the four branches of literature, 1773–1782)—but private scholars and book collectors also treasured it and copied it by hand generation

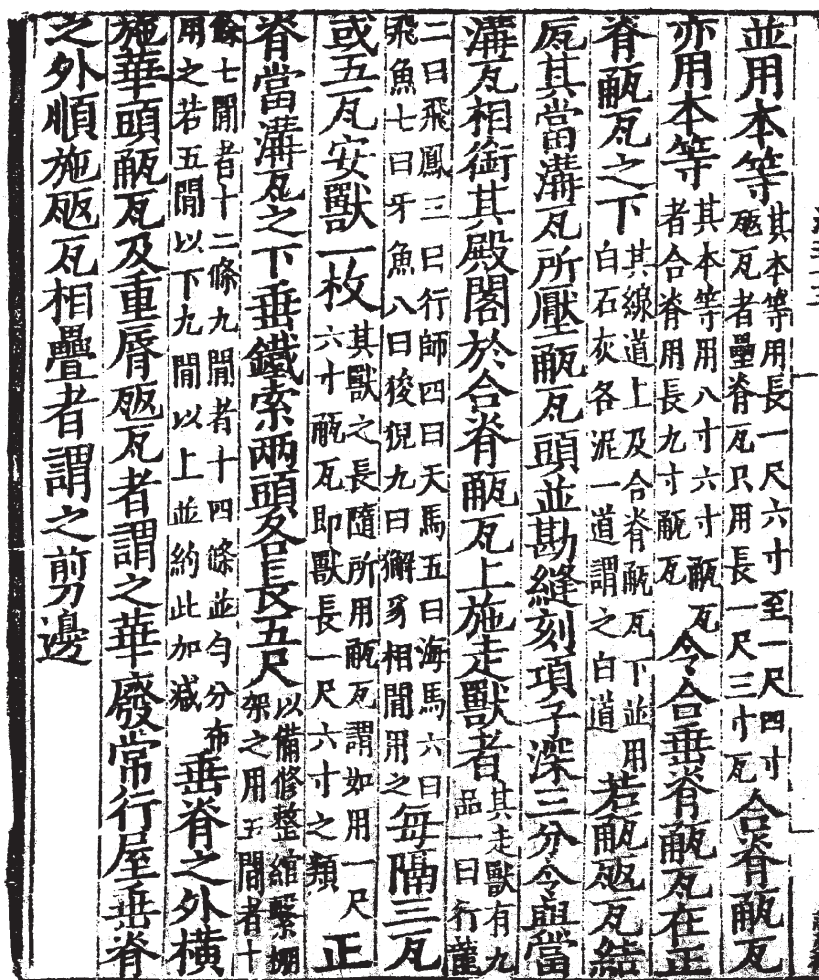


FIGURE I.1. Shaoding edition of the YZFS (juan 13:4b, "Tile System")

after generation. Nowadays it is recognized as the key to understanding the Chinese architectural tradition. Even more significantly, it has a special function as a cultural icon, and every scholar engaged with the history of architectural knowledge in China must reckon with it.

In thirty-four chapters, the YZFS records traditional and contemporary building principles and technologies, summarizing them into thirteen systems, including preliminary planning (orientation, leveling, and foundations), stonework (platforms and carving), structural construction (major carpentry), nonstructural features (minor carpentry), wood carving, wood turning, sawing, bamboo working, tile work, clay work,

polychrome-painting techniques, brickwork, and production of tiles and bricks (kilning). Among these systems, major carpentry is prominent in the promotion of architectural standardization, featuring a standard modular system based on the measurements of bracketing. The complex system of structural bracketing is one of the most distinctive traits of traditional Chinese architecture (figures I.2–I.3).

Following the standard methods of construction, the treatise stipulates standard amounts of materials, labor, and working time that are needed in executing the given construction tasks of all these building systems. The technical methods in the text involve all types of official and public buildings, from palaces, towers, and pavilions to official residential halls and governmental buildings, from city gates and walls to moats and fortifications, as well as monasteries, pagodas, and gardens. Various architectural elements and details are covered in the discourse of standard construction methods, from different kinds of tie beams and braces to every component of bracketing, from window lattices and individual elements of railings and ceilings to miniature structures inside a hall, such as revolving sutra libraries (*zhuanlunzang* 轉輪藏) and wall sutra cabinets (*bizang* 壁藏). Even such architectural and technical details as water troughs under eaves (*shuicao* 水槽), aprons (*sanshui* 散水), and scaffolds (*yingjia* 鷹架) are discussed, as well as such seemingly trivial, small components as curtain-opening rods (*pilian'gan* 擗簾竿) and tree-protecting railings (*kelongzi* 棵籠子). Furthermore, six chapters of the treatise are devoted to line drawings, illustrating

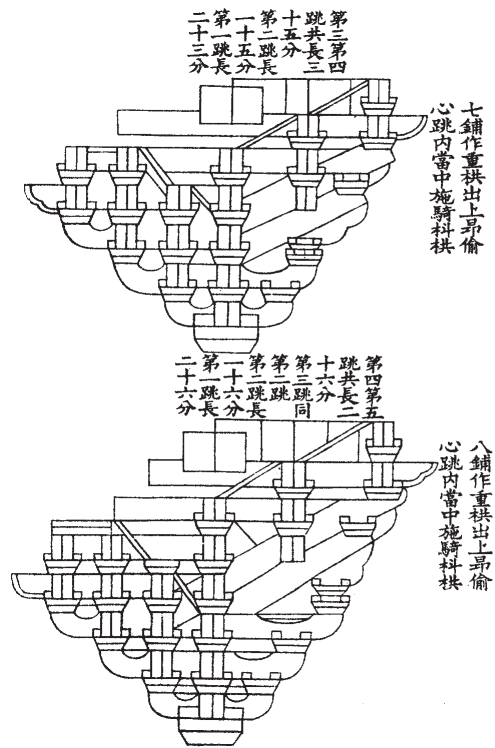


FIGURE I.2. YZFS illustration of bracketing (*juan* 30:7b, side view; 1925 edition [and hereafter])



FIGURE I.3. Bracketing of the Soul-Sleeping Hall (973) at the Shrine for the God of the Ji River in Jiyuan, Henan (featuring a corner bracket set, front and upward view; author photograph)

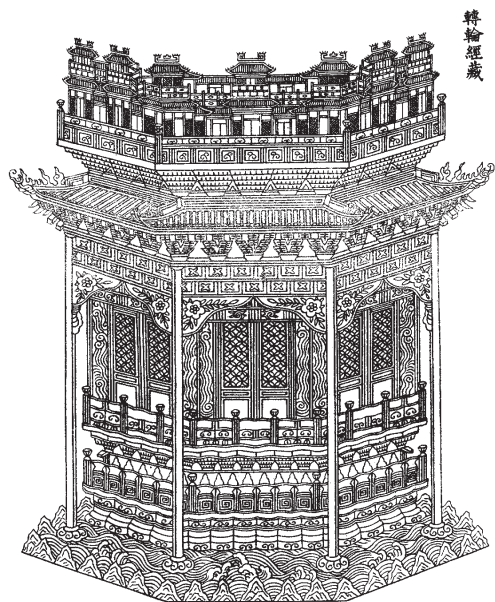


FIGURE I.4. YZFS illustration of a revolving sutra library (*juan 32:21b*)

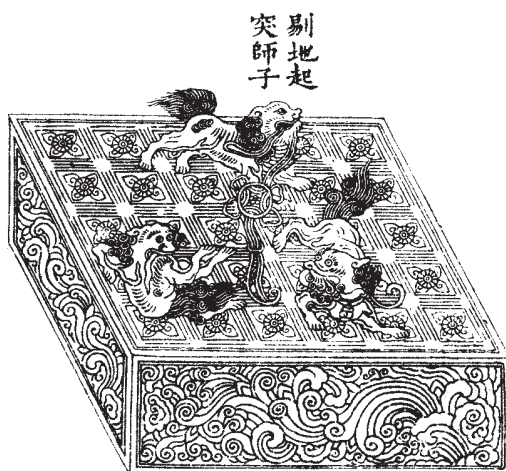


FIGURE I.5. YZFS illustration of a carved stone platform (*juan 29:7a*)



FIGURE I.6. YZFS illustration of wood-carving motifs (*juan 32:23a*)

fundamental construction technologies and tools, major architectural components, structural methods, and decorative arts including carving, tile decorations, and color-painting motifs (figures I.4–I.7). Such a complete record of building technologies and construction methods, with rich illustrations, is unprecedented in the history of imperial China.

Modern architectural historians and sinologists have been studying the YZFS since the early twentieth century but have focused on its technical content (see appendix 1 for details). The scholarship initially dealt with the textual transmissions and authorship and then advanced to the structural system and building methods recorded in the text. The approach has been to compare the textual content with the wood-framed structures and

details of the few extant buildings from that period. Although the scholarship has greatly furthered our knowledge of Song building technology and the Chinese architectural system, little has been said about the broader cultural value or implications of the work. In general, the *YZFS* has been seen primarily as a work of a technical nature.

However, the *YZFS* is by no means a purely technical text. Behind the detailed technical methods and government rules are distinctive cultural factors of contemporary building practice. Uncovering these cultural elements in the *YZFS* requires a different way of reading it.

A court official in the Directorate of Construction, Li Jie was also an erudite scholar, a book collector, and a prolific writer as well as a talented calligrapher and painter. According to the inscription on his tomb tablet, which was written by the scholar Cheng Ju 程俱 (1078?–1144) on behalf of a subordinate official under Li,⁵ Li produced books on diverse subjects, including geography, historical personages, paleography, musical instruments, horses, and board games. Notably, he studied some of the most influential classical works, including the *Shanhai jing* 山海經 (Classic of mountains and seas),⁶ compiled between the fourth and first centuries B.C.E., and the *Shuowen jiezi* 說文解字 (Explanations of words) from the second century C.E. As a scholar oriented toward the classical tradition, he painstakingly searched for the norms and orthodoxy in the historical tradition when he was writing the *YZFS*. Despite the imperial order of producing a practical treatise, he engaged in a textual review of architectural

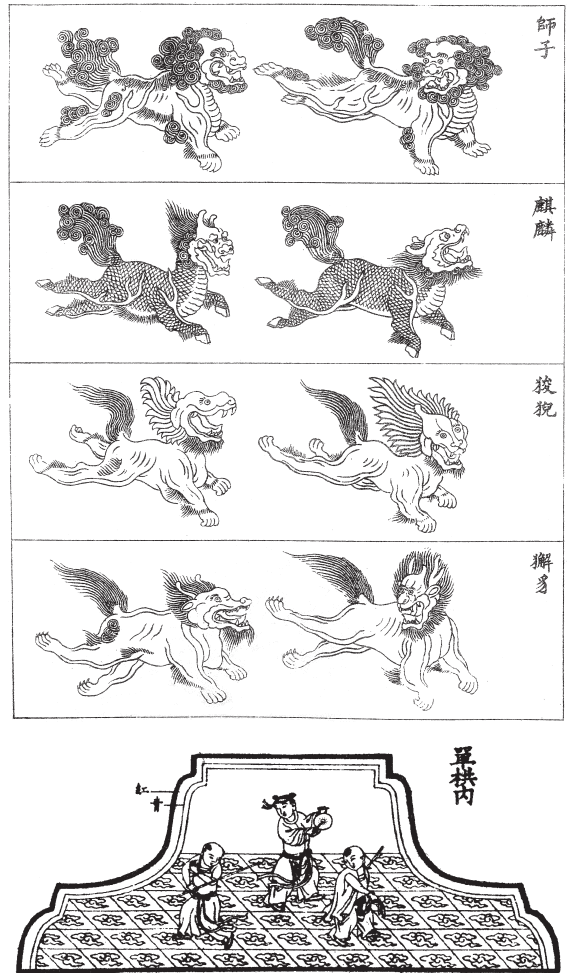


FIGURE 1.7. *YZFS* illustrations of the color-painting system: (top) decorative motifs: auspicious beasts (*juan* 33:11b); (above) color painting on the filling board between two bracket sets, featuring frolicking boys (*juan* 34:4a)

tradition on fundamental principles, technologies, and terminology. By tracing contemporary building methods back to precedents in the classics and earlier authoritative texts, he claimed the legitimacy of the building standards he was presenting to the court and to all readers in society. This scholarship on classical architectural texts and terminology makes the *YZFS* a unique literary work on architecture.

In the quest for classical and orthodox roots for the dynasty's building standards, Li confronted the challenge of traditional sources coming into conflict with contemporary practical knowledge. Understanding Li's manner of handling such conflicts casts light on the Chinese literati's attitudes toward their cultural heritage and how they treated, absorbed, and carried it forward while introducing novel elements of their own times.

In formulating the state building standards, traditional texts were only one type of source for Li's work. As he indicates at the beginning of the *YZFS*, he organized useful building principles and specialized methods both by tracing the textual tradition in architecture and by "ordering" craftsmen to explain the technical methods and elements item by item. Among the total 3,555 entries of the text, 3,272 came from oral accounts of craftsmen while 283 entries were found in traditional texts. After setting down what craftsmen described and demonstrated to him, he consulted with his colleagues and subordinates, who were also scholars and must have had some experience of building construction just like himself.⁷ So the material presented in this work is original: a combination of textual tradition, verbal accounts from craftsmen, and Li's own reexamination and synthesis of the material.

It is important to understand the relationship between Li and the craftsmen he conferred with. On the one hand, these craftsmen were working under Li's superintendence, receiving his instructions for the construction; on the other, those craftsmen played an important role in assisting Li's completion of the *YZFS*. According to Li's tomb tablet, he had been working in the Directorate of Construction for eight years when he received the imperial order to write the *YZFS* (in 1097): "The rules for examining a structure as sturdy or not, the methods of constructing buildings, and the application of a carpenter's weight strings and ink marks, all had been understood clearly [by him]" (堅窳之制、堂構之方、與繩墨之運、皆已了然於心).⁸ It seems, then, that he was quite experienced in construction practices and knew a lot about architectural procedures. Nonetheless, he had craftsmen explain in detail what they knew and what they used in practice. Apparently, he found his own knowledge of

architecture insufficient and realized that he must turn to craftsmen for greater knowledge. Li organized, reexamined, and probably revised this professional knowledge and made it available to the whole country. As he intended the *YZFS* to be, this summarized knowledge in turn raised the level of building knowledge of court and local officials, men of letters, and craftsmen who read the *YZFS* or learned of its contents indirectly.

Li's acquisition of practical building knowledge from those who were constructing the buildings suggests a fascinating cultural phenomenon: there was active communication and cooperation between the two social classes of the literati and craftsmen, or the learned and the "unlearned" as commonly defined. One wonders if such communication was typical during the Song dynasty or in the entire premodern time. More generally, how did the different social groups interact with one another in the domain of architectural knowledge? Was it a unilateral communication in which scholars expanded their technical knowledge by conferring with craftsmen, as Li Jie did, or did craftsmen also consult with scholars about how to improve their work? Did scholars offer advice to craftsmen? And who was responsible for the invention of new knowledge? Did they share architectural knowledge and professional vocabulary in general? How did they depend upon and benefit from one another?

Since the technical methods in the *YZFS* are claimed to have come mostly from craftsmen's mouths, it is of interest to observe how the original practical knowledge of craftsmen was preserved in Li Jie's reworking of it. To what extent did the *YZFS* conserve popular customs and cultural elements transmitted by craftsmen and builders? For one thing, Li seems to have acquired from the craftsmen a system of specialized language: technical phrases and terminology. In the oral communication between craftsmen, it was such specialized language that was used to deliver technical substance. In the production of this language, the specific social and cultural environment to which it was exposed must have left a mark on it.

The craftsmen working under Li's supervision and serving imperial building projects must have been skilled ones recruited from different districts. Being mutually understandable among them and widely accepted in the profession, the specialized language must have had commonly recognized architectural concepts embedded in it, either traditional concepts or newly popular ones. These concepts were either expressed directly, in straightforward language, or made more complex with hidden meanings.

In particular, architectural terminology provides strong evidence of cultural encounter. When an architectural term or phrase came into being,

the words used in it—consisting usually of two or three characters, sometimes more or fewer—had to possess meanings that made sense architecturally. Specific words were chosen to describe specific building methods, structural forms, and individual elements. Sometimes the words represent structural functions or positions straightforwardly; but other times they denote structural and physical appearances metaphorically. The meanings of the words may be ambiguous, offering a challenge to later generations to interpret and understand them. In any case, naming a specific building method or element must have reflected how the technical feature was perceived. Analysis of the characters and words in the architectural terms can reveal ancient Chinese conceptions of architecture and the distinctive social and cultural settings behind them.

The professional terminology of the *YZFS* combines three kinds of language: (1) straightforward technical terms; (2) popular, sometimes vulgar, vocabulary; and (3) refined literary language. We must ask how the combination of different kinds of language developed and who were responsible for it. Did terms of vulgar language simply belong to builders and craftsmen while those of literary grace were produced by scholars or conceived by Li Jie? Did craftsmen and literati ever share this architectural vocabulary in their respective professions—the building trades and architectural scholarship? An inquiry into the semantic meaning of the words used in these terms will help trace their sources. Such an inquiry is needed to classify the technical terms and see if they were systematic, and if so, who created this systematic terminology and why.

In Western scholarship on architectural nomenclature, Robert Willis commented on the workmen's natural tendency to name things metaphorically. He explained that "this practice is easily accounted for, since these men, being unlearned, have more acquaintance with things than with the combinations and derivations of words."⁹ This explanation, however, does not always reflect historical reality, and it does not apply to some periods of ancient China, including the Song. In Chinese history, the Song dynasty was associated with an extraordinarily brilliant culture and unprecedented prosperity in literary, artistic, scientific, and technological creations. The court adopted new techniques of governance by vigorously developing culture and education while discontinuing military promotions. Such a national policy not only stimulated the literati's acquisition of greater learning but also encouraged the general population to become literate and obtain education. As a consequence, literature and poetry as well as art flourished as never before, and people of

all levels of social status enjoyed fine poetry, either as composers, readers, reciters, singers, or auditors.

When workmen and craftsmen in such a culturally brilliant society as Song China were brought up with a moderate knowledge of culture or a certain degree of literacy, it could make a difference in their practice of naming technical things. They were acquainted not just with things but also with the combinations and derivations of words, and they could employ refined and poetic language when identifying technical elements. The naming then became more sophisticated and had a greater potential to turn a set of technical nomenclature into a systematic one, bearing certain popular cultural concepts. Such a metaphorical system would not have been “easily accounted for,” and those who invented or developed this system, be they craftsmen or scholars or both in cooperation, would have had more intellectual capacity than the “unlearned.”

It is because of the superior place of the *YZFS* in the history of Chinese architecture and culture that I have undertaken this study. I have employed a philological approach to the subject in order to explore the abundant and unique cultural implications in the architectural terminology of the *YZFS*. I analyze Li Jie’s textual strategy and examine the relationship between tradition and innovation. I argue that the *YZFS*, from its format to its content, represents both the absorption of tradition and an adjustment to contemporary needs as well as innovations in technical writing. Furthermore, I look at the semantic meanings of the architectural terms that appear in various chapters, mainly the terms for bracketing, from the major carpentry system, since this is the most striking feature of Chinese architecture of the period. I pay special attention to the cultural relevance underlying the technical nomenclature.

Investigating the origin of the bracketing terminology of the *YZFS*, I consider what kind of language was used and who employed the specific words for identifying its structural or physical features. In addition, I ask to what extent the terminology is systematic in relation to architectural procedures and if there are systematic patterns of meaning or intention. As this study will reveal, a remarkable number of terms for bracketing in the *YZFS* were drawn from botanical nomenclature, especially tree and flower terminology. These bracketing terms cover individual bracketing elements, composite units, and methods for combining individual elements. I have found a systematic architectural metaphor underlying this terminology: bracketing elements are frequently likened to flowers, petals, branches, sprays, and leaves, and a whole bracket set is likened to a cluster of flowers.

With the aid of contemporary literary texts, I propose that in tenth to twelfth century China, both craftsmen and literati perceived bracket sets as flowers and flowering trees. Evidently there was a prevailing notion at the time that pillars and brackets were arrayed like groves of trees bearing lush clusters of blossom. I trace the tradition of this botanical nomenclature of bracketing and this distinctive architectural conceptualization back to early China.

In addition to this specific architectural imagery, I discuss more generally the impact of literature and the arts on the creation of architectural terminology and the relationship between craftsmen and literati in this domain. In the *YZFS*, some terms use particular words that make sense architecturally only when related to the specific terms that were used in the practice of lyric-poem compositions during the tenth to twelfth centuries. Examples can also be found in the bracketing terminology. Inquiring into the interaction between learned society and craftsmen, I argue that craftsmen themselves also employed their literary knowledge in the naming of particular architectural elements such as bracketing. This reflects the exceptionally brilliant culture and prosperity of literary creation during the Song period. Moreover, some architectural terms in the *YZFS* borrow words for particular styles of art that were prevalent in contemporary painting and sculpture. All these phenomena indicate an active interplay of literature, arts, and craftsmanship in Song China. They also suggest cooperation between the learned and the “unlearned” and shared architectural vocabulary and building knowledge during this period. The interrelationships between craftsmen and scholars played an important role in the construction of the knowledge field of architecture in premodern China.

Chapter 1 of this work examines the historical tradition of architectural literature prior to the *YZFS*, with an emphasis on the pre-Qin and Han periods. Materials from this early period were given a preference over those of later times by Li Jie. Chapter 2 discusses the rise of practical building manuals at the beginning of the Northern Song and how architectural knowledge presented in writing became an ideal. It also treats the overall social, intellectual, and technological environment that nourished the Song production of widespread architectural knowledge—the *YZFS* in the end. Chapter 3 further discusses the imperial patronages and social setting of the compilation of the *YZFS* and how Li Jie sought classical and orthodox roots for the state building standards he was formulating. In addition, the faithfulness of written architectural knowledge to the reality is examined, which shows that Li’s pursuit of the classical tradition was consistent with his examination of the legitimacy of the practical methods.

The rest of the book shows how the architectural knowledge Li Jie presented in the *YZFS* reflects distinctive cultural phenomena and popular architectural concepts shared by craftsmen and literati, and how practical knowledge of architecture and the literary tradition among the Chinese resonated in Song times. Chapter 4 collects architectural terms for bracketing in the *YZFS* that employ botanical nomenclature and identifies their meanings. These terms cover the most fundamental elements and construction features of a bracket set and form a powerful metaphorical system in which bracketing elements are analogized to flowers and trees. Turning to contemporary and earlier literary sources, this chapter reveals that the craftsmen and literati had the same perception of bracketing and that such a perception reflects a distinctive architectural conceptualization. Chapter 5 looks into some architectural terms that have a close connection with literature and arts, investigates scholars' architectural knowledge, and argues for Song craftsmen's literacy, showing the way that these two social groups cooperated in creating shared architectural vocabulary and knowledge.

1

The Historical Tradition of Writing on Architecture

From Antiquity to the Mid-Tenth Century

Your subject learned that “[the sages built palaces and chambers] with a ridgepole at the top and eaves below [in order to attend to the wind and rain],” [which way of building,] in the *Classic of Changes*, corresponds to the time [and divinatory symbol] of “Great Maturity.” [Your subject also learned that] “the positions [of buildings] must be adjusted right and the cardinal directions be determined correctly,” [which,] in the *Rites of the Zhou*, indeed is a ceremony of [establishing a state in] peace (臣聞“上棟下宇”、《易》為大壯之時；“正位辨方”、《禮》實太平之典).

Li Jie, “Jin xinxiu *Yingzao fashi xu*”¹

This is how Li Jie begins his preface to the *YZFS*, which served to present the work to the imperial court. He cites two of the most esteemed Confucian classics, which were attributed to kings and nobles of the Zhou (mid-eleventh century–256 B.C.E.), one of the most powerful dynasties in Chinese history. One of these writings was the *Yi* 易 (Changes), later known as the *Zhouyi* 周易 (Zhou’s [book of] changes) and the *Yijing* 易經 (Classic of changes). The second was the *Li* 禮 (Rites), which refers to the *Zhouguan* 周官 (Government posts of the Zhou), later known as the *Zhouli* 周禮 (Rites of the Zhou).² These classics recorded the art of divining

and the philosophy of life of the ancients, or rites and ceremonies of the Zhou dynasty. Li Jie used these two texts to demonstrate the fundamental principles of construction that had been practiced by ancient rulers who had succeeded in establishing a peaceful and powerful state. The building standards he formulated were based on these traditions of construction practice and architectural administration.

Referring to classical sources and relating them to contemporary society was a common practice in ancient Chinese writing. This reflects a characteristic of Chinese thinking in many spheres: preference for established precedents. In the practice of compilation, it was often the case that new works cited old texts, with their compilation format and contents more or less built upon previous texts. In the absorption of tradition, however, writers faced the challenge of incorporating it into contemporary social needs and introducing innovative elements. It is essential to understand the complex attitudes of Chinese literati toward possible conflicts between tradition and reality and how they accomplished the integration of both in their writings.

In the *YZFS*, Li Jie consults an extensive list of classical and earlier texts on architecture, especially those involving fundamental technologies and principles of construction. In the beginning section of the *YZFS*, “Kanxiang” 看詳 (Examination of details), he frequently quotes those essential texts and indicates that he is following the building principles recorded in classical texts. Furthermore, in the first two chapters, collectively titled “Zongshi” 總釋 (General explanations), he engages in a textual study of architectural terminology and traces the evolution of major technical terms from classical sources to his time. To understand how Li Jie dealt with the relationship between traditional theories and contemporary practice, it is necessary to investigate the previous architectural writings that were available to him. A historiographical study of earlier architectural literature follows.

Pre-Qin and Han Architectural Literature

Incidental Evidence in Classics and Philosophy

Extant Chinese architectural literature from before the Qin period (221–206 B.C.E.) is sparse. During the unprecedented destruction of classics under the directive of the First Emperor of Qin (r. 221–210 B.C.E.), practical texts, such as those on medicine, divination, and horticulture, were exempt from destruction (“所不去者、醫藥、卜筮、種樹之書”).³ Books on building

methods, if any, would also have been exempt. Therefore, the sparseness of architectural materials probably reflects the actual state of architectural writing at this early time.

In the pre-Qin works that were rediscovered, collected, or further compiled during the Han dynasty (206 B.C.E.–220 C.E.), scattered mention of architecture can be seen mostly in texts recording or explaining Zhou-dynasty rites and ceremonies and in the political and historical documents attributed to the Three Dynasties—Xia (ca. twenty-first to sixteenth centuries B.C.E.), Shang (ca. sixteenth to mid-eleventh centuries B.C.E.), and Zhou. Literary works on the history of the rise and expansion of the Zhou also contain references to architecture. Many of these texts have been esteemed since the Han dynasty as essential Confucian classics. These works include the *Yijing*, the *Zhouguan* (or *Zhouli*), and two other fundamental ritual texts: the *Yili* 儀禮 (Rites and ceremonies) and the *Liji* 禮記 (Record of rites). They also include the *Shangshu* 尚書 (Book of documents), also known as the *Shu* 書 (Documents) or the *Shujing* 書經 (Classic of documents), the earliest and most authentic record of government affairs of the Three Dynasties, and the *Yi Zhoushu* 逸周書 (Noncanonical Zhou documents), the materials sifted out from the *Zhoushu* 周書 (Zhou documents; included in the *Shangshu*). In addition, the *Chunqiu Zuozhuan* 春秋左傳 (Zuo's [Zuoqiu Ming 左丘明, fifth century B.C.E.] commentaries on the *Spring and Autumn Annals*), the oldest historical narrative of China, and the *Shijing* 詩經 (Classic of odes), the earliest anthology of poetry in China, also provide us with information on architecture.⁴ In these texts, references to architecture occur only as incidental inclusions in passages or lines explicating ritual activities or narrating historical events. As many ceremonies and events took place in palaces, ancestral shrines, or other ritual buildings, descriptions of the rites and activities often made reference to architectural locations and layout, and, in certain cases, also to building principles, processes, noted size, primary structural features, and architectural nomenclature.

Let us take first the *Yili* and the *Shangshu* as examples. None of the *Yili*'s seventeen chapters is devoted to architecture. Rather, architectural notices are mingled among other details in discourses on ceremonies. These allusions enable scholars of later generations to trace the tradition of early-period architecture. For instance, the chapter "Xiang yinjiu li" 鄉飲酒禮 (The rites of the district symposium)⁵ includes the stipulation "Place washing utensils to the southeast of the eastern stair" (設洗于阼階東南),⁶ which indicates that important buildings at that time had two stairs at the front, an eastern one (*zuo* 阼) and a western one. The eastern stair of a hall

was where the master of ceremonies mounted the platform of the hall to hold a ceremony; the western one was for guests entering or leaving the hall. This architectural layout and the functions of the two stairs are further reflected by stipulations in other sections of the *Yili*. The chapter “Dashe yi” 大射儀 (The rites of the [state] grand archery meet) includes the following directions:

The guests step down [from the hall] and stand to the west of the western stair, facing the east. The ushers follow the order [of the master] to let guests step up. The guests step up and stand at the western interior wall, facing east (賓降立于西階西、東面。擯者以命升賓。賓升立于西序、東面).⁷

This instruction also indicates that inside a great palatial hall there were two partitions called *xu* 序.

Similarly, no chapters of the *Shangshu* are focused on architecture, but information of the general layout and architectural compositions of a palatial compound can be found in its accounts of significant ceremonies. For example, in its “Guming” 顧命 (The testamentary charge, presiding over the accession [of the king’s heir]) section that describes the obsequies for King Cheng 成王 (r. 1042/35–1006 B.C.E.)⁸ and the ceremony of ascending the throne by King Kang 康王 (r. 1005/03–978 B.C.E.), the text incidentally portrays some basic architectural characteristics of the ancestral shrine of the Zhou where these ceremonies took place. The following passage frequently refers to the built environment of the shrine through its descriptions of the display of ceremonial objects there:

狄設黼辰、綴衣。牖間南嚮、敷重篋席……西序東嚮、敷重底席……東序西嚮、敷重豐席……西夾南嚮……漆仍几。胤之舞衣……在西房。兑之戈……在東房。大輅在賓階面、綴輅在阼階面、先輅在左塾之前、次輅在右塾之前。⁹ The salvage men set out the screens ornamented with figures of axes, and the tents. Between the window and the door, facing the south, they placed the different mats of bamboo basketwork . . . In the side space on the west, facing the east, they placed the different rush mats . . . In the side space on the east, facing the west, they put the different mats of fine grass . . . Before the western side chamber, facing the south, [they placed] . . . the usual lacquered bench. The dance costumes of Yin . . . [were displayed] in the western apartment; the spear of Zhui . . . [was displayed] in the

eastern apartment. The grand carriage was by the guests' steps, facing the south. The next carriage was by the eastern steps, facing the south. The foremost carriage was in front of the left lobby; and the next carriage was in front of the right lobby.¹⁰

From this passage, scholars of later generations can be assured about the distinct functions of the two stairs of the hall, the *zuojie* 阼階 (eastern stair, for the master of the ceremony) and the *binjie* 賓階 (guests' stair, located in the west). It also clearly indicates that there were eastern and western partition walls (*dongxu* 東序 and *xixu* 西序) inside the hall, as reflected in the *Yili* and many other pre-Qin texts. Moreover, there were a few small rooms inside the hall (*xijia* 西夾 and therefore at least a *dongjia* 東夾 [eastern side chamber] as well). This passage also shows the layout of the shrine complex. There were two side apartments beside the shrine (*dongfang* 東房 and *xifang* 西房) and there was a gatehouse (*shu* 塾) in front of the shrine, which was divided into a left lobby and a right one. Overall, one can deduce that the facade of the Zhou-dynasty ancestral shrine faced south and that the shrine compound was very likely an enclosed yard, precisely like the compounds uncovered in archaeological excavations.¹¹

Apart from incidental information of architectural layout and composition, these classics also provide textual evidence of architectural and structural details of magnificent buildings in their stipulations or records of rituals and ceremonies. In the forty-nine-chapter *Liji*, architecture figures notably in its chapter 14, "Mingtang wei" 明堂位 (The positions in [the ceremony of] the Hall of Distinction).¹² The Mingtang was a significant structure in ancient royal ritual architecture in which the king held state ceremonies and granted officials an audience. The Zhou-dynasty Mingtang was received as a great tradition in the imperial architecture of succeeding dynasties, but its function has been variously interpreted in history. However, the *Liji* includes the following explanation: "明堂也者、明諸侯之尊卑也"¹³ (What was called Mingtang was [in which] to differentiate the superiors and inferiors of feudal dukes). As the great Han-period scholar Zheng Xuan 鄭玄 (127–200) commented, "this is where [officials] had an audience with the king, at which place ceremonies were carried out and order and degrees were distinguished" (朝于此、所以正儀辨等也).¹⁴

The following passage is one of the few in chapter 14 of the *Liji* that concentrates on architectural description:

大廟、天子明堂。庫門、天子皋門。雉門、天子應門……山節藻梲、復廟重簷、刮楹達鄉、反坫出尊；崇坫、康圭、疏

屏、天子之廟飾也。¹⁵ The great temple corresponded to the Hall of Distinction of the Son of Heaven, the Ku (Treasury) gate to the Gao (Tall or enceinte) gate of the Son of Heaven, and the Zhi (Crenellated) gate to the Ying (Reception) gate of the Son of Heaven . . . [The palaces were distinguished by] the mountain-shaped brackets [on the columns] and the painted short posts [above the beams], the two stories and double eaves, the polished [wood] columns and the wide-open windows, the earthen stand on which the cups [after being used in the ceremonies] were placed, the high stand on which the jade tokens were displayed aloft, and the lightly carved screen. [All were just like] the ornaments of the temple of the Son of Heaven.¹⁶

Here, a group of architectural terms succinctly describes the architectural layout of palatial gates and the structural and stylistic features of the grand temple of the district of Lu 魯 (modern Qufu 曲阜 of Shandong). For pre-Qin architecture the text reveals the following: mountain shape of the bracketing (*shanjie* 山節),¹⁷ primitive polychrome features on the wood-framed structure (*zaozhuo* 藻栒, painted short posts), refined surface of major structural components (*guaying* 刮楹, polished columns), and the existence of two-storied structures (*fumiao* 復廟) with multiple eaves. Nevertheless, the architectural description is subsumed under the main subject of the chapter, namely the ritual orders and practices taking place inside and around the buildings.

Passages with an elaborate description of architectural details are contained in other pre-Qin classical texts as well. The *Yi Zhoushu* includes a document entitled “Zuo Luo” 作雒 (洛) (The making of Luo [modern Luoyang]) that depicts the historical events of the construction of the Zhou’s capital city by Duke Zhou (Zhougong 周公, in power 1042–1036 B.C.E.).¹⁸ In describing the common features of the palaces in the capital, the text comprises the following passage:

咸有四阿、反坫、重亢、重郎、常累、復格、藻栒、設移、旅楹、春常、畫旅、內階、玄階、堤唐、山齋……¹⁹ [They] all had hip roofs, eaves bending upward, overlapped purlins, two-storied structures, string nets [under the eaves], layers of brackets, decorated short posts, corridors of side halls, lines of columns, painted coffers, screens ornamented with ax motifs, reception stairs, black stone stairs, a path in the central yard, [and] walls painted with mountains . . .²⁰

This description yields further detailed evidence of the architectural style, the overall level of the wood-framed structure, the architectural decorations, and the interior furnishings of Zhou palaces. From the “decorated short posts,” as seen in the *Liji* as well, to the “painted coffers” (*chongchang* 春常), the text implies that many of the architectural elements of Zhou palaces were well ornamented. Color painting on the surface of timber structures indeed developed thereafter into a primary decorative art in Chinese architecture. In addition to the *fumiao* as seen in the *Liji*, the *chonglang* 重郎 (two-storied structures) here further confirms that two-storied wood-framed buildings represented a typical form of palatial architecture during the Zhou period. Moreover, all the palaces in the capital were of hip roofs (*si'e* 四阿) and upward-bending eaves (*fandian* 反坫), which also indicates the most prominent features of magnificent buildings at that time. The hip roof represents the highest class of the form for roofs in Chinese building tradition, and one can now trace this tradition at least back to the Zhou period. The overlapped purlins (*chongkang* 重亢) reflect that the Zhou palaces were built in a comprehensive system of wood-framed beam structure. In this system, the wood frame is raised by the two eave columns (one at the front and the other at the rear)—and often interior columns as well—and multiple layers of horizontal transverse beams that support longitudinal purlins at different levels (figure 1.1). From the mention of “layers of brackets” (*fuge* 復格), it can be inferred that the bracketing already contained double-layered bracket arms as seen in the architecture from the Han period onward.

Most of the architectural forms and practical building methods reflected in this text not only persisted and further developed in later high-class architecture but were also documented in literary writings and official records, although many of the terms changed. Even the string net under the eaves (*changlei* 常累), protecting against damage by nesting birds, is also described clearly in the *YZFS*, many centuries after this initial recording. The term changes, however, to *hu dianyan queyanwang* 護殿簷雀眼網 (sparrow-eye [bamboo] net protecting eaves of a hall).²¹ In fact, tracing the textual history and classical tradition of the contemporary building methods and terminology was one of the major tasks that Li Jie endeavored to accomplish in compiling the Northern Song building standards.

Incidental mentions of architecture in these classics also reveal some essential architectural principles that were carried out by pre-Qin kings and nobles. They reflect contemporary architectural administration and fundamental building technology and were perceived as a vital part of the

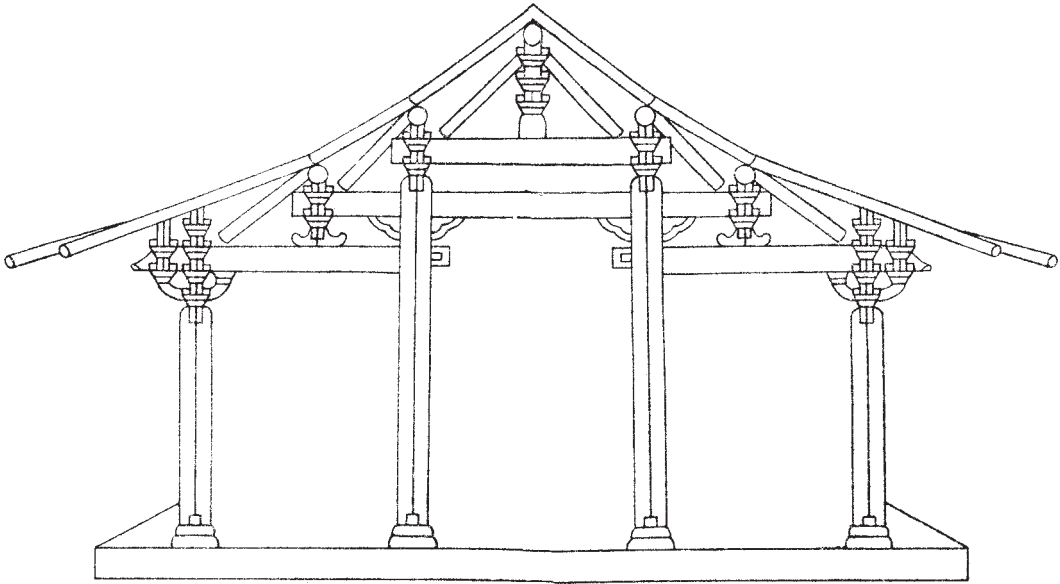


FIGURE 1.1. *YZFS* illustration of a six-rafter-span wood-framed structure (*juan* 31:20a-b): transverse beams support longitudinal purlins at different levels

architectural tradition throughout Chinese history. As partly cited in the *YZFS*,²² the first words in the beginning chapter of the *Rites of the Zhou* read as follows: “惟王建國、辨方正位”²³ (When a king established a state, [he ordered that] the cardinal directions be determined and that the positions [of buildings] be adjusted correctly). This reflects a significant notion of constructing states, cities, and buildings during the pre-Qin period: of all the procedures related to construction, the first was to determine the four cardinal directions and adjust the structural positions. This notion of construction was regarded as a ceremony of establishing a peaceful and powerful state in the succeeding dynasties. In construction practice, this essential procedure required the employment of specific methods and technologies for orientation. At that time, the four directions were determined by observing the shadow of the sun in daytime and the North Star at night. This practice is also reflected in pre-Qin classics, such as the poem “Ding zhi fangzhong” 定之方中 ([Build palaces by] determining the cardinal directions) in the *Classic of Odes*, which includes the line “揆之以日”²⁴ (observe and measure the sunlight [at sunrise and sunset in order to determine east and west]). In examining traditional technologies of orientation, the *YZFS* repeatedly cites both this text and the historical commentaries on it,²⁵ in which the word

ding 定 has two meanings: to construct buildings, or the “*ding* star” that was used together with the North Star to determine south and north. Although the notion of determining directions and adjusting positions as a primary procedure for construction is expressed only briefly in these texts, it had a profound impact upon the long building practice thereafter.²⁶

Another work in the *Shijing* anthology of poetry, entitled “Mian” 綿 (Successiveness), which depicts the growth of the House of Zhou, includes the following lines recounting how Gugong Danfu 古公亶父 (Ancient Duke Danfu) built residences for the Zhou on the plains inhabited by Zhou tribes:

乃召司空、乃召司徒、俾立室家。其繩則直、縮版以載。作廟翼翼。掄之陿陿、度之薨薨、筑之登登、削屢馮馮。百堵皆興…… [He] called his superintendent of public works/[He] called his minister of instruction/And charged [them] with building the houses/With the line [everything was made] straight/The frame boards were bound tight so as to rise regularly/[They] made the ancestral temple in its solemn grandeur/[Crowds] brought the earth in baskets/Threw it with shouts into the frames/[They] beat it with responsive blows/[They] trimmed [the walls] repeatedly, and sounded strong/Five thousand cubits of walls arose together . . .²⁷

In these lines, one finds incidental references to the *sikong* 司空 (superintendent of public works) and the *situ* 司徒 (minister of instruction), the leading government posts for construction during the pre-Qin period. This is not the only text among pre-Qin classics mentioning a construction ministry that took charge of state construction. Such a government system of architectural administration was institutionalized and further developed from the Qin to the Song periods. Li Jie himself served as an assistant superintendent of the imperial Directorate of Construction (Jiangzuojian 將作監) while he was writing the *YZFS*. At the beginning of his preface, he specifically looks back to the government posts of construction of the pre-Qin and Han periods, treating them as an essential tradition in architectural administration: “共工命於舜日、大匠始於漢朝”²⁸ (The post of state supervisor of all craftsmanship [*gonggong* 共工] was appointed in the time of Shun 舜 [an ancient king], and the post of greatest craftsman of the state [*dajiang* 大匠] originated in the Han dynasty).

This poem also describes the processes of erecting a building by employing the technology of ramming the earth between boards. Termed

banzhu 版築 (boards and mallets, ramming between boards) in the Confucian text *Mengzi* 孟子 (Mencius, thoughts of Meng Ke 孟軻 [ca. 372–ca. 289 B.C.E.]),²⁹ this technology is characterized by the use of wooden frame boards (*ban* 版) within which the earth is tamped down layer by layer with mallets (*zhu* 築) until the rammed-earth foundation or wall is made to the desired height (figure 1.2).³⁰ As one of the oldest architectural traditions in China, it had been in practice as early as the late Neolithic period and early Bronze Age³¹ and was still in use during the Northern Song period. The *YZFS* includes detailed processes and standards for building rammed walls and foundations in the system of *haozhai* 壕寨 (moats and fortifications),³² and pre-Qin and Han texts that mention rammed-earth technology and practices are cited as the theoretical basis for these standards.³³ The standards include such technical details as the proper amount of earth and that of smashed tiles and broken bricks to be mixed with it, as well as the number of mallet blows for each earth pit. The following lines, for instance, stipulate the thickness of each layer of earth

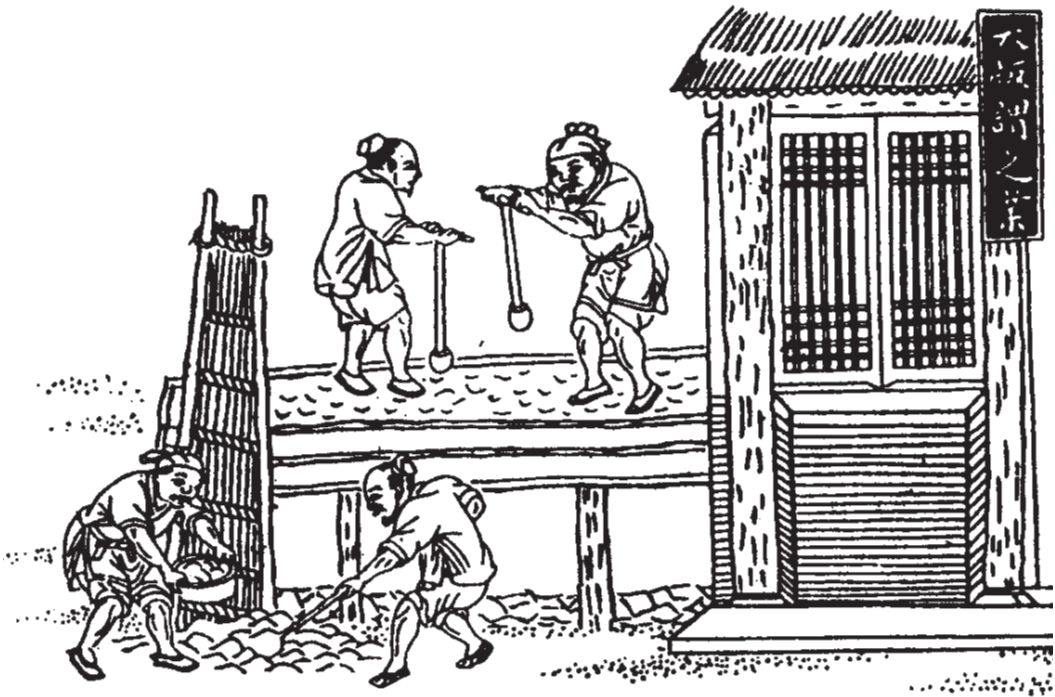


FIGURE 1.2. Illustration of rammed-earth technology in the *Erya yintu* (illustrations attributed to Song-Yuan artists)

to be rammed and its thickness after having been rammed: “每布土、厚五寸、築實、厚三寸。每布碎磚瓦及石札等、厚三寸、築實、厚一寸五分”³⁴ (Whenever earth is put in, [let each layer be] five *cun* thick, tamp it down, and make it three *cun* thick. Whenever putting in smashed bricks, broken tiles, rubble, and the like, [let each layer be] three *cun* thick, tamp it down, and make it one and a half *cun*).

Also in the *Shijing*, the poem “Sigan” 斯干 (Assorted banks)³⁵ includes vivid depictions of the appearance of magnificent buildings. It has been considered by many commentators to be a narrative on the construction of palaces by King Xuan 宣王 (r. 827/25–782 B.C.E.) of the Zhou. In the following lines, the magnificence of the individual palace or, more likely, a symbolic one in a palatial complex, is evoked vividly through metaphoric images:

如跂斯翼、如矢斯棘、如鳥斯革、如翬斯飛、君子攸躋。
 [With its steady structure] like a man on tiptoe, in reverent expectation / [With its straight ridges] like arrows flying rapidly / [With its extended eaves] like a bird [hovering] on balanced wings / [With its multicolors of elements] like a pheasant in flight [exhibiting its beauty] / [The palace is] where our noble lord will ascend.³⁶

As brief as these lines are, such metaphoric imagery affected the way that people perceived magnificent architecture and striking architectural elements in later periods. A famous rhapsody of the Three Kingdoms period (220–280), the *Jingfudian fu* 景福殿賦 (Rhapsody on the Hall of Great Blessings) by He Yan 何晏 (190–249), depicts the imperial palace (built in 232) of Emperor Ming 明帝 (r. 227–239) of the Wei 魏 (220–265) in Xuchang 許昌. It includes a phrase that reads “*fei'ang niaoyong*” 飛昂鳥躡 (flying cantilevers flitting like birds),³⁷ in which cantilevers—a bracketing element—are likened to flying birds. Li Shan 李善 (d. 689), a Tang (618–907) commentator on this rhapsody, glosses this metaphoric imagery in a more prosaic way: “飛昂之形、類鳥之飛” (The appearance of a flying cantilever resembles a flying bird). It is not absolutely clear whether Han and Tang builders indeed characterized a cantilever in the same way as the rhapsody composer and the literary commentator did. However, there is no doubt that the perception of a cantilever as a flying bird was rooted in the minds of Han and Tang literati. Such metaphoric imagery in pre-Tang literature was accepted during the Song dynasty. The *YZFS* not only lists this literature as traditional architectural sources on the cantilever

but also includes the term “flying cantilever” (*fei'ang* 飛昂) as one of the standard terms of this striking bracketing element.³⁸ When such metaphoric imagery met with a culturally brilliant and flourishing literary society such as the Song, it was elaborated much further, and a variety of architectural metaphors emerged in Song architectural terminology.³⁹

Pre-Qin philosophical classics provide useful information on contemporary or earlier-period architecture as well. In the discourses on their philosophies of life and theories of state administration, pre-Qin thinkers sometimes discuss essential principles related to the construction of cities, use common architectural principles as examples of their philosophical doctrines, or criticize contemporary rulers' lives of luxury by comparing their resplendent palaces with those simple and unadorned ones of earlier, sagacious kings. For example, the *Mozi* 墨子 (Micius, pacifist philosophical text attributed to Mo Di 墨翟 [fl. 400 B.C.E.]) includes an essay titled “Bei chengmen” 備城門 (Preparing city gates).⁴⁰ In its discourse on the political proposition of opposing wars of aggression, this essay discusses principles of defensible cities, including the establishment of important structures around the city gates and along city walls, such as *houlou* 候樓 (or 埃樓, watchtowers) and *lu* 櫓 (overhanging uncovered watchtowers). Another essay in this work, entitled “Yifa” 儀法 (Rules), expounds the importance of rules to the governance of a state. It uses essential principles of craftsmanship as an example:

天下從事者不可以無法儀……雖至百工從事者、亦皆有法。百工為方以矩、為圓以規、直以繩、[衡以水]、正以縣[懸]。無巧工不巧工、皆以此五者為法。⁴¹ All people under heaven who engage in work cannot [do it] without rules . . . Even the hundred artificers who engage in work all have rules as well. The hundred artificers make a square with the carpenter's square, make a circular form with compasses, make a straight line with the carpenter's line marker, [make a horizontal element even with a water-level instrument], and make an erect element straight by suspending a weight string. There is no difference whether it is skilled craftsmen or unskilled ones, [as they] all follow these five principles as rules.

Here, the text points out the five principles of artisanship—carpenter's square (*ju* 矩), compasses (*gui* 規), line marker (*sheng* 繩), water-level instruments (*shui* 水 or *shuiping* 水平), and suspended weight string (*xuan* 縣, i.e., 懸). These basic principles of craftsmanship are often used by other pre-Qin

thinkers to illustrate their philosophical points as well. So important are these principles to the profession of construction that Li Jie treats them as the first entry of his “Kanxiang,” the beginning of the *YZFS*. There this *Mozi* text as well as other pre-Qin and Han texts are cited, including a text from the *Hanfeizi* 韓非子 (legalist philosophical text attributed to Han Fei 韓非 [ca. 280–233 B.C.E.]). Other philosophical classics, from the *Guanzi* 管子 (politico-philosophical text attributed to Guan Zhong 管仲 [d. 645 B.C.E.]) and the *Laozi* 老子 (Daoist text attributed to Lao Dan 老聃 [fl. sixth century B.C.E.]) to the *Zhuangzi* 莊子 (Daoist philosophical text attributed to Zhuang Zhou 莊周 [ca. 369–286 B.C.E.]), were all consulted by Li Jie in his compilation of the *YZFS*.

Specialized Sections in Technological Documents

Scattered architectural references like those above are typical of pre-Qin writings, probably with only one exception. That exception is a small section specifically on “architect-artisans” (*jiangren* 匠人) included in the *Kaogongji* 考工記 (Records of artificers⁴²), the earliest surviving compilation of texts on handicraft technology in China.⁴³ The *Kaogongji* records the trade in handicraft industries, which includes architectural technology, building methods, and principles of urban design. Its authors are unknown, but based on the dominant regional style of its language this text has been identified by scholars from the Song period onward as a work of the state of Qi 齊.⁴⁴ From its content and specific terms of measures for quantity, it has been identified more precisely as an official document of the Qi state.⁴⁵ Because the text clearly contains some methods for examining product quality, the *Kaogongji*, with its elaborate regulations, was likely compiled for the purpose of inspecting, evaluating, and maintaining the quality of handicraft production (of which architecture was considered a part).⁴⁶ The compilation of the work was undertaken during a period when society in China was undergoing a transition from the political unity, military might, and cultural brilliance maintained by the state of Zhou to a fragmentation of power, frequent warfare, and the breakdown of moral and cultural norms. Under these circumstances, an intention to recover, sustain, and perpetuate the ideal state system and social order of the powerful Zhou, including its technological and architectural practices, has also been identified by modern scholars as the social and political context for the official Qi compilation of the *Kaogongji*.⁴⁷

Having survived the Qin’s destruction of classics, this text was rediscovered during the Western Han (206 B.C.E.–25 C.E.) dynasty and

was added to the *Zhouguan* (title later changed to *Zhouli*), serving as its last chapter, “Dongguan” 冬官 (Winter offices, the government post in charge of trade), one of the six state posts of the Zhou dynasty.⁴⁸ From Han times on, as the *Zhouli* became one of the traditional Confucian classics, the *Kaogongji*, as a part of it, also received serious study by Confucian scholars like Wang Anshi 王安石 (1021–1086),⁴⁹ the great scholar and politician of the Northern Song who played a critical role in the state initiative of compilation of the *YZFS*.⁵⁰ During the Song period, there were many official and private publications of studies of the *Kaogongji*.⁵¹

The *Kaogongji* starts with a statement that the *baigong* 百工 (literally, “hundred artificers”) constitute a social status of the state, whose responsibilities are to examine the quality of materials and terrain and to manage materials for making objects and utensils (buildings included in a broad sense). It emphasizes that artificers must pay attention to four necessary conditions in order to follow the sage’s inventions of all good designs: these conditions are favorable climate, geographical conditions, good materials, and skillful technique. The text classifies all the artificers’ work into six major categories according to the types of materials or the nature of the techniques involved, among which the “work of managing timber” (攻木之工) is listed and elaborated first.⁵² Each category contains several detailed types of work. Under the category of timber work, which most concerns us here, the following seven types are listed and their respective technologies discussed: *lun* 輪 (wheels), *yu* 輿 (carriages), *gong* 弓 (bows), *lu* 廬 (timber elements of weapons), *jiang* 匠 (artisans), *che* 車 (chariots), and *zi* 梓 (ritual musical objects). Most closely related to architecture is the section on *jiangren* in association with the work *jiang*.⁵³ This section contains some 560 words, which is merely 8 percent of the whole *Kaogongji*. This terse text is significant because it is the earliest complete architectural text known in China.

The *jiangren* section treats the duties of craftsmen in three aspects: *jiangren jianguo* 匠人建國 (artisans building a state capital), *jiangren yingguo* 匠人營國 (artisans designing a capital city), and *jiangren wei gouxu* 匠人為溝洫 (artisans making ditches). The *jiangren jianguo* section contains only forty-three words, but the content is very important:

匠人建國、水地以縣（懸）、置槲以縣（懸）、眠（眊）以景（影）、為規、識日出之景（影）與日入之景（影）、晝參諸日中之景（影）、夜考之極星、以正朝夕。⁵⁴ [When] artisans build a state capital, a water-holding level instrument [is

used] to examine the level of the ground [chosen for the site of the building to be constructed] where poles [set up at the four corners] are straightened by ropes with weights hanging down; [and by examining the heights of the poles, the level of the ground is determined;]⁵⁵ a pole [also] is set up and straightened by ropes with weights hanging down, so as to observe shadows [of the sun]; a circle [centered at the pole] is drawn, and the shadow at sunrise and the shadow at sunset are marked [on the circle]; in daytime, the shadow at high noon is consulted, and at night, the North Star is observed, so as to adjust [and determine] east and west [as well as south and north].

This passage describes the first steps that an architect-artisan should take in planning and building a city: how to determine the earth level of a potential location of a city and then how to determine the four cardinal directions. As mentioned before, “determining the directions” (*bianfang* 辨方) and “adjusting the positions correctly” (*zhengwei* 正位) have been regarded as the most important things for proceeding with the construction of a state since the Zhou period. Although the *Rites of Zhou* and other pre-Qin texts mention this notion, only the *Kaogongji* provides detailed descriptions of the correspondent technology. In his explanation of these words of the above *Rites of Zhou* text, the Northern Song scholar Wang Anshi rephrased part of the language in the *jiangren jianguo* passage and its succeeding *jiangren yingguo* text, elaborating:

晝參諸日景、夜考諸極星、以正朝夕。於是、求地中以建王國。此之謂辨方。既辨方矣、立宗廟於左、立社稷於右、立朝於前、立市於後、此之謂正位。⁵⁶ In daytime, the shadow of the sun was consulted; at night, the North Star was observed, so as to determine east and west [as well as south and north]. Therefore, the center of the earth was sought in order to set up the king’s state, which is what “determining the cardinal directions” meant. After the cardinal directions were determined, [the king] built [his] ancestral shrine to the left [of his palace], built altars to the gods of the soil and grain to the right, built a royal court to the front, and built a market to the rear, which is what “adjusting positions” meant.

Wang Anshi further clarified the interrelationship between “determining the directions” and “adjusting positions”: the latter must

depend on the former. Architectural positions cannot be adjusted correctly if the four directions are not correctly determined, and therefore the ideal plans for positioning major buildings in the state capital, as the *jiangren yingguo* passage states, cannot be realized. In addition, Wang connected the fundamental technical process of determining the four cardinal directions with the ideology of a king's state or capital resting at the center of the earth. Such an ideology was often represented in pre-Qin Confucian classics and subsequent historical works. Since early times, this theoretical ideology indeed affected the way of Chinese thinking with regard to an idealized kingdom situated in the center of the world.

The water-holding level instrument and the method of determining the cardinal directions by observing the sun's shadow in the *Kaogongji* are the prototypes of those more advanced, comprehensive leveling and shadow-observing instruments that were developed in later times. The *YZFS* records and illustrates a set of those advanced instruments used in contemporary building practice, such as the *shuiping*, *zhenchi* 真尺 (rectifying ruler), *yingbiaoban* 景(影)表版 (a round board with a gnomon in the center to gauge the shadow of the sun), *wangtong* 望筒 ([North Star] observing tube), and *shuichi yingbiao* 水池景(影)表 (shadow-gauging water-holding board to rectify for the directions), in the entries on *quzheng* 取正 (determining the directions) and *dingping* 定平 (determination of level) (figures 1.3, 1.4).⁵⁷ Yet Li Jie clearly states that the building methods of determining the directions and level in his treatise were compiled “strictly” or “cautiously” (謹) on the basis of the *Kaogongji* (in addition to other pre-Qin classics):

看詳：今來凡有興造、既以水平定地平面、然後、立表測景、望星、以正四方。正與經傳相合。今謹按《詩》及《周官·考工記》等修立下條。⁵⁸ Examination of the details: Nowadays, whenever there is construction [ongoing], [builders] are already using a water-holding instrument to determine level, and after that, [they] set up poles to observe the shadows [of the sun]; [they also] observe the North Star in order to determine the four cardinal directions. [This practice] precisely conforms to [the records in] the classics and historical texts. Now [your subject] strictly writes the next entry [the system of determining the directions] by following the *Classic of Odes* and the “*Kaogongji*” section of the *Government Posts of the Zhou* and other texts.

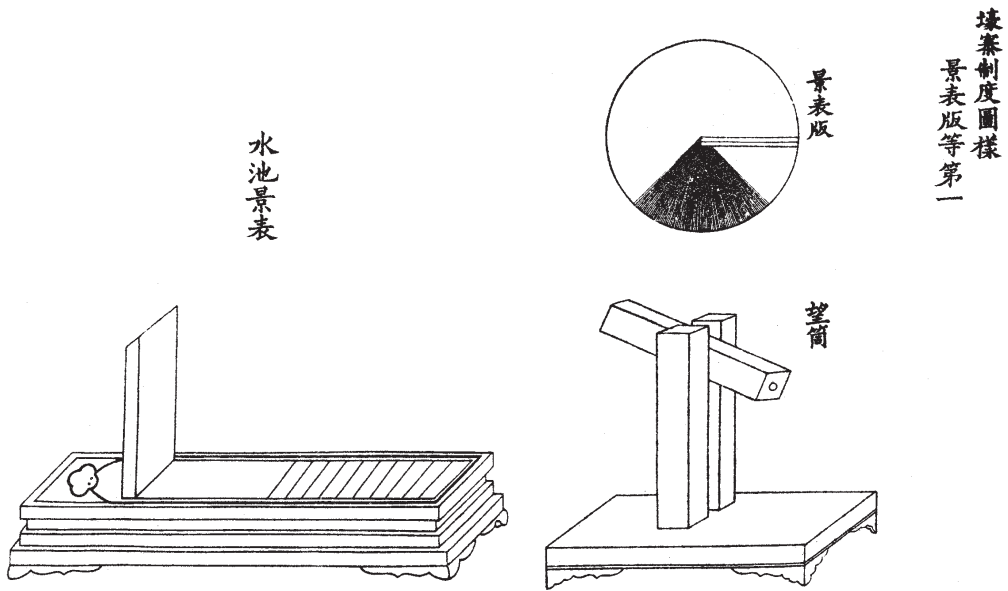


FIGURE 1.3. YZFS illustrations of orientation technology (*juan* 29:2b-3a): (left) shadow-gauging water-holding board (*shuichi yingbiao*); (right) tube (*wangtong*) for observing the North Star and shadow-gauging board (*yingbiaoban*)

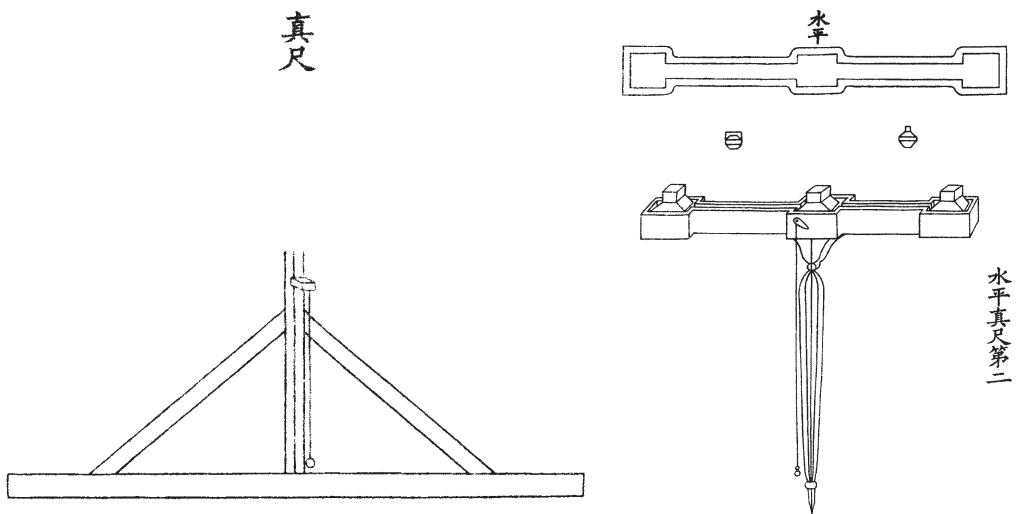


FIGURE 1.4. YZFS illustration of leveling technology (*juan* 29:3b-4a): (left) rectifying ruler (*zhenchi*); (right) water-holding instrument (*shuiping*)

看詳：今來凡有興建、須先以水平望基四角所立之柱、定地平面、然後、可以安置柱石。正與經傳相合。今謹按《周禮·考工記》修立下條。⁵⁹ Examination of the details: Today, whenever construction occurs, it must be [the case] that [builders] first use a water-holding instrument to observe the columns set up in the four corners of the base, [so as to] determine the level of the ground, and then [they] can install the stone base of the columns. [This practice is] exactly commensurate with [the records in] the classics and historical texts. Now [your subject] strictly compiles the next entry [the system of determining level] by following the “Kaogongji” section of the *Rites of the Zhou*.

Here, Li Jie repeatedly stresses the consistency between classical architectural tradition and contemporary building methods. Indeed, in other entries of the “Kanxiang” such an identity is emphasized as well.⁶⁰ Obviously, he positions his discussion of practical building technologies within a proper tradition. On the one hand, we thus know that he strove to find traditional sources to assist his determinations of the “standard” technical methods he presented to the court; on the other, it is also clear that some practical building technologies during the Song period had departed far from pre-Qin and Zhou models. It must have been a challenge for him to manage to convince the court and prospective users of his treatise with the coherence between the discourse on practical methods and the classical tradition.

The next two aspects of the craftsmen’s duties account for the main body of the *jiangren* section. The *jiangren yingguo* passage first sets out the standard urban design of a capital, which produced a theory of urban planning of significant historical influence:

匠人營國、方九里、旁三門、國中九經九緯、經涂九軌。左祖右社、面朝後市、市朝一夫。⁶¹ When artisans designed a capital city, [they made the city] nine *li* long and three gates on each side [of the city walls]; in the city, nine roads from north to south and nine roads from west to east, and each road was as wide as nine wagons abreast; the ancestral shrine was in the left [of the city], while the altars to the gods of soil and grain on the right; the audience chambers were in the front, while the market was behind [them]; the market and the audience chambers constituted an area of one hundred steps square.

Such a standard urban design features a symmetrical layout of an enclosed square city that includes three gates on each side, nine streets running north and south and east and west, a central palace compound with ancestral temples on its left, altars to the gods of the land and grain where the state ceremony of harvest prayer was presented on its right, an outer court in front, and a market at its rear. The measurements of the width of each street and of the area of the outer court and the market are also indicated. This formula of the urban system became the traditional architectural source consulted by all dynasties in the design of their capital cities from the Eastern Han period (25–220) onward.⁶² It is not quoted in the *YZFS*, since this official building manual of the Northern Song does not address issues of urban design. Looking at the character of the *YZFS*, it is a treatise on concrete building technology and methods pertaining to closed structural systems. Nevertheless, the impact of other building technologies in the *Kaogongji* upon the architectural theory in the *YZFS* is considerable and can be demonstrated further by reference to other parts of the *Kaogongji*.

The following from the *jiangren yingguo* passage describes the architectural measurements, plans, and forms of the palaces of the Xia, the Shang, and the Zhou dynasties, with greater detail provided for the Zhou palace. The description of the Zhou-dynasty Mingtang compound indicates that a noticeable modular system of architecture had already emerged:

周人明堂、度九尺之筵、東西九筵、南北七筵、堂崇一筵。五室、凡室二筵。室中度以几、堂上度以筵、宮中度以尋、野度以步、塗度以軌。The Hall of Distinction of the Zhou is measured with a mat of nine *chi* in length.⁶³ [The hall is] nine mats [long] from east to west, seven mats [wide] from south to north, and [the terrace of] the hall is one mat high. [It consists of] five chambers [inside], each chamber two mats [long on all its sides]. Inside a chamber [everything] is measured according to [the size of] a stool. [Everything else] in the hall is measured according to [the size of] a mat. A palace compound is measured by the length of two extended arms. Outer precincts are measured by the length of a full pace. Streets are measured in the axle length of two wheels of a vehicle.

The concept of modules was essential in the mass production of Chinese art.⁶⁴ Architectural modules were also significant in the development of Chinese architecture. The above *jiangren yingguo* passage is probably the earliest extant text on architectural modules in China. According to this

text, the basic unit of measure for a palace building is the length of a mat covering the floor of the building. Moreover, a different measuring unit is used for different architectural spaces: a mat (筵) for a palatial hall, a stool (几) for the interior of a hall, the length of the extended arms of a person (尋) for measuring space within a palace complex, a full pace (two steps, 步) for measuring space in the outer precincts of a palace compound, and the axle length of two vehicle wheels (軌) for streets and roads. Such a modular concept finds its successor in the architectural treatises of later periods. The earliest text that clearly indicates the continuation and development of such a modular concept is the *Mujing* 木經 (Timberwork manual) of the late tenth century, in which different architectural elements are used as modules for different structural portions of a building, and a unit of a human anatomical measurement, such as an arm's length, is related to the measurement of stairs.⁶⁵ A more comprehensive modular system was developed during the late Northern Song dynasty, as is seen in the *YZFS*. In this system, the section of a regular bracket arm, termed *cai* 材, is used as a standard module for the design of all parts of a building. It is a two-dimensional module, namely both the width and the height of the arm are functional as a module, and each is used in the determination of the measurement of an architectural element in one direction. The *YZFS* classifies the *cai* module into eight grades, and each has a different size of the section of the arm (figure 1.5), ranging from nine *cun* high and six *cun* wide (first grade) to four and a half *cun* high and three *cun* wide (eighth grade), applicable to buildings of different levels of importance and structural comprehensiveness: “凡構屋之制、皆以材為祖。材有八等、度屋之大小、因而用之。”⁶⁶ (All principles of constructing buildings are based on *cai*. A *cai* has eight grades. Considering the size of a building, it is thus used accordingly.)

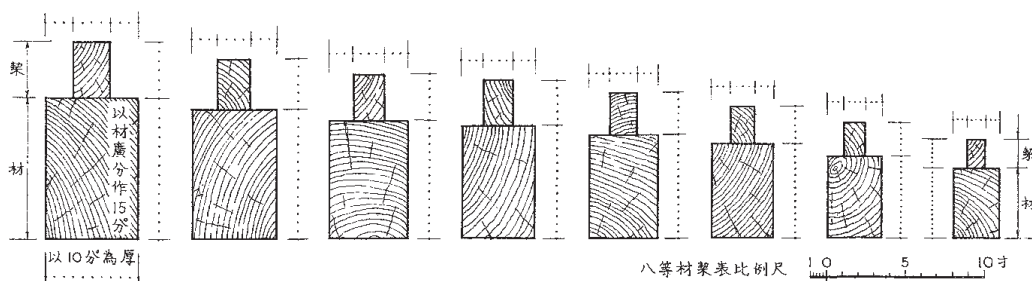


FIGURE 1.5. The eight grades of a *cai* module of the *YZFS*: left to right: first grade (9 × 6 *cun*), second grade (8.25 × 5.5 *cun*), third grade (7.5 × 5 *cun*), fourth grade (7.2 × 4.8 *cun*), fifth grade (6.6 × 4.4 *cun*), sixth grade (6 × 4 *cun*), seventh grade (5.25 × 3.5 *cun*), eighth grade (4.5 × 3 *cun*) (after Liang Sicheng, *Yingzao fashi zhushi*, 240; featuring a smaller modular unit *zi* on top of a *cai* timber of each grade)

The Zhou-dynasty Mingtang, as recorded here in the *Kaogongji*, was used by succeeding dynasties as the most important historical reference of the Zhou architectural tradition. It was cited in works devoted to ritual traditions and by scholar-officials in memorials presented to the court in the course of discussions regarding the proper design of the Mingtang. During the Northern Song period, Emperor Huizong 徽宗 (r. 1100–1125), who sought to symbolize his dynasty's possession of the power of the Zhou, personally studied the system of the Mingtang in the *Kaogongji* and sponsored a design drawing of the Mingtang based on it. According to the *Songshi* 宋史 (Standard history of the Song), this imperially designed Mingtang was built at his directive:

(政和五年)又詔:“明堂之制、朕取《考工》互見之文、得其製作之本……宜令明堂使司遵圖建立。”於是、內出圖式、宣示於崇政殿、命蔡京為明堂使。開局興工、日役萬人。⁶⁷ (In the fifth year of Zhenghe 政和 [1115]) [the emperor] again issued an imperial order: “[Regarding] the system of the Mingtang, I read the related records of the *Kaogong[ji]*, and have understood the essentials of its making . . . It is appropriate to order the Mingtang commissioner to abide by the drawing to build [it].” Thereupon, a drawing was taken from the inner precincts [of the court] and was promulgated at the Chongzheng Hall. [The emperor] ordered Cai Jing [蔡京 (1046–1126)] to be the Mingtang commissioner. The construction began. It involved some ten thousand workers every day.

As important as the *Kaogongji* was to the Song court and to the imperial construction projects, so much did it mean to Li Jie while formulating state building standards.

The *jiangren yingguo* passage goes on to describe the size of several palatial gates and the position of the residences of imperial concubines and the offices of high-ranking officials. This description provides further information about the layout of a state's capital. The passage ends with measurements for the *men'e* 門阿 (city gates) of a king's palace city and for the *gongyu* 宮隅 (corner towers of the palace city) and *chengyu* 城隅 (corner towers of the outer city), and measurements for the main streets within and outside the king's palace city; it states that the measurements for structures and streets for the city of a prince are smaller. This section contains a clear-cut hierarchical architectural system, which reflects the ideological and ritual

demands of the rulers. Such an architectural hierarchy also had a profound influence on succeeding dynasties.

The *jiangren wei gouxu* section starts with the tools and methods of ditching and the measurements of ditches and waterways, followed by some principles of digging ditches and building a dam. Among the principles of building a dam, a very important one is stated briefly, that is, how to estimate manpower requirements: “凡溝防、必一日先深之以為式。里為式、然後可以傳眾力”⁶⁸ (When building a dam, it is necessary that the estimate be made first by referring to the work [that one builder has done] during a day. The estimate [also should] be based on [what is involved in building] a dam of one *li*, and after that the manpower [needed for the whole project] can be managed).⁶⁹ In these two sentences, the principles of estimating and adjusting manpower are associated with the daily rate of progress and statistics for the amount of needed manpower, and most likely the days needed to complete a portion (in this case, one *li*) of a project. It is a primitive concept of the efficient management of manpower and scheduling. In fact, such a concept of project management as recorded in the *Kaogongji* faithfully reflects the actual construction practices of the time. An account in the *Chunqiu Zuozhuan* records the process of building a city in the state of Chu during the Spring and Autumn period (770–476 B.C.E.):

量功命日、分財用、平板榦、稱畚築、程土物、議遠邇、略基趾、具餼糧、度有司。事三旬而成、不愆于素。⁷⁰ Estimating [the need for] labor and designating the days [of construction], distributing building tools, unifying the panels and supporting posts [for ramming walls], balancing [the work loads of] transporting and ramming earth, making standards of earthwork and tools, investigating the distances [materials must be transported], inspecting [all sides of] the foundation [of the city], preparing foodstuffs, and examining and choosing the officials [supervising the construction], [consequently,] the construction was completed in thirty days, within schedule.

This account indicates that the advance evaluations and control of labor, earthwork, days, and distances provided for an efficient management of construction. This concept of construction management was rather influential in later periods. The *YZFS* contains lengthy discussions of the standard methods for determining manpower and time needs, which are

presented in its chapters on *gongxian* 功限 (limits of human work).⁷¹ It also includes chapters on *liaoli* 料例 (standard requirements for materials) that provide detailed rules related to materials for various types of work,⁷² and this part is also associated with building management. Strengthening construction management was one of the major purposes of the imperial patronage of the treatise. With such a long history, the primary concept of construction management as reflected in pre-Qin classics was already developed into a comprehensive system of management during the Northern Song dynasty.

The final portion of this passage describes methods of determining roof height and gives some architectural proportions and measurements of palace barns, underground storehouses, city walls, and ditches. Many of these methods were continued in later architecture. For example, the height of a wall is given as three times its width (“牆厚三尺、崇三之”), a proportion that is the same as that of the rammed-wall methods of the *YZFS*: “築牆之制、每牆厚三尺、則高九尺”⁷³ (In the system of constructing walls, on each occasion that a wall is three *chi* thick, then make it nine *chi* tall). Citing the *Kaogongji* and other earlier texts on rammed walls, the *YZFS* once again stresses the identicalness between contemporary practice and tradition before providing the detailed standard for rammed-wall methods.⁷⁴

In setting out the method for determining roof height, the text of the *jiangren wei gouxu* section reads as follows: “葺屋參分、瓦屋四分”⁷⁵ (For a thatched roof, [the height of the roof from the eaves is] one-third [of the width of the building]; for a tiled roof, [it is] one-fourth). This not only indicates that the roof height is closely related to the general width of a building, but it also clearly states that the height depends upon which type of roof is under construction. This information represents another aspect of the great importance of the *jiangren* section of the *Kaogongji*, since it is the earliest text that clearly distinguishes the rules of roof height in terms of roofing material. The methods described in this text apparently are related to their effectiveness in draining water from roofs, which accounts for the inclusion of these roof rules in the *wei gouxu* text dealing with ditches. A rough and absorbent thatched roof is slower to drain rainwater than is a tiled roof; therefore, a thatched roof is designed at a higher pitch, while a tiled roof is of a relatively lower one. The principle of roof height based on the width of a building was followed by succeeding dynasties and was developed into more comprehensive methods. The *YZFS* records the *juzhe* 舉折 ([first] raise [the total height] and [then] break [for individual heights of purlins]) method: the rise of the total roof height is determined by the

total width of bays on the side plus the depth of the protrusion of bracketing from the eave columns.⁷⁶ It also stipulates a detailed method for setting the roof pitch that varies with the type of structure under construction and with the type of roofing material. Despite the fine distinctions in the principles of determining the roof height for different types of buildings in contemporary practice, Li Jie spares no pains emphasizing again that those principles “basically” (大抵) all conform to those recorded in the *Kaogongji* and that he set the standard principle by following the textual tradition.⁷⁷

To sum up, the *jiangren* section of the *Kaogongji* describes architectural rules and urban planning ideas that include the designs of the capital city, palaces, and other buildings, and it also applies a clear-cut hierarchical system to architecture. In addition, the text includes practical building methods, such as those for roofs and walls, and includes a valuable concept of construction management in determining the needs for manpower and time. As I have shown, the whole body of this text was extremely influential during succeeding dynasties.

Specialized Dictionary Categories for Architecture

Incidental allusions to architecture are included in histories, literature, and scientific essays of the Qin and Han periods as well.⁷⁸ The *Zhoubi suanjing* 周髀算經 (Mathematical classic of the Zhou shadow-gauging instrument; completed during the first century B.C.E.) includes a passage on “正四方之法” (methods of determining the four directions) that correctly records fundamental technologies of orientation by observing the shadows of the sun; the passage on “求圓於方之法” (methods of making a circular form from a square) includes the principle of making a square from a circle as well.⁷⁹ Another Han-period mathematical work, the *Jiuzhang suanshu* 九章算術 (Nine-chapter mathematical classic), includes answers to the mathematical issues applicable to the construction of buildings, such as calculating the cubage of buildings in various geometrical forms and measurements of individual building elements as well as the size of a city.⁸⁰ Qin and Han-period architectural literature includes a new type of writing: etymological dictionaries. These dictionaries either contain explanations of specific characters and words pertaining to building structures and architectural elements or, more important, include a separate category for architecture.

In most cases of Qin and Han-period dictionaries, words were compiled according to the radicals and strokes of the characters, or based on their sounds. Thus, architectural terms were scattered across different sections of such a dictionary, as seen in Xu Shen’s 許慎 (ca. 58–148) *Shuowen jiezi*

說文解字 (Explanations of words).⁸¹ In contrast to such lexical works, the *Erya* 爾雅 (Approaching elegance; literary exposition) and the *Shiming* 釋名 (Explanations of terms) represent an entirely different compilation format for a dictionary: both include one section that glosses architectural terminology.

The *Erya* was compiled during the late Warring States period and completed during the early Western Han period. This work uses contemporary standard language to explain words in early-period books that, due to either the passage of time or the differences in local dialects, had become difficult to understand. It comprises nineteen chapters, each of which glosses terms on a given subject. What concerns us most here is chapter 5, “Shigong” 釋宮 (Glosses on architecture),⁸² which specifically treats the architectural terminology of the pre-Qin period. Like the *Kaogongji*, the *Erya* includes architecture as one of many components of the whole. However, in the *Erya*, architectural content is organized into a more specialized category. The *Kaogongji*'s *jiangren* section is actually a mere passage rather than a clearly demarcated category. Moreover, it deals with not only building methods and urban planning theories but also irrigation designs for agricultural fields. In contrast, the “Shigong” chapter in the *Erya* is devoted to architectural terminology or literary words related to architecture; although some terms designate roads and paths or human movement occurring in different architectural settings,⁸³ they are treated as something related to the built environment.

About eighty architectural terms are treated in the “Shigong.” These terms cover both general terms for a building and specific names of certain buildings, as well as individual architectural components or locations. The first two definitions read “宮謂之室、室謂之宮”⁸⁴ (*Gong* is called *shi* and *shi* is called *gong*), which explains that both *gong* 宮 and *shi* 室 appeared in pre-Qin classics as *general* terms for houses, residences, or chambers (including palaces where kings or emperors resided). In other parts of this glossary where *gong* is used to define other architectural members, *gong* is likely used to denote a compound of buildings (residences or palaces), such as “宮中之門謂之闈、其小者謂之閨” (A gate [leading to the houses] inside a *gong* is called *wei*; a smaller *wei* is called *gui*)⁸⁵ and “宮中街謂之壺” (Lanes [between the small gates and houses] inside a *gong* are called *kun*).⁸⁶ In any case, that the “Shigong” explains *gong* in early classics as a *general* term for residences would have helped contemporary readers properly understand that the architecture represented by this term could be different from that associated with contemporary meanings—it might not necessarily represent

residences of kings. The term *gong*, along with the compound *gongshi* 宮室, changed their meanings by denoting mostly imperial palaces after the Qin-Han period, as the early-Tang scholar Lu Deming 陸德明 (556–627) clarified: “案古者貴賤同稱宮、秦漢以來惟王者所居稱宮焉”⁸⁷ (Note: In ancient times, [houses for] both nobles and the lowly were called *gong*; it is since the Qin-Han [period] that only those where emperors reside are called *gong*).

With such a definition of *gong*, the “Shigong” chapter does not gloss merely the “palace” but also terms for architecture in general. Therefore, it not only defines *miao* 廟 (shrine), *qin* 寢 (bedchamber; soul-sleeping chamber), *xie* 榭 (pavilion, or kiosk on a high terrace), *tai* 臺 (terrace), and *lou* 樓 (tower), which are cited in the terminological section of the *YZFS*, but it also explains *jia* 家 (inside of a house),⁸⁸ *shi* 埽 (fowl pen),⁸⁹ *fang* 防 (small, curved screen used in archery meets to protect against arrows),⁹⁰ *liang* 梁 (bridge),⁹¹ and *ji* 倚 (stone bridge, or stepping stones placed in the water for crossing a river).⁹² In addition, the glossary explicates a broad range of architectural elements, from the wood components of doors, including threshold (*yu* 闕), door frame (*xie* 楔), lintel (*liang* 梁), door spindle (*wei* 椳), door leaves (*fei* 扉), door-locking central timber (*chuan* 傳 or *tu* 突), to the mats of bamboo or reeds covering the roof (*yao* 筵), the timbers nailed to the wall for hanging clothes (*hui* 樺), and the clay platform inside a building (*dian* 玷). These are not elements used exclusively in buildings for kings. The definitions of architectural positions, such as “西南隅謂之奧、西北隅謂之屋漏、東北隅謂之宦、東南隅謂之窻”⁹³ (the southwestern corner [of a chamber] is called *ao*, the northwestern corner is called *wulou*, the northeastern corner is called *yi*, and the southeastern corner is called *yao*), which explain the four corners of a building, also apply to any building type. Therefore, although the earlier classics that the writers of the “Shigong” read and used as the sources of the architectural glossary often describe those architectural terms and elements in the architecture of kings, the “Shigong” was likely intended to gloss common classical architectural terminology.

As a literary exposition, the *Erya* employs contemporary popular language to explain old, difficult words, expressions, and terms in the earlier classics; similarly, the “Shigong” also constitutes a useful means by which to facilitate understanding the architecture pertaining to the rituals and historical narratives in the classics. For example, the text includes the following definitions: “東西牆謂之序”⁹⁴ (the eastern and western walls [of a house] are called *xu*), “兩階間謂之鄉”⁹⁵ ([the space] between two

[eastern and western] stairs [of a hall] is called *xiang*), “正門謂之應門”⁹⁶ (the front gate [of a palace] is called *ying* [audience or court] gate), “門側之堂謂之塾”⁹⁷ (the halls beside a gate are called *shu*), “廟中路謂之唐”⁹⁸ (roads inside the ancestral shrine are called *tang*), and “堦謂之玷”⁹⁹ (the clay platform inside a room [where utensils are put] is called *dian*). The classical architectural terms glossed here, *xu* 序, *xiang* 鄉, *yingmen* 應門, *shu* 塾, *tang* 唐, and *dian* 玷, are essential for understanding the texts that we encountered above and underscored as examples of incidental inclusions of architecture in the pre-Qin classics. The explanations of these terms, together with many others, provide a richer source on the architecture of early-period China than does the pre-Qin literature itself; the richness lies both in the longer period extending to the early Han and in the additional references to architectural structures, elements, positions, and space.

The following definitions, which explicate several terms for structural elements of timber architecture, are very important in this architectural glossary, each of which is quoted in the *YZFS*:

采廡謂之梁、其上楹謂之柁。闕謂之檣。栴謂之窰。棟謂之桴。桷謂之榱。桷直而遂謂之闕、直不受檐謂之交。檐謂之檣。¹⁰⁰ The great beam of a building (*mangliu*) is called *liang*; the post on the beam is called *zhuo* [dwarf post]; the small square timber on the capital of a column (*bian*) is called *ji*; the square timber block on the capital of a column (*er*) is called *jie*; purlins (*dong*) are called *fu*; square rafters (*jue*) are called *cui*. The square rafters [long enough] to reach the eave directly are called *yue*; [the square rafters] not directly reaching the eave are called *jiao*; eaves are [also] called *di*.¹⁰¹

In explaining the major components of a wood-framed structure, these definitions reflect the level at which the beam structure of pre-Qin architecture was developed and the complexity of how structural elements were combined (or connected to one another) as a functional entity. It is revealed, for instance, that short posts (*zhuo* 柁) were installed on the great transverse beam (*liang* 梁 or *mangliu* 采廡) to support the upper structural elements—purlins (*dong* 棟 or *fu* 桴), which run longitudinally and support rafters and other roofing materials. The rafters (*jue* 桷 or *cui* 榱) included two kinds, *yue* 闕 and *jiao* 交, depending on whether they reach the eaves or not. Although the definitions of *yue* and *jiao* are not very clear here, it can be deduced that *yue* represents eave rafters, which are supported by the eave purlin and another purlin higher than it; *jiao* represents those rafters that are never supported by eave

purlins, that is, those rafters in the upper part of the roof structure. Perhaps *jiao* rafters were supported by the ridge purlin and an intermediate purlin, or by two intermediate purlins, or they were used to constitute a complicated, miniature cofferlike structure.¹⁰² In addition, the definitions of *ji* 榑 or *bian* 關, *er* 栴 or *jie* 窠 (i.e., 節) reflect the level of bracketing achieved in Chinese architecture by the pre-Qin period. *Bian* or *ji* represents the square, straight timber installed on the capital of a column, which is a primitive form of bracket arm commonly seen in the buildings after the Han period. *Er* or *jie* is the square timber block on the capital, which, in combination with *bian* or *ji* in the more mature form of later periods, functions as the bottommost support for a whole bracket set installed between the eave (or a purlin or beam) and a column in post-Han architecture. Based on the fundamental features of a wood-framed structure of pre-Qin architecture described above and on those scattered allusions to palatial buildings that are incidentally included in pre-Qin classics as previously noted, one can roughly reconstruct the wood-framed structure of a pre-Qin palace as Tanaka Tan 田中淡 (b. 1946) has proposed (figure 1.6).¹⁰³

The “Shigong” chapter of the *Erya* is a significant text. For the first time in Chinese literature, architecture merited its own independent category in a compilation. This chapter served as an important reference for later scholars

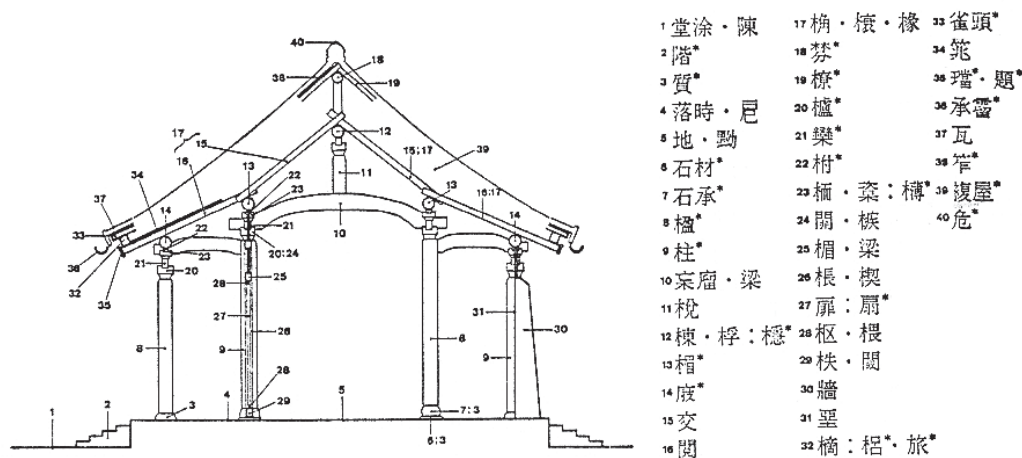


FIGURE 1.6. Tanaka Tan’s reconstruction drawing of the wood-framed structure of a pre-Qin palatial building based on the *Erya* architectural terminology and other early-period texts (Tanaka, *Chugoku kenchikushi no kenkyu*, 47) (Among these terms, numbers 10–12 are *mangliu* or *liang*, *zhuo*, *dong* or *fu*, respectively; 15–17, *jiao*, *yue*, *jue* or *cui*, respectively; 23–24, *er* or *jie*, *bian* or *ji*, respectively; 32, *di*)

studying pre-Qin architecture and exploring architectural traditions of early periods. The *YZFS* cites the “Shigong” frequently for individual architectural terms. From the Han to Song periods, scholarship on the “Shigong” was richly produced as scholars studied the *Erya* as a Confucian classic.¹⁰⁴

In imitation of the compilation format of the *Erya*, Liu Xi’s 劉熙 (fl. 200) *Shiming* dictionary also has an architectural category.¹⁰⁵ This twenty-seven-chapter work explains words or terms mostly by analyzing a homophonic word that the author considered had a connection with the glossed term either etymologically or semantically. For example, *tiao* 跳 (jump, leap) is explained as “條也。如草木枝條務上行也”¹⁰⁶ (*tiao* [a branch]; [to jump is] as if branches of vegetation rise up), in which *tiao* (branch) as a homophone of *tiao* (jump) is used to explain vividly the appearance of what the action word “jump” represents. Among the broad range of subjects explained,¹⁰⁷ chapter 17, “Shigongshi” 釋宮室 (Explanations of [the terminology of] architecture), a title similar to that of the “Shigong” section of the *Erya*, specifically glosses architectural terminology.

Not only the format but also the contents of the “Shigongshi” resemble the “Shigong.” Like the “Shigong,” the beginning of the “Shigongshi” glosses *gong* 宮 (building), *shi* 室 (chamber), and the terms for various locations inside a building; the middle section of both texts gloss major structural elements of a wood framework. In addition, the “Shigongshi” explains some ninety architectural terms, a number close to that in the “Shigong.” However, the glossed terms in these two texts are not identical: the “Shigongshi” contains many terms that are not included in the “Shigong.” Moreover, it is often the case that in glossing the terms treated in the “Shigong,” the “Shigongshi” adds certain terms that are interrelated and complementary to those in the “Shigong.” For instance, in addition to the four terms for the four corners inside a building glossed in the “Shigong,” the “Shigongshi” also glosses the term for the center of the inside of a chamber: “中央曰中霤”¹⁰⁸ (The center [of a chamber] is called *zhongliu*). The “Shigong” glosses *gong*, *shi*, and *jia* 家 (house) as generic terms for a building, a chamber, or a residence, but the “Shigongshi” glosses *gong*, *shi*, *zhai* 宅 (house), *she* 舍 (residence), *yu* 宇 (covered building), *wu* 屋 (building) as generic terms for buildings or chambers.¹⁰⁹ Moreover, the “Shigongshi” is a longer text because it elaborates the explanations or, sometimes, definitions of most glossed terms to a significantly greater extent than does the “Shigong.” For example, *gong* 宮 is explained as “穹也。屋見於垣上、穹隆然也”¹¹⁰ (*qiong* [as “arched”], [which is] a building [built] on the walls seen as an arched cavity), and *shi* 室 as “實也。人、物實滿其中也”¹¹¹ (*shi* [as “solid”], as people and objects

fully fill its inside), while overly concise glosses, “*gong* is called *shi* and *shi* is called *gong*,” are provided in the “Shigong.”

In general, the “Shigong” gives only simple definitions of architectural terms (what was called what) but barely explains their etymologies. In contrast, the “Shigongshi” always offers an explanation of why a certain thing was given such a name, which often makes sense and illuminates the understanding of those classical terms for early-period architecture. While the explanations in the “Shigongshi” basically use the approach of homophonies, there are occasions in which a semantic meaning or the social context of the origin of a specific term is given in the explanation rather than a homophonic word. For example, the explanation of the southwestern corner inside a building reads as follows: “室中西南隅曰奧、不見戶明、所在祕奧也”¹¹² (The southwestern corner inside a chamber is called *ao*, [which is because] light coming in through the door cannot reach [this location and therefore] this location is private and mysterious [like a hideaway]). The explanation of blocks (*dou* 斗) reads as follows: “斗在欂兩頭、如斗也”¹¹³ (*Dou* are [installed] on the two ends of a curved arm and are like a peck [measure]). In these two examples, semantic meanings of the terms explain why the specific names are used for the architectural locations and elements. In explaining the term for the northwestern corner inside a building, the text refers to the traditional etiquette of mourning:

西北隅曰屋漏。禮、每有親死者、輒撤屋之西北隅、薪以爨竈、糞沐、供諸喪用。時若值雨、則漏、遂以名之也。¹¹⁴ The northwestern corner [of a chamber] is called *wulou* [leak in the chamber]. As per the etiquette, whenever there was a kinsman who died, [the family] immediately dismantled the northwestern corner of the chamber and used [the dismantled timbers] as firewood in the kitchen range for cooking and boiling water for washing, in order to be prepared for all mourning ceremonies. During that period [when the northwestern corner of the chamber was dismantled], if it rained, [the chamber] then leaked; therefore, [*wulou* was] used to name the location [of the northwestern corner].

The availability of such semantic interpretations represents an important aspect of the contribution of the “Shigongshi” to the development of Chinese architectural writings, because such interpretations are included neither in pre-Qin classics and the *Kaogongji* nor in the “Shigong” chapter

of the *Erya*. Semantic explanations of architectural terminology help transmit the accurate meaning of a term and how it came into being. Both the homophonic interpretations and the semantic explanations of the “Shigongshi” became a legacy to scholars of later periods, including Li Jie.

More types of buildings are glossed in the “Shigongshi” than those treated in the “Shigong” (see appendix 2). Like the *Erya*, the “Shigongshi” of the *Shiming* does not confine its glossary of architectural terminology to a king’s structures or imperial courts. In its middle part, the “Shigongshi” indeed glosses a few terms specifically related to structures and architectural elements of imperial palaces, such as *dian* 殿 (palace hall) and *bi* 陛 (high stairs under an imperial hall), *xiaoqiang* 蕭牆 (the screen wall facing the gate of a hall), *zhu* 宁 (the space between the gate and the interior screen of the imperial hall, where officials had an audience with the emperor), and *fusi* 罍 罍 (a screen outside the gate of the imperial hall, where officials requested an audience). In the explanations of these terms, the text clearly indicates that it is glossing terms of imperial architecture:

殿、有殿鄂也。陛、卑也。有高卑也。天子殿謂之納陛、言所以納人言之階陛也……蕭牆、在門內、蕭、肅也。臣將入、於此自肅敬之處也。宁、佇也。將見君所佇立定氣之處也……罍罍、在門外、罍、復也。罍、思也。臣將入、請事於此、復重思之也。¹¹⁵ *Dian* means that [people are] in a state of trepidation in the [palatial] hall. *Bi* is “lowly”; [at the stairs of the high terrace], there are [distinctions between] the noble and the lowly. The hall for the Son of Heaven is called *nabi* [admitting stairs], which means the stairs and terrace where [the emperor] accepts admonitions from officials . . . *Xiaoqiang* [the screen wall facing the gate of the palace] is at the inside of the gate; *xiao* means “solemn”; when officials are about to enter [the imperial hall], this is the place at which [they] fill themselves with deep veneration. *Zhu* is “to stand still”; [it is] the place where [officials] stand still and compose themselves when [they are] about to call to pay respects to the emperor . . . *Fusi* [screen] is at the outside of the gate [of the palace hall]; *fu* means “once again”; *si* is “to think.” When officials are about to enter, [they] request an audience for [a certain] matter here; [here, they] think over the matter again and again.

The explanations of architectural terms here are clearly associated with the ritual orders and hierarchical positions of the emperor and his

servants. Nevertheless, no entries in the “Shigongshi” other than the above text clearly indicate a connection with imperial palaces or buildings. The glossary explains far more terms for a variety of types of architecture than just magnificent buildings like shrines, towers, high terraces, and watchtowers. The new types of architecture glossed include government office (*si* 寺), jail (*yu* 獄 or *lao* 牢 or *lingyu* 囹圄), public gathering place (*wa* 瓦), posthouse or inn (*zhuan* 傳), thatched cottage (*ci* 茨 or *lu* 廬), well, depository, barn, and even outhouse (*ce* 廁). Therefore, as its interpretations of *gong* and *shi* do not indicate any specific associations with palaces, the *gongshi* 宮室 in the *Shiming* also represents buildings in a broader sense, denoting residences, halls, chambers, and palaces. The “Shigongshi” section of the *Shiming* can be defined as a text that collects from various sources of earlier periods and glosses a wide range of architectural terminology, covering imperial, government, public, and common buildings.

Comparing the terminology for the structural elements of a wood-framed building glossed in the *Erya* and in the *Shiming* (see appendix 3), one can understand more about the technological development of Chinese wood-framed architecture from the pre-Qin to Han periods. For instance, *wu* 梧 for slanted braces on the beam structure appears not in the *Erya* but in the *Shiming*. Supporting purlins and resting on one end of a beam, the slanted braces functioned to strengthen the beam framework by forming a triangular structure in combination with the upper purlin (and the short posts under it) and the beam (intersecting the lower purlin). This powerful structural component is called *tuojiao* 托腳 (literally, “supporting foot” or “cushion”) in the *YZFS* (see figure 1.1) and is common in the extant buildings from the Five Dynasties (907–960) to the Yuan (1271–1368) periods. The “Shigongshi” text indicates that such a functional element was used in architecture at least as early as the late Han period, and thus the wood-framed structure and building technology as a whole were already quite advanced.

From the terms for bracketing in these two texts, one can also see a rough process of evolution from the pre-Qin to Han periods, in which both bracket arms and blocks gradually developed from their primitive forms. The bracketing featured in the *Erya* is only a square timber (*bian* or *ji*) immediately supporting the beam or purlin, installed between the beam or purlin and the capital. *Gong* 栱 is explained merely as a large timber and is not glossed together with other bracketing elements (*bian* or *ji* and *er* or *jie*). There is no indication in the *Erya* that a *gong*, or a *bian* or *ji*, was structurally connected with a block (*er* or *jie*). However, as glossed in the *Shiming*, a

bracket arm possesses a curved form (as *luan* 欂) and clearly supports small blocks at its two ends.¹¹⁶ At the same time, blocks are classified into two distinct types: a large block on the capital (*lu* 櫨) and small blocks on the arms (*dou* 斗). The combination of arms and blocks as an entire structure made it possible for arms to pile up and form a multilayer bracketing structure that functioned better in supporting a deeper eave and extending its supporting width under a beam or a purlin. Such a multilayered bracketing structure was supported by the large block at the bottom, which strengthened the function of bracketing as a fulcrum between the weight of the eaves and the loads of framework transmitted from the beam. This type of functional bracketing structure became an essential structure in Chinese wood-framed architecture from the Han period on.

As a separate category on architecture in a dictionary, the “Shigongshi” of the *Shiming* is as important as the “Shigong” of the *Erya* in the history of Chinese architectural writing. While the format of the *Shuowen jiezi* dominates the compilations of dictionaries in later periods, the *Shiming*’s continuation of the *Erya*’s compilation format made a difference to Chinese literature in the domain of architecture. Starting with these texts, architecture began to be treated as an independent subject.

Vivid Literary Representation of Architecture: The Han Rhapsodies

A unique writing genre in Chinese literature, the Hanfu 漢賦, or rhapsodies in the Han-dynasty style, emerged during the Western Han period and flourished during the Eastern Han and Three Kingdoms periods. A form of rhymed prose written in refined language, Han rhapsodies frequently eulogize historical and contemporary rulers’ deeds. Those deeds include construction of magnificent palaces, grand-scale hunting parks and gardens, and capital cities. As a consequence, historical architectural features, mainly of imperial built environments, are represented vividly in the form of literature. These works are collected in the sixth-century anthology *Wenxuan* 文選 (Selections of refined literature), compiled by Xiao Tong 蕭統 (501–531).¹¹⁷ Among many elegant works,¹¹⁸ the two most famous pieces that are specifically collected under the section on *gongdian* (palaces) are Wang Yanshou’s 王延壽 (ca. 124–ca. 148, courtesy name Wenkao 文考) “Lu Lingguangdian fu” 魯靈光殿賦 (Rhapsody on the Hall of Numinous Brilliance in Lu) and the Three Kingdoms–period “Jingfudian fu” 景福殿賦 (Rhapsody on the Hall of Great Blessings), by He Yan 何晏 (courtesy name Yongshu 永叔).¹¹⁹ These two works feature extensive architectural terminology in their elaborate descriptions of palatial buildings.

While these are purely literary works filled with flowery language and descriptions of architecture replete with romantic exaggeration, their value for architectural literature is uncontested. They reflect the most striking characteristics of the magnificent architecture, compounds, and capital cities that are represented: their layout, structure, building elements, and details. Let us look at a part of the “Lu Lingguangdian fu” as an example:

飛梁偃蹇以虹指、揭蓬蓬而騰湊。層櫺磔危以岌峩、曲枅要紹而環句。芝栴攢羅以戢翬、枝掌杈枒而斜據。Flying beams, arched and arced, pointing like rainbows/raised aloft, great and grand, soar and gather/Layered bearing blocks are precipitously piled, precariously positioned/curved bracket arms, bent and bowed, are concatenated/Painted dwarf posts are thickly arrayed, closely clustered/Bracing struts, like bifurcating branches, lean at angles.¹²⁰

This rhapsody depicts the Hall of Numinous Brilliance built by Prince Gong of Lu 魯恭王, Liu Yu 劉餘, the son of Emperor Jing 景帝 (r. 156–141 B.C.E.) of the Han in the district of Lu 魯. As seen above, it contains very specific terms for structural components, such as beams, struts, posts, brackets, and blocks. Providing architectural details like these, rhapsodies of the Han and Three Kingdoms periods convey precious information of pre-Qin and Han architecture, especially in consideration of the dearth of sources of the period devoted to architecture. Compared with pre-Qin literary works that include references to architecture or architectural activities,¹²¹ these rhapsodies describe architecture consistently over the whole length of the piece. Although architectural descriptions are mixed with praise of the virtues of rulers and nobles, architecture has virtually become the focus of the writing.

Essays on the Tradition of Ritual Architecture

During the Eastern Han period, writings specifically discussing architectural traditions emerged in association with the study of Confucian classics. Probably the earliest such text known to date, Cai Yong's 蔡邕 (133–192) *Mingtang Yueling lun* 明堂月令論 (A study of the Mingtang in the “Yueling”)¹²² focuses its discussion on the architectural system of the Zhou-dynasty Mingtang as reflected in the section “Yueling” (Ritual orders of lunar months) in the *Liji*. With Confucian thought receiving exclusive imperial promotion during the reign of Emperor Wu of the Western Han

dynasty, following the Zhou ritual systems became legitimized from this point on. Rulers of later periods were at the forefront of the reconstruction of the Zhou-dynasty Mingtang, the essential architectural representation of the classical system. Over the course of time, the detailed structure and form of the Zhou Mingtang had become unclear. Therefore, investigations of the Zhou Mingtang became a political task in later periods. It was in this context that works specifically studying the precise system of the classical Mingtang structure came into being.

One of Cai's arguments in his essay is that the Zhou Mingtang was composed of nine chambers. He challenged the great commentator Zheng Xuan, who, based on the *Kaogongji* of the *Zhouli*, had maintained that the classical Mingtang included five chambers. Nonetheless, Cai's study of the Mingtang is conducted from the viewpoint of ritual contents, but there is a significant difference between Cai's work and other commentaries on pre-Qin texts, including Zheng's. Instead of scattered language about architectural systems among the lines of commentaries on rituals, Cai's work treats a type of architecture (Mingtang) as the main subject of writing. This new kind of literature—works on architectural subjects—significantly influenced Chinese architectural writing in later times.

Architectural Literature from the Jin to the Tang

Following the new development of architectural writings during the Han period, architectural literature from the Jin 晉 (265–420) and the Northern and Southern Dynasties (386–589) to the Sui (581–618) and the Tang (618–907) periods both continued traditional practices and exhibited new features. Lexical works such as Cui Bao's 崔豹 (fl. 290–306) *Gujinzhhu* 古今注 (Explanations of [terminology of] ancient and present times) and Zhang Yi's 張揖 (fl. 227–233) *Guangya* 廣雅 (Extended literary exposition) have a category for architecture: the *duyi* 都邑 (capitals and districts) category or the *shigong* (glosses on architecture) section.¹²³ The *Wenxuan* (Selections of refined literature) anthology also classifies literary works into categories and includes one for *jingdu* 京都 (capital cities) and one for palaces.¹²⁴ In addition, works treating built environments as a main subject of writing emerged. Separate categories for architecture and individual architectural entries were included in Sui and Tang official and unofficial reference books. Studies of the classical Mingtang system persisted, but unlike in previous scholarship, theoretical explorations of this tradition were integrated

with actual imperial building practices. Official regulations pertaining to buildings were also stipulated in Tang times.

Built Environments as a Main Subject of Writing

This new form of literature is found in works that record historical and contemporary built environments at least during the Northern and Southern Dynasties. In contrast to histories that mention architecture incidentally, works like the *Sanfu huangtu* 三輔黃圖 (Maps of the Three Administrative Districts [of the Western Han])¹²⁵ and Yang Xuanzhi's 楊銜之 (d. ca. 555) *Luoyang qielan ji* 洛陽伽藍記 (A record of the Buddhist monasteries in Luoyang)¹²⁶ treat architecture as a main subject. The *Luoyang qielan ji* details the architecture in Luoyang during the Northern Wei period (386–534). The main purpose of this five-chapter work was to record the Buddhist temples of Luoyang, but it also includes information on the city of Luoyang, palaces, residences, gardens, and so on.

The *Sanfu huangtu* describes the imperial Qin and Western Han palaces, capital cities, and gardens, such as Weiyang Palace 未央宮, Shanglin Garden 上林苑, and Kunming Lake 昆明池. Government offices at the Western Han capital Chang'an 長安 (modern Xi'an) and Qin and Han urban life and customs are also recorded. Imperial hunting parks and palaces as well as the ritual architecture of the Zhou dynasty are often mentioned in the text prior to the references to Han palaces. Clearly, Zhou imperial architecture was treated as a classical tradition to be followed in imperial and official building practices. Some extremely important principles as practiced in imperial Qin-Han architecture are recorded. For example, in featuring the compound of the Weiyang Palace, built by Emperor Gaodi 高帝 (r. 206–194 B.C.E.), the following principle is summarized: “蒼龍、白虎、朱雀、玄武、天之四靈、以正四方、王者制宮闕殿閣取法焉”¹²⁷ (The Green Dragon, the White Tiger, the Scarlet Bird, and the Black Warrior, being Four Spirits of Heaven, are to define the four directions, and a king builds palaces, towers, and halls by following this law). Here, the Green Dragon, White Tiger, Scarlet Bird, and Black Warrior (a tortoise-snake spirit) represent, respectively, the eastern, western, southern, and northern groups of the twenty-eight constellations, and they had been used to correspond to the four cardinal directions since the pre-Qin period. This tradition was observed in the Qin and Han imperial building designs, naming the eastern halls, eastern watchtowers, and even tile ends used on them Green Dragon, for example. In addition, this source often specifies the names of the wood used to make particular building elements, which offers a useful reference for

the selection of timber materials and corresponding architectural features in the Qin and Han palaces. Regarding the front hall of the Weiyang Palace, for instance, it states, “以木蘭為棼橑、文杏為梁柱”¹²⁸ (Use magnolia to make rafters for the double-layered roof, use beautifully veined ginkgo to make beams and columns). In its description of the front hall of the Epang Palace 阿房宮 of the Qin, it also specifies, “以木蘭為梁”¹²⁹ (Use magnolia to make beams). Timber materials are also mentioned in the record of the Linchi Pond 琳池 that was sponsored by Emperor Zhao 昭帝 (r. 86–74 B.C.E.) of the Han: “乃命以文梓為船、木蘭為柁”¹³⁰ ([The emperor] then ordered that boats be made from beautifully veined catalpa and rudders be made from magnolia). From these records, magnolia seems to have been a common building material. Compared with such light timber as catalpa, which was used to build boats, magnolia along with ginkgo was used to make important sturdy structural components. Ancient craftsmen must have had adequate knowledge of the qualities of timber by Qin and Han times.

Theoretical Explorations of Tradition Integrated with Contemporary Architectural Practice: Treatises on the Design of the Mingtang
 Recovering the exact architectural form of the classical Mingtang was again a political task for the learned society during this long period. In his essay *Mingtang zhidu lun* 明堂制度論 (A discussion of the Mingtang system), the Northern Wei scholar Li Mi 李謐 (484–515) offers a critical review of previous scholarship on the classical Mingtang architectural system, including Cai Yong’s study of it.¹³¹ Pointing out the differences between the records of the Mingtang system in different pre-Qin sources, he argues against both Zheng’s opinion of the five-chamber Mingtang and Cai’s proposal of the nine-chamber Mingtang. He criticizes Han scholarship either as self-contradictory or as unreasonable and “certainly not matching the principles of construction” (於營制之法自不相稱).¹³² It is important to see that Li was able to review previous scholarship from a viewpoint of construction practice. Li reminds his peers that they should distinguish among textual errors, incorrect commentaries, and the essence of the classics.

The awareness of history on the part of Han and Wei scholars began to be integrated more actively with contemporary architectural practice during the Sui dynasty. As an imperial architect in charge of the Construction Bureau, Yuwen Kai 宇文愷 (555–612) is a main figure of his day who explored architectural traditions in depth. Upon the imperial order to construct the Mingtang as an aspect of “revival of classical systems,” he presented to the court a document entitled *Mingtang yibiao* 明堂議表

(Memorial of discussions of the Mingtang).¹³³ He studied many classical and early-period texts dealing with the type and function of the Mingtang and offered a critical review of recorded Mingtang systems. He also conducted a careful archaeological survey of the remaining Mingtang of the Southern Dynasties in Jiankang (modern Nanjing), and this archaeological material was used as important references both in his textual review and in his examination of historical Mingtang drawings of different versions.¹³⁴ He displayed his comprehension of the classical Mingtang tradition in a variety of media, including a drawing of his design and a wooden model, both of which have been lost. The text does not include many measurements of the design, as must have been displayed in his drawing and wood model.

The general principle of his work on the Mingtang tradition is claimed as follows: “臣遠尋經傳、傍求子史、研究眾說、總撰今圖。其樣以木為之。”¹³⁵ (Your subject searched far into the classics and commentaries, sought and relied on the records of philosophers and histories, studied all the varied opinions, summed them up, and made this [Mingtang] drawing. Its form is represented in [a] wood [model]). Through a comprehensive study of the textual tradition, a collection of firsthand materials, a summarization of various ideas, and a combined format of presentation, Yuwen offered the best treatise on architectural history in China before the Tang period.¹³⁶ Although the *Mingtang yibiao* was a work discussing a type of traditional architecture, much of the approach was employed again when, approximately five hundred years later, Li Jie compiled the *YZFS*.

With the interruption of warfare, Yuwen's design for the Sui Mingtang was not built, but the conscious effort to reconstruct classical traditions in building practice that Yuwen made resonated into Tang times. Historical texts record heated debates on the orthodox form of the Mingtang among Tang court officials during the reigns of Emperor Gaozong 高宗 (r. 650–683) and Empress Wu Zetian 武則天 (r. 684–690, during the Tang, and 690–705 during the Zhou 周). A lengthy imperial edict from the reign of Gaozong gives the imperial design of the Mingtang for the purpose of its construction in the capital (Chang'an).¹³⁷ This edict details the design principles for all major building elements and their symbolic meanings on the basis of the textual traditions in the classics and histories. It contains information on the numbers and measurements of the structural elements, from beams to bracketing.¹³⁸ It also includes many architectural terms widely used in contemporary architectural practice, such as *xia'ang* 下柳 (downward cantilevers), *shang'ang* 上柳 (upward cantilevers), *ji* 枅 (brackets), *liangong* 連栱 (interconnected brackets), *qian* 檑 (one-rafter-long beams), *fangheng*

方衡 (lateral tie beams), *yangma* 陽馬 (corner beams), *dali* 大栿 (great eaves), and *feiyanchuan* 飛檐椽 (flying eave rafters), many of which are comparable to those in the *YZFS*. Their inclusion makes it an important reference for understanding the architecture of the Tang, one of the heydays of architecture in Chinese history, from which very few buildings survive.

Architectural Entries in Imperial and Unofficial Reference Works

Official reference works were compiled during the Wei and the Northern and Southern Dynasties, but they are all lost, and the few remaining fragments do not reveal whether these works dealt with architecture. Most of the Sui and Tang official and unofficial reference works are well preserved, and they often include a separate category for architecture, in which historical and classical texts mentioning architecture are quoted under different entries. These entries are set up either according to different architectural types or based on the specific names of the buildings mentioned in the historical texts.

The Sui-period imperially commissioned four-chapter *Bianzhu* 編珠 (Plaited beads, or Brilliant literary words in pairs; preface datable to 611)¹³⁹ includes a section entitled “Juchubu” 居處部 (Category of architecture). Both the establishment of an architectural category and its title were followed faithfully in Tang and even Song reference works. In this section, passages or verses drawn from the classics, literature, and miscellaneous writings are presented under entries made up of a pair of names of buildings or a pair of literary words on architecture that are literally identical or similar. Such entries include *Yifenglou Mingluandian* 儀鳳樓. 鳴鸞殿 (The Phoenix-Bearing Tower and The Mythical Bird-Crying Hall), *Wansuidian Qianqiumen* 萬歲殿. 千秋門 (The Hall of Ten Thousand Years and The Gate of a Thousand Autumns), *baixinzhu meihualiang* 柏心柱. 梅花梁 (polished-cypress columns and blossoming-plum beams), and *huashi diaotang* 畫室. 雕堂 (painted chambers and carved halls).¹⁴⁰

Exhibiting a new format of compilation, Tang-period reference works feature architectural excerpts in entries on architectural types. The one-hundred-chapter *Yiwen leiju* 藝文類聚 (Categorized collection of books; presented to the court in 624) is probably the first work to arrange texts in this way: its architecture section (“Juchubu”) includes twenty entries in which architecture is classified into twenty types.¹⁴¹ The entries are arranged in the following order: *gong* 宮 (palace), *que* 闕 (watchtower), *tai* 臺 (high terrace), *dian* 殿 (hall), *fāng* 坊 (residential district in the palace city), *men* 門 (gate), *lou* 樓 (tower), *lu* 櫓 (overhanging watchtower on city walls, often

uncovered), *guan* 觀 (watchtower), *tang* 堂 (residential hall), *cheng* 城 (city), *guan* 館 (guesthouse), *zhaishe* 宅舍 (residence), *ting* 庭 (yard), *tan* 壇 (altar), *shi* 室 (chamber), *zhai* 齋 (study), *lu* 廬 (hut), and *daolu* 道路 (road, in the sense of its relationship to architectural construction). In contrast to these general architectural types, various kinds of imperial architecture, such as *zongmiao* 宗廟 (ancestral shrine), Mingtang, and *piyong* 辟雍 (a type of Mingtang), are treated under their own entries in the category for rituals (*libu* 禮部).¹⁴² A great number of historical texts are broadly extracted in these sections from the classics, histories, and literary works. Under each entry on architecture, the compilers first cite traditional records related to the given type of architecture in the classics and histories and then quote poems, rhapsodies, and other literary texts depicting architecture. The *Yiwen leiju*'s classification of general architectural types and its arrangement of traditional sources on architecture under individual types greatly influenced the compilation format of reference works of contemporary and later periods. This format persisted into the terminological section of the *YZFS* as well.

In the thirty-chapter *Chuxueji* 初學記 (Notes of primary learning; presented to the court in 727), fifteen architectural types are included under the category “Juchu” (Architecture).¹⁴³ Eight of the entries are the same as those in the *Yiwen leiju*: “palace” (*gong*), “hall” (*dian*), “tower” (*lou*), “high terrace” (*tai*), “residential hall” (*tang*), “study” (*zhai*), “door” (*men*), and “road” (*daolu*). Seven categories are new: *duyi* 都邑 (capital and districts), *chengguo* 城郭 (inner and outer cities), *kucang* 庫藏 (government storehouse), *qiangbi* 牆壁 (wall), *yuanyou* 苑囿 (imperial park and garden), *yuanyou* 園圃 (garden), and *shi* 市 (market). Probably for the first time in Chinese literature, excerpts from classical texts mentioning imperial gardens and hunting parks are collected in an independent category (here, the entry for *yuanyou*). Moreover, in the *Yiwen leiju*, *yuanyou* 園 (garden or land for growing plants), *pu* 圃 (ground used for growing vegetables, flowers, or fruit), and *shi* (market) are entries under *chanyebu* 產業部 (category of production),¹⁴⁴ which indicates that the compilers did not regard these as architectural compounds or anything associated with construction. Beginning with the *Chuxueji*, such entries were moved to the architectural section. These new formats became a tradition followed in later-period reference works, such as the *Taiping yulan* 太平御覽, an “imperial inspected” encyclopedia compiled in the early Northern Song.¹⁴⁵

In the thirty-chapter *Baishi liutie shileiji* 白氏六帖事類集 (Categorized collection of all things by Mr. Bai [Juyi] 白居易 [772–846]), the one-chapter

section on architecture contains twenty-nine architectural types, including *jingdu* 京都 (capital of the country) and *yiju* 邑居 (residences in the counties). However, quite a few types of imperial architecture are treated in another chapter, on the moral merits of the kings and emperors of previous periods. Thus, classical texts on imperial architecture, including Mingtang, *piyong*, *yuanyou*, *lingtai* 靈臺 (spirit terraces), *chidao* 馳道 (imperial roads), and even *gongdian* (palaces), are treated separately from the general architectural category.¹⁴⁶ This separate treatment of imperial architecture from that of general architectural types was apparently a continuation of the compiling system of the *Yiwen leiju*.

Despite the variations in entries for architectural types and in the order of these entries, the Tang reference works extracted historical materials on architecture from traditional texts and established architectural entries according to architectural types. In collecting and treating architectural materials from the classics, histories, literature (poems and rhapsodies), lexical works, and miscellaneous writings, these reference works spurred intensive preparatory work for the further arrangement and treatment of classical architectural literature during the Northern Song period, both in the imperial reference works and in the imperial *Building Standards*, the *YZFS*.

Imperial Regulation of Buildings: The Tang

Chinese rulers had a political concern to stipulate official rules for construction at least during the third century. In an essay on the deeds of previous kings and emperors, Emperor Yuan 元帝 (r. 552–555) of the Liang 梁 (502–557) stated that such rules were made in the day of Cao Cao 曹操 (155–220), the founder of the Wei of the Three Kingdoms period: “及造宮室、繕治器械、無不為之法則、皆盡其意”¹⁴⁷ (When [he was] making palaces and carrying out improvements in ritual implements, nothing was made without setting out rules, all having embodied his thoughts [of the norms]). Unfortunately, no details of Cao Cao’s rules for the making of palatial buildings are mentioned, and it is even unclear whether these rules were noted down and made available to the public. In history, imperial building standards as official codes appeared during the Tang period.

The most important of all Tang architectural materials is a short official document entitled *Yingshanling* 營繕令 (Rules of construction and repair), a code enacted during the Kaiyuan 開元 reign (713–741). It clearly indicates the strict regulation of architectural types, structural measurements, and architectural ornaments in association with the rank of officials. The brief extant text included in an annotation of the *Tang*

liudian 唐六典 (Six codes of the Tang; 735)¹⁴⁸ and the short text collected and cited in Song-Yuan works may be only a small part of the original document.¹⁴⁹ Because of its great importance, the entire text cited in Song-Yuan works is quoted here:

凡王公以下屋舍、不得施重栱藻井。三品以上堂舍、不得過五間九架、廈兩頭、門屋不得過三間五架。五品以上、五品堂舍、不得過五間七架、廈兩頭、門屋不得過三間兩架。仍通作烏門。六品七品以下堂舍、不得過三間五架、門屋不得過一間兩架。非常參官不得造抽心舍、施懸魚、瓦獸、乳梁裝飾。其祖父舍宅、門廡子孫雖廡盡、聽依舊居住。王公以下及庶人第宅、皆不得造樓閣臨人家。庶人所造房舍、不得過三間四架、不得輒施裝飾。For all residences of princes and dukes and those whose ranks are lower, double-layered bracket arms and coffers are not allowed to be used. Residences of those whose official ranks are above the third rank are not allowed to surpass a five-bay, nine-rafter hip-gabled structure, and their gatehouses are not allowed to surpass a three-bay, five-rafter structure. Residences of those whose official ranks are of the fifth and above are not allowed to surpass a five-bay, seven-rafter hip-gabled structure, and their gatehouses are not allowed to surpass a three-bay, two-rafter structure. *Wu* gates [烏門] generally are still built [for residences of those whose ranks are of the fifth and above]. Residences of those whose ranks are below the sixth and the seventh are not allowed to surpass a three-bay, five-rafter structure, and their gatehouses are not allowed to surpass a one-bay, two-rafter structure. Those who are not consultants-in-ordinary¹⁵⁰ are not allowed to build “axle-center” residences [*chouxinshe* 抽心舍],¹⁵¹ and [their residences are not allowed to] have installed decorations of overhanging fish, tile beasts, and refined beams. For those [having] residential houses of their grandfather, even though all the descendants are granted a hereditary rank [as a recognition of the services of the grandfather], let them live in the old residences. Neither residences of those whose ranks are under princes and dukes nor those of commoners are allowed to have a pavilion tower overlooking other inhabitants’ houses. Houses built by commoners are not allowed to exceed three bays and four rafters, and decorations are never allowed.

This document shows, for the first time in Chinese architectural literature, that almost every aspect of the Chinese architectural system was associated with the status of the building's owner. Of an earlier period, the *Kaogongji* preserves an architectural hierarchy in which the dimensions for a prince's city were smaller than those for the king's palace city. Other pre-Qin texts also include passages reflecting a hierarchical regulation of colors used in architecture (such as red for a king, dark colors for commoners). In the *Yingshanling*, it is clear that a hierarchical architectural system also applied to architectural types, structures, and even particular elements. For the first time, bracket arms are clearly related to social status. The *chonggong* 重栱 (double-layered arms) were not allowed to appear in low-ranking officials' residential halls. This is of profound importance to an understanding of Chinese architecture. Our knowledge of Chinese wood-framed architecture is thus increased and we can clearly see that the complexity of brackets, such as whether they are made with a single-layered arm or double-layered arms, how many layers of protruding arms they have, whether or not more complicated elements like cantilevers are used, is a matter of the grade of the building and of the social status of the owner (see figure I.2, illustrated bracketing from the *YZFS*, in which double-layered cross arms are installed on the first and second layers of protruding arms under the eaves, and the double-layered cross arms support tie beams that connect neighboring bracket sets longitudinally).

It is also the first time that we are told specifically how many bays a building has and how many rafters are used in a section of a wood frame, thus indicating that the number of purlins in a frame is significant for the status of the building. In other words, the size of a building and the space formed by its frame are also associated with social status. Architecturally, they are also a matter of the grade of a building. For instance, within the same social status, the residential hall and the gatehouse have different stipulated sizes and structures. Meanwhile, certain types of architecture and elements are permitted only for buildings for relatively high-ranking officials. For example, coffers (*zaojing* 藻井), a striking interior decorative element, are allowed only for princes and dukes and, from the context, thus for those whose ranks are above the first and the second. All residences for officials of any rank are allowed to have a hip-gable roof (*shaliangtou* 厦兩頭, a gable roof at the top and a hip roof at the bottom) at most, excluding the hip roof (four-slope roof, or *si'e* 四阿), which is the highest grade of roof types in all times. In addition, a *wu* gate (烏門)—likely referring to *wutoumen* 烏頭門 (*wutou* gate)—was not allowed in the buildings of

those ranking below the sixth and seventh levels. The *wutou* gate was used as an entrance structure in the residences of middle and high-ranking officials. It is included in the category of minor carpentry in the *YZFS*, which, nevertheless, does not define it or specify to what cases the *wutou* gate applied.¹⁵² *Wutou* refers to the decorated upper part of the doorposts of the gate (figure 1.7 left).

Moreover, decorative features, including tile decorations and elaborately shaped structural elements, also related to the social hierarchical system. Roof decorations like suspended fish (*xuanyu* 懸魚) and walking beasts (*washou* 瓦獸), along with curved beams (*ruliang* 乳梁), were allowed only for houses of court officials whose ranks were of the fifth or higher. Houses of ordinary people could not have decoration. Suspended fish and other roof decorations are illustrated in the *YZFS*, where suspended fish are termed *chuiyu* 垂魚 (figure 1.7 right). It is helpful then to understand that, in the *YZFS*, decorations like these, along with finely shaped beams—called *yueliang* 月梁 (crescent beams)—

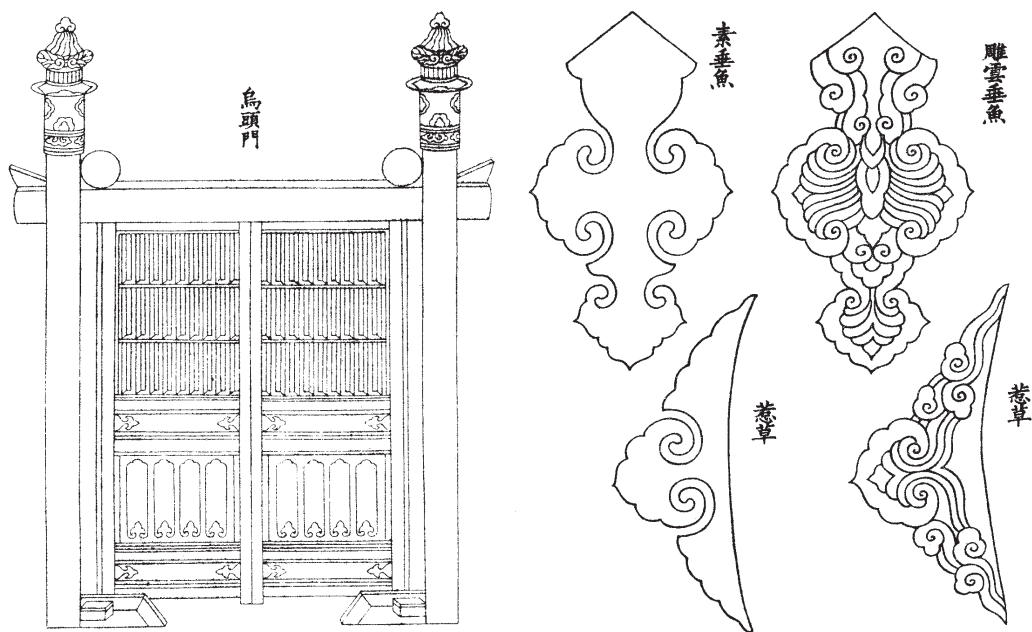


FIGURE 1.7. (Left) *YZFS* illustration of a *wutou* gate (*juan* 32:2b); (right) *YZFS* illustration of suspended fish (top) and seaweed as roof decorations (*juan* 32:9b)

and columns, using the *juansha* 卷殺 (entasis treatment) technique, are limited to official buildings or in the residential halls of ranked officials. This makes sense because the *YZFS* was an imperial treatise that set forth standards for official architecture. Nevertheless, the *YZFS* contains almost no clear statements regulating the usage of certain structural methods or elements in connection with social status. In this aspect, the *Yingshanling* becomes particularly important in Chinese architectural literature because of its clarification of the association between many aspects of architecture and social classification.

Short as it is, the *Yingshanling* deserves a unique place in Chinese architectural writings. It not only complements the *YZFS* in the discourse on the social status of architectural systems but is also important to the study of the *YZFS* from a technical point of view. The Tang and Song dynasties are close to each other historically, and from the *Yingshanling*, one can see the influence of Tang building technology upon Song architecture. The architectural structures of the two periods are similar in terms of structural types, elements, and terminology. The double-layered arms (*chonggong*), coffers (*zaojing*), hip-gable roofs (*shaliangtou*), *wu(tou)* gates, suspended fish (*xuanyu*), and walking beasts (*washou*), as well as the “X-bay Y-rafter” structure (*X jian Y jia* X間Y架, as a way to describe the type of frame), are all perpetuated in the building methods and terminology of the *YZFS*. In fact, the *YZFS* cites the *Yingshanling* for the building technology of the *shaliangtou* construction.¹⁵³ The term *ruliang* 乳梁 in the *Yingshanling* most likely was a generic term for any curved, finished beam, which is different from the *rufu* 乳楹 (two-rafter beam) in the *YZFS*. A *rufu* is a type of *mingfu* 明楹 (exposed beam) that is finished, and according to the illustrations in the *YZFS* and most extant Song buildings, a *rufu* is usually shaped as a crescent beam. The terms *ruliang* and *chouxinshu* 抽心榑 (which has no exact equivalent in the *YZFS*) serve as examples of the changes of architectural terminology and technology from the Tang to the Song dynasties.

In general, pre-Song architectural literature evolved from incidental mentions to a specialized category in historical and literary writings, and then to works specifically concerned with historical architectural compounds and classical ritual architecture. Accompanying an increasing awareness of history and tradition was the integration of that awareness into contemporary architectural practice. As architectural practice became increasingly sophisticated, architectural technology must have improved as well. Improved technology resulted in turn in greater construction activity involving patrons of all social statuses, who might build using a variety

of architectural methods. At the same time, awareness of the historical tradition, focused on ritual, strengthened the tendency of the imperial courts to regulate social status, which would also be represented in architecture, including the residential halls of people of different social rankings. This social background, together with developments in architectural practice and technology, contributed to the emergence by the Tang dynasty of imperial architectural regulations; this was the Tang's legacy to the Song.

2

From the *Mujing* to the *Yingzao Fashi*

The Rise of Building Manuals and the Construction of Architectural Knowledge

It would be impossible to replace a dynasty's established practice [and set a dynasty's new rules] without superb knowledge of architecture (非有治三宮之精識、豈能新一代之成規).

Li Jie, "Jin xinxiu *Yingzao fashi* xu"¹

Writing a constructive, comprehensive architectural manual and setting a dynasty's building standards, Li Jie was fully aware of the challenge of sufficient architectural knowledge. He stressed that possessing adequate knowledge of architecture was critical for accomplishing such a task. Indeed, although official rules for construction pertinent to social classification had been promulgated in Tang times, technical architectural knowledge had never been summarized in writing before the tenth century.

Traditionally, practical building knowledge was transmitted from teacher to disciple orally, often secretly, and this secrecy partly created a diversity of technical methods in use by different groups of craftsmen and in different regions. In the process of Chinese architectural technologies undergoing such an extensive development through to the end of the Tang period, there might have arisen an increased need for an authoritative guide to proper building methods. Experienced master craftsmen might have intended their written summaries of practical building methods to provide

artisans and builders in different areas with a standard to follow in their work. Organizing such knowledge and writing it down, however, would not have been an easy task, requiring both a rich experience in building practice and an adequate level of literacy. For common craftsmen lacking adequate education, it would have been difficult to record effectively the building technologies they knew or invented. For those who were literate, for instance scholars concerned with architecture, the challenge would have been an adequate technical knowledge of architecture. These factors probably account for the long absence of technology-oriented treatises on architecture in Chinese history.

Ending this lapse in the late tenth century was the three-chapter *Mujing* 木經 (Timberwork manual), an unofficial building manual that nonetheless affected Northern Song construction practices significantly. More than one hundred years later, the dynasty produced comprehensive official building standards in the form of a large-scale architectural monograph, namely the *YZFS*. The rise of technical building manuals during the Song period is an important development in the architectural literature of China. With the appearance of these manuals, written architectural knowledge began to be circulated among the public, available to craftsmen, officials, and scholars. It is important to look at how the knowledge of building technology was preserved in these manuals and what this written knowledge meant to society.

The *Mujing* and Its Impact upon Northern Song Building Practice

The Authorship: Craftsman or Scholar?

From the Northern Song period onward, authorship of the *Mujing* has been attributed to Yu Hao 喻皓 (also written as 喻浩 or 預浩; fl. 965–989),² who was said to be a famous, highly experienced, very skilled master craftsman (both a designer and a superintendent of construction projects, known as a *duliaojiang* 都料匠) during the early Northern Song period. Northern Song accounts state that he actively took part in important construction projects in the Northern Song capital Bianliang 汴梁 (modern Kaifeng 開封) during the reign of Emperor Taizong (r. 976–997).³ When Taizong patronized the construction of the wooden pagoda of the Kaibao Monastery 開寶寺 (built in 989), Yu was the designer and took charge of the construction. In addition, Northern Song accounts refer to Yu as

a Zhejiang 浙匠 (craftsman from Zhejiang) or Zhedong *jiangren* 浙東匠人 (craftsman from eastern Zhejiang).⁴ An account records that Yu offered private advice to the craftsman building a wooden pagoda at Hangzhou under the patronage of Qian Chu 錢俶 (r. 947–978), the last ruler of the Wuyue kingdom (904–978).⁵ It is not clear in this account whether Yu was formerly a subject of Wuyue, but such is likely considering the dates of this event and his activities in Bianliang.⁶ Yu's affiliation with the Wuyue kingdom was suggested in post-Song texts.⁷ Therefore, Yu was probably a master craftsman of the Wuyue before he continued his practice and became famous in the Song capital. There is no clear record indicating that Yu was an official of the imperial Song Directorate of Construction, although we know that he played a leading role in the official building practice of the capital. Indeed, the *Mujing* includes building methods specifically for imperial palaces (宮中 denoting the precincts of palaces), as discussed and shown in the text quoted below. But it is not clear if the palaces mentioned in this text were associated with Song imperial architecture or with that of the Wuyue.

It is of much interest that many Northern Song scholars wrote or took it as a pleasure to talk about Yu Hao and his *Mujing*. These scholars include Yang Yi 楊億 (974–1020), in his oral account *Yang Wengong tanyuan* 楊文公談苑 (Record of Yang Wengong's [Yang Yi] talks);⁸ Ouyang Xiu 歐陽修 (1007–1072), in his *Guitianlu* 歸田錄 (Record of returning to fields, ca. 1067); Shen Kuo 沈括 (1031–1095), in his *Mengxi bitan* 夢溪筆談 (Brush talks at Dream Creek, 1086–1093); and monk-scholar Wenying 釋文瑩 (fl. eleventh century), in his *Yuhu qinghua* 玉壺清話 ([Contemporary] stories excerpted from corpora at Yuhu, 1078). It is important to note that when the statesman and scholar Shen Kuo wrote about the *Mujing*, he said, "Some say it was written by Yu Hao" (或云喻皓所撰).⁹ So the authorship was in doubt even at that time. In modern scholarship, Xia Nai 夏鼐 (1910–ca. 1985) suggested that the *Mujing* was likely a work by an anonymous author but attributed to Yu Hao because of the renown of his technical skills; and Yu Hao might have been illiterate.¹⁰ If so, it is possible that someone literate—a scholar—wrote for Yu Hao, taking down his oral account of practical building methods. It would thus represent an instance of cooperation between craftsmen and scholars. Since many Northern Song scholars were interested in Yu Hao and his *Mujing*, there occurs the possibility that learned society beginning in the tenth century became greatly concerned about practical matters like architecture. Whether such communication and cooperation between scholars and architectural professionals indeed emerged then and, if so, how much they interacted will be revealed as we look at the technical

contents of the *Mujing* and the *YZFS* in connection with their significance for all of society.

The Content of the *Mujing*

Most of the contents of the manual have been lost. The surviving text is a short passage preserved in Shen Kuo's *Mengxi bitan*.¹¹ It may not reflect the original text precisely but is presumably an excerpt or summary.¹² Although it is a fragment and might be secondhand material, it is a very important reference in the development of Chinese architectural technology from the Tang down to the early Northern Song. It demonstrates a conception of architectural modules, which places its practice in a position between traditional architectural systems (from the *Kaogongji*) and the more advanced system of architectural standardization represented by the *YZFS*. Moreover, no matter whether this treatise was written during the early Song or the late Five Dynasties period, the architectural methods set forth in this manual represent the transmission of architectural technology from the Tang to the tenth century.

The importance of this unofficial manual lies also in its influence on contemporary architectural practice. Mid-Northern Song accounts state that the *Mujing* was a prevalent text from the early Song period until the 1060s, a span of some one hundred years.¹³ This extended influence is important in studying Chinese architectural history and improving our knowledge of Song architecture. Because of its importance, the bulk of the surviving text is quoted below:

凡屋有三分（〔註〕去聲）：自梁以上為上分、地以上為中分、階為下分。凡梁長幾何、則配極幾何、以為榱〔衰〕等。¹⁴如梁長八尺、配極三尺五寸、則廳法堂〔廳堂法？〕也。¹⁵此謂之上分。楹若干尺、則配堂基若干尺、以為榱〔衰〕等。若楹一丈一尺、則階基四尺五寸之類。以至承栱、榱桷、皆有定法。謂之中分。階級有峻、平、慢三等。宮中則以御輦為法……此之為下分。Buildings have three modular units ([original annotation] *fen* as falling tone): The [main] crossbeam and what is above it belong to the upper unit; what is above ground [except for the beam structure] belongs to the middle unit; the stairs belong to the lower unit. In all circumstances, the length of the [main] crossbeam governs the height of the ridge purlin, and the ratio between them leads to a progressive increase or decrease in the height of the ridge

purlin. If a [main] crossbeam is eight *chi* long and a ridge purlin of three-and-a-half-*chi* in height is used, it is then the case in which a small residential hall [*ting* 廳] follows the principle of a larger residential hall [*tang* 堂] (or is the method for residential halls [*tingtang* 廳堂]?). These are called [the principle of] the upper unit. The dimensions of [eave] columns determine the dimensions of the base of a hall, and based on the relationship between them, [measurements of the base] increase or decrease by degrees. For example, if a column is eleven *chi* [high], a platform will be four and a half *chi* [high]. As for bearing brackets and rafters, all have their fixed methods [like the case of the base]. [All these] are called [the principle of] the middle unit. For stairs, there are three kinds: steep, intermediate, and gentle. In palaces, these gradients are based upon [a unit derived from] the imperial carriage . . . This is [the principle of] the lower unit.¹⁶

The text states that a building has three *fen* 分 (modular units): those above beams—that is, beams, purlins, and framework—belong to the upper unit (上分); those above the ground—platform, columns, brackets, and rafters—belong to the middle unit (中分); and the stairs attached to the platform belong to the lower unit (下分).¹⁷ Each modular unit deals with the relationship between measurements of two elements (or two parts) belonging to the same unit. In the upper unit, the length of the main beam determines the height of the ridge purlin (*ji* 極). This principle is consistent with the *juzhe* 舉折 (raise and break) method in the *YZFS*. In this method, the height of the ridge purlin must be determined first, by the length of the main crossbeam basically, and then heights of other purlins can be determined in order to make the break line of the roof. In the *Mujing*, the relationship between these two structural elements—main beam and ridge purlin—is defined as a ratio of 3.5 (height of ridge purlin) to 8 (length of the beam), that is, 1:2.28. Modern scholarship suggests that this ratio—1:2.28—represents the upper unit,¹⁸ which I think is incorrect. The text associates this ratio with a special case in which “a smaller residential hall follows the principle of a larger hall” (廳法堂), or specifically with the “method for residential halls” (廳堂法), regardless of the variation in the text.¹⁹ This association indicates that the ratio was not a universal proportion applicable to all beam structures. The text does not clarify a concrete or fixed ratio between measurements of the main beam and the ridge purlin but merely gives an example of that proportional relationship in a special situation of beam structures. Even if such a “fixed”

ratio were given in the text, it would be applicable for determining the height of the ridge purlin only, but not for determining dimensions of all other elements on the beam structure. For instance, this ratio would not exist between the length of the main crossbeam and heights of any other purlin; nor would it work for determining other measurements of the beam structure, such as the diameters of all purlins, lengths, and widths of other supporting components (inverted V-shaped braces, for example). Therefore, the ratio of the length of the main beam and the height of the ridge purlin cannot serve as a module for the entire upper unit. It would make more sense if we consider that the length of the main crossbeam served as the module. A proportional relationship between the dimension of the main beam and that of one element (ridge purlin, for instance) must be different from the proportion of the dimension of the main beam and that of another element (intermediate purlin, for example). However, all these proportions must be based on the length of the main crossbeam.

In the middle unit, the measurement of the principal columns (*ying* 楹) determines that of the platform of a hall (*tangji* 堂基). However, the ratio of the dimensions (most likely, heights) of them that is defined here, 4.5 (platform) to 11 (column), or 1:2.44, is certainly not a universal proportion for the entire middle unit.²⁰ This is because the text continues to state, “Even for supporting brackets [*chenggong* 承拱], rafters [*shuaijue* 榑桷], and other elements, there are always fixed methods [*dingfa* 定法] [to determine their dimensions]. These [also] belong to the middle unit.”²¹ Clearly, the proportional relationship between platform and column (1:2.44) does not apply to smaller elements such as bracket arms, blocks, and rafters. Instead, the “fixed methods” here must designate a few ratios of the dimensions of these smaller elements and the dimensions of the column. Again, these “fixed methods” or ratios are not elaborated in the text. As a technical manual tailored to craftsmen in their building practices, these “fixed methods” were necessarily explained, if not elaborated. Probably we should not assume that the author (Yu Hao or someone else) might have deemed it unnecessary to detail each of these “fixed methods” since they would have been understood; if that had been the case, why would he have told readers such basic aspects as the definitions of the three basic units, which also would have been readily understood? It is more likely that these “fixed methods” were omitted in the excerpt Shen Kuo selected from the *Mujing* text. In any case, one thing is clear: all these “fixed methods” must depend upon the measurement of the principal column, just as the upper unit must be based upon the length of the principal beam.

The last part of the text, which explains the lower unit, classifies the gradients of stairs into three kinds: steep, medium, and gentle. Without mentioning details of these gradients in general building practice, the text elaborates upon them in the construction of imperial palaces. As the text shows, these gradients were measured by how the imperial sedan chair was raised to ascend the stairs. The arm length and shoulder height of the leading and trailing bearers of the sedan chair were involved in measuring these gradients.²² Modern scholars have tried to deduce these three gradients (ratios of the height and length of stairs) in the text, and their deductions diverge.²³ At any rate, the principle of determining the gradients of stairs by the way the bearers hold the imperial carriage would not be efficient in designing and constructing the stairs. It might be useful for examining the gradients of built stairs.

More practical, efficient methods for building stairs are given in the *YZFS*. The descriptions of both the system of stonework and that of brickwork in this treatise include principles of making stairs (“zao tadao zhi zhi” 造踏道之制), in which gradients are clearly indicated. The gradient of stone stairs is slightly different from that of brick stairs, but each has only one kind of gradient instead of three. For instance, the method for stone stairs is given as “每階高一尺作二踏、每踏厚五寸、廣一尺”²⁴ (On each occasion that a stair is one *chi* high, make two steps. Each step is five *cun* tall and one *chi* wide). Because one *chi* 尺 is equal to ten *cun* 寸, the gradient is thus straightforwardly 1:2. Compared with the three kinds of gradients in the *Mujing*, the standard, single gradient in the *YZFS* clearly indicates the change in the system for building stairs from the early to the late Northern Song periods. The indirect, inefficient way of determining the ratios of the height and length of the ramp (stairs) during the *Mujing* period had been replaced by a straightforward, “designer-and-builder-friendly,” efficient, and unified method. The unification of these gradients may also have been one of the aspects of central control over building practices.

In the *Mujing*, the three units did not seem to possess a coherent relation to one another. The upper unit, which was based on the length of the main crossbeam, was fit only for the framework; elements within this unit were not determined by the dimensions of the columns. Likewise, the dimension of the main beam did not determine any elements within the middle unit (columns, walls, doors, and windows), those on top of the columns (brackets, eaves, and rafters), and those under the columns (platform). There is no unifying modular unit available for all parts and all elements. Unlike the *Mujing*'s multimodular system, a unified modular system derived from a

standard timber element was set out in the *YZFS*. This unified module was called the *cai* 材: a section of a bracket arm in which the ratio of its height and width was 3:2. This module works not only for bracketing, columns, windows and doors, eaves and rafters, but also for beams, purlins, and the entire timber frame. Since a section of a bracket arm consists of two dimensions, width and height (sometimes termed “length” in the *YZFS*), the *cai* module is virtually a two-dimensional modular system. When it is used to measure heights, *cai* means the height of the section of a bracket arm; similarly, in measuring widths, *cai* means the width of the section of a bracket arm. In addition, in order to measure smaller elements or designate a tiny measurement, the width of a *cai* was divided into ten portions, each termed *fèn*; correspondingly, the height of a *cai* then became fifteen *fèn*.

Comparing the modular systems in the two manuals, we see that the *cai* module possesses advantages over the *Mujing*'s modules. It is more precise and more convenient for measuring architectural elements and parts. In the *Mujing*, all “fixed methods” in the middle unit are based on the height of the column, meaning that those smaller elements, including brackets, which are composed of so many very small timber elements, are determined by larger elements. Architecturally, this is less reasonable than the reverse, with larger elements determined by smaller elements, like the *cai* of the *YZFS*. In fully developed modular systems like the one recorded in the *YZFS* and in the Qing-period imperial building manual *Gongcheng zuofa* 工程做法 (Construction methods, 1734), it is a basic principle that the module comes from a measurement of a relatively smaller architectural element, for instance the *cai* in the *YZFS* or the width of a bracket arm (料口) in the *Gongcheng zuofa*. Although Qing-period building modules also included a module derived from the height of a column, such a “large” module was designed for those common, minor (小式) buildings that had no bracketing in them. All ornate buildings (大式), including those common buildings that had bracketing, used the width of a bracket arm as the unifying module for all parts of the building. The advantage of such a module system lies in the efficiency with which larger elements can be accurately measured, since their measurements simply equal multiples of the module (for instance, 1M [module], 3M, 20M, and so on). In contrast, with a larger module, some measurements of a smaller element, such as the curvature of the lower part of a block, which is very tiny, could not be measured efficiently because it would have to be a very small fraction of the module (and often an irrational number, such as one-seventh, one-ninth, or even one-fiftieth of the module).

Although the “basic units” in the *Mujing* are a primary modular system and different from the unifying modular system represented in the *YZFS*,²⁵ the modular conception recorded in this unofficial tenth-century building manual is significant. Modern scholarship on Chinese architecture has suggested that a standard architectural module emerged during the mid-Tang period. This suggestion is based on a survey of the main structural components of extant Tang buildings. Nevertheless, there is no textual evidence to date, and the group of surviving Tang buildings available for measurement data is rather limited. A recovered Dunhuang document that is believed to date from either the late Five Dynasties or early Northern Song periods, which includes a list of building materials, is probably the earliest extant text suggesting the existence of a standard architectural module (figures 2.1, 2.2).²⁶ In this document, the measurements of almost all architectural elements possess a special feature in that they contain only two of the three dimensions: (1) the measurements for the *men'e fangzi* 門額方子 (lintel above the door) include *chang* 長 (length) and *kuo* 闊 (width or height) only, with information about the third dimension missing; (2) all other elements are described only in terms of length (*chang*) and *jing* 徑 (diameter), no matter if the section of such elements is round or not. This descriptive feature of architectural measurements was most likely due to a fixed ratio in practice, in other words a standard modular system characterized by a conventional ratio of the two dimensions in a section of an element—most likely a bracket arm. As in the *YZFS*, the section of a bracket arm is used as a standard module, in which the ratio between its height and its width is 3:2. With such a fixed ratio or module widely accepted by architect-craftsmen and builders, the two dimensions of the section of an element would have been clearly determinable if the diameter of a round timber was known; likewise, the third measurement (width or height) of an element of a square section would have been easily determined. Thus, by the late Five Dynasties or early Northern Song periods, which is Yu Hao's time, a standard architectural module relating to a fixed ratio of the two dimensions of an element was already in use. The *Mujing* clearly indicates the application of modular units, although these “units” did not yet constitute a unifying, standard modular system. The *Mujing*'s modular units represented a transitional stage of module systems from a primitive, multimodular level to the mature, unifying one as seen in the *YZFS*.

The value of the *Mujing* in Chinese architectural literature is not limited to its clear indication of a primitive modular system. Significantly, this text is probably the earliest-known instance of Chinese architectural writing clearly indicating a classification of frame types during the late tenth century. Its

mention of a “method for residential halls” (or method for residential halls of a mixed class) indicates that there were other types of frames as well. Extant Tang-period wood-framed buildings demonstrate a clear differentiation between two types of beam structure: *tingtang* 廳堂 (residential halls) and *diange* 殿閣 (tower-type halls).²⁷ The *YZFS* also includes these two main types of beam structure, and in the *YZFS*, the division between these types is distinct. In terms of architectural grade, *tingtang* is inferior to *diange*, and accordingly different ratios of the height of ridge purlin and the length of the main beam apply to the two types: roughly 1:4 for a residential hall and 1:3 for a tower-type hall.²⁸ The ratio illustrated in the *Mujing* is, nevertheless, 1:2.28. Because it is larger (higher) than both types in the *YZFS*, modern scholars have suggested scribal errors.²⁹ However, this larger ratio, in association with a steeper roof than that indicated by the imperial Song manual, might instead reflect the actual technology and style of architecture during the late Five Dynasties and early Song periods. Extant buildings of this period do indeed reveal that some residential halls were built with a higher grade than they were supposed to have; the frames of these halls are of a mixture of the tower type and residential-hall type, and the gradients of the roofs in these halls were usually greater than 1:4.³⁰

Considering that a mixture of the two types of frames was indeed a characteristic of the architecture of the Five Dynasties and early Song periods, both of the *Mujing*'s variant texts “則廳法堂也” and “則廳堂法也” could have made sense at the time. The latter would mean “[that] then [is the] method for residential halls,”³¹ and thus the text would indicate the contemporary phenomenon in which a residential hall could be built with a taller roof than its grade. In the former phrase, *fa* 法 is a verb that could mean “follow [the rule of],” and thus the phrase means that *ting* 廳 (smaller residential hall) follows the method for *tang* 堂 (larger residential hall). Although the discourse in the *YZFS* on the major carpentry system uses the term *tingtang* for residential halls, as opposed to the tower-hall type (*diange* 殿閣),³² we see a more careful division of building types in its discourse on the tile system. In describing the methods of building ridges, the *YZFS* classifies buildings into seven types, corresponding to seven grades of buildings: immediately next to the first grade, *diange*, are *tangwu* 堂屋 and *tingwu* 廳屋, not *tingtang*. Moreover, the method for *tingwu* reads as follows: “廳屋：若間、椽與堂等者、正脊減堂脊兩層”³³ (For those *ting* halls that have the same number of bays and rafters as do *tang*, [the height of] their main ridges should be two layers less than the ridges of *tang*). Following this sentence, an annotation reads as follows: “餘同堂法” (The remaining aspects [of ridges] follow the methods for *tang*).

Likewise, under the method for the fourth grade of buildings, gate-tower halls 門樓屋, an annotation reads as follows: “其高不得過廳”³⁴ (Its height cannot be more than [that of] *ting*). Apparently, although *tingtang* was a generic term for residential halls during the Northern Song period, *ting* and *tang* were nonetheless two different types of halls and *ting* was inferior to *tang*. That is to say, *ting* and *tang* corresponded to “small residential hall” and “large residential hall,” respectively.³⁵ This could also have been the case during the late Five Dynasties period, so the *Mujing* text “則廳法堂也” is not necessarily erroneous, as modern scholars have claimed. In any case, the text indicates that during the tenth century it was a common phenomenon for a residential hall to be built with a taller roof than expected from its designated grade. It could be the case that residential halls generally were made in greater grades, or that a smaller residential hall, termed *ting*, was often designed to follow the principles of larger residential halls, *tang*. This point improves our understanding of Five Dynasties and early-Song architecture.

The So-Called Hundred-Year Impact of the *Mujing* on Song Practice
According to Song accounts, the *Mujing* building methods were widely accepted and followed in architectural practice until the mid-Northern Song period. In his *Guitianlu*, which relates anecdotes of the court and matters that official historiographers did not record, the eminent scholar Ouyang Xiu comments on Yu Hao’s skills and his *Mujing*:

國朝以來、木工一人而已。至今木工皆以預都料為法。有《木經》三卷、行於世。³⁶ Since [the foundation of] our state, [Yu Hao has been] simply the only figure among builders. To this day, all builders follow the methods of Master Carpenter Yu. There is a three-chapter *Timberwork Manual* [written by him], extant.

Ouyang’s claim that the text was in use in the “present day” (至今) is very important for understanding the duration of the *Mujing*’s impact on Song architectural practice. His preface is dated to the fourth year of the Zhiping 治平 period (1067) under the reign of Emperor Yingzong 英宗 (r. 1063–1067). The latest date mentioned in the anecdotes of this text is the second year of the Zhiping period (1065).³⁷ Qing scholars suggested that the contents of the *Guitianlu* were Ouyang’s notes jotted down from time to time (平時劄記).³⁸ Song accounts suggest that when Ouyang presented this work to Emperor Shenzong 神宗 (1048–1085,

r. 1067–1085), he revised some of the contents that he had recorded earlier and also added to the work additional anecdotes.³⁹ Thus, it is difficult to date precisely the “present day” of the text. Nevertheless, in the text a record of an anecdote concerning Emperor Renzong 仁宗 (r. 1023–1063) includes the following language: “仁宗初、立今上為皇子、令中書召學士草詔”⁴⁰ (At the time when Renzong ascended the throne, he ordered that His Majesty (the present emperor) be made crown prince, and [he] ordered the Imperial Secretariat to call scholars to draft an imperial edict [to that effect]). Clearly, the “present emperor” refers to Yingzong. Moreover, another anecdote recorded in this work relates the following: “國朝百有餘年、年號無過九年者……嘉祐九年改為治平。惟天聖盡九年、而十年改為明道”⁴¹ (Our state has existed for more than one hundred years, and there has never been a reign title that was used for more than nine years . . . In the ninth year of the Jiayou 嘉祐 [1056–1064], [the reign title] was changed to Zhiping 治平 [1064–1067]. Only the Tiansheng 天聖 [1023–1032] reign lasted a full nine years, and yet in its tenth year [1032], [the title] was changed to Mingdao 明道 [1032–1033]). In this passage, the date of Ouyang’s writing is clearly several years after 1060—one hundred years after the foundation of the Song. Because Ouyang did not mention the case of the Xining 熙寧 reign (1068–1077) under Shenzong, which also lasted more than nine years, we know for certain that Ouyang wrote this note in the 1060s, or no later than the early 1070s.

In particular, the anecdote that immediately follows the above account about Yu Hao’s *Mujing* also includes the following: “國朝之制、知制誥必先試而後命。有國以來、百年不試而命者、纔三人”⁴² (It is the system of our state that the drafter of imperial decrees must first take an examination and, after that, can be appointed. Since our state was founded, there have been, for a hundred years, only three people who were appointed without taking an examination). Again, *bainian* 百年 (one hundred years) indicates the date of writing to be around the 1060s. Based on these facts, it is most likely that Ouyang recorded most of the anecdotes, including the one about Yu Hao, during the 1060s. That is to say, Ouyang’s comments on this technical manual could reflect its actual influence on Song architecture through the 1060s, or at a conservative estimate, from the 1050s to the 1060s.

Some twenty to thirty years later (1086–1093), Shen Kuo, who included excerpts from the *Mujing* in his work the *Mengxi bitan*, made the following comments:

近歲土木之工、益為嚴善、舊《木經》多不用。未有人重為之。亦良工之一業也！⁴³ Builders in recent years have become much more precise and skillful [than formerly]. The old *Timberwork Manual* has basically fallen out of use. There is hardly anybody [capable of] writing a new one. [To write such a work is] truly an outstanding achievement for skilled craftsmen!⁴⁴

This account suggests that this “old *Timberwork Manual*” indeed had been “used” (用)—consulted in one way or another—by Song builders before Shen’s time. How the Song architectural professionals “used” it deserves further discussion. Here, according to Song records, after an exceptionally long period of “use,” the *Mujing* had lost its influence by the late eleventh century. If we place the composition of the *Mujing* at the time of Yu Hao, about 950–980, then the duration of the *Mujing*’s influence spanned nearly one hundred years.

However, considering the great gap, despite some similarities, between the overall building technologies as recorded in the *Mujing* and those in the *YZFS*, it is not proper to equate the *Mujing*’s methods with the entire first hundred years of Northern Song building practice. Nor is it appropriate to treat the *Mujing*’s technologies as the totality of Northern Song building technologies from 960 to the 1060s. The primitive stage of modular systems in the *Mujing*, as mentioned above, did not even reflect the reality that a more comprehensive modular system had already been in practice at least since the Five Dynasties period, if not since the Tang period. Even in remote regions like the Dunhuang area, builders used a far more complex module to construct wood-framed grotto eaves. These modular systems were all superior to that of the *Mujing* and identical to that of the *YZFS*. It is therefore doubtful that the primitive modular system in the *Mujing* influenced building practice as long as and as much as it was said to do. It is hard to imagine that even one hundred years later Song builders still “all followed the methods” that it laid out without improving the building technologies and employing newly developed methods. It is also unlikely that Song builders were unaware of the existence of the more advanced modular system that had long been applied to their architectural legacy—Tang and Five-Dynasties buildings. Then what was happening during this “hundred years” of building practice?

Written Architectural Knowledge: The Ideal of Professionals and Literati

I argue that the *Mujing's* impact on Northern Song building practice, to a great extent, lies in its rarity as a technical treatise in the long history of Chinese architecture. After the *Kaogongji*, no early technical treatises on architecture were passed on to the Song other than the *Mujing*, which was written either at the end of the Five Dynasties period or immediately after the establishment of the Song. As mentioned, most craftsmen lacked sufficient schooling to be able to write about the techniques that they had acquired from practical experience. In such a context, the *Mujing*, whether it was composed by a master craftsman (Yu Hao or a contemporary) himself or by a scholar writing for him, was unprecedented. For the first time in Chinese history, a text offered elaborate technical methods for wood-framed building systems that were highly practical and could be applied to the actual design and construction of individual structures. In other words, it was exactly what common builders had been longing for in their professional practice. They needed a useful manual as a standard to guide them in improving their practices. This manual was thus well received and, beyond that, esteemed as a “classic of timberwork” by Northern Song craftsmen. Although they themselves must have been creating new, better methods as Song architectural technology developed, they nonetheless treated the *Mujing* as an essential reference. During those one hundred years of practice, the degree to which craftsmen depended on the *Mujing* standard was reduced, and this process must have occurred much sooner than after one hundred years. Evidence from extant Song structures of this period shows us a more developed building system than that in the *Mujing*. Yet even as the *Mujing* methods became less and less practical, the manual remained an icon of its kind and continued to be respected and consulted by Song craftsmen. Even if they employed newer methods in actual construction practice, they would nevertheless claim that their designs “followed” or were enlightened by “following” or “using” the theories laid out in the *Mujing*.

As also mentioned, Song scholars too paid great respect to this building manual. Such respect is expressed by their enthusiastic comments on Yu Hao's skills and on the *Mujing*, from Ouyang Xiu's “simply the only figure among builders” (木工一人而已) to Shen Kuo's evaluation of the *Mujing* as “an outstanding achievement for skilled craftsmen” (良工之一業). More important, Song literati rejoiced in drawing associations between especially esteemed building designs and the principles contained in the *Mujing*. For example, in his *Luoyang mingyuan ji* 洛陽名園記 (Record of celebrated

gardens in Luoyang, ca. 1087), Li Gefei 李格非 (fl. 1080s) offers praise in commenting on the wood-framed hall in “Master Liu’s garden” (劉氏園):

涼堂高卑、制度適愜、可人意。有知《木經》者、見之且云：“近世建造、率務峻立、故居者不便而易壞、唯此堂、正與法合。” The size (height) of the Hall of Coolness and the structural system are exactly appropriate and delightful, suiting people’s needs. Someone who knows the *Timberwork Manual* saw this structure and said, “In recent years all buildings that are constructed are made of an imposing height, and that is why they are inconvenient to live in and easily destroyed. Only this hall precisely conforms to the standard building principles [as in the *Mujing*].”

Li Gefei’s piece was written almost at the same time as Shen Kuo judged the *Mujing* to be no longer useful. Clearly, until a new compilation of updated building technologies like the later *YZFS* was available to society, Song scholars like Li Gefei still regarded the *Mujing* as the most authoritative source and the most important standard for judging and assessing architectural designs as good or bad. The continuing influence of the *Mujing* among the literati is strikingly apparent.

It is because Song architectural professionals and literati alike were fanatical in their veneration of the *Mujing* classic that its influence on building practices extended so far beyond its relevance. A thorough, skillful compilation of architectural knowledge had become an ideal of both craftsmen and the literati. Realizing the “hundred-year” duration of the *Mujing*’s impact on Song construction practice is important for understanding the social effect of written practical knowledge in medieval China.

It is significant that the *YZFS* was in progress precisely around the time when the *Mujing* had completely fallen out of use, both in reality and in terms of the rhetoric surrounding it. From the *Mujing* to the *YZFS*, practical architectural knowledge was organized more systematically and on a greater scale, and it became widespread throughout society. Bearing witness to the brilliance of technical architectural treatises in Song times, both the *Mujing* and the *YZFS* are more culturally informative than merely practical.

Northern Song Official Writings on Architecture before the *YZFS*: Intellectual Preparation for the Production of State Building Standards

Completed at the beginning of the twelfth century, the *YZFS* was partly the outcome of active construction practice under a steadily advancing economy during the Song. It synthesized proven practical methods within the tradition as well as improvements and developments over nearly one hundred and forty years. It also emanated from the ceaseless exploration of the architectural tradition. Many contemporary official writings had laid a significant foundation for the organization and study of the textual tradition on architecture in the *YZFS*. They provided an important intellectual preparation for the production of an imperial architectural treatise and state building standards in which the practical and classical traditions were fused.

Pictorial Studies of Traditional Ritual Architecture: The *Sanlitu* and the Song Revival of the Classics

From the beginning of the Song dynasty onward, Confucian scholars began their active exploration of architectural traditions in the classics. Their explorations were directly associated with the political and ritual demands of the Song emperors, who strongly promoted classical ritual systems. In 962, shortly after the foundation of the Song, Nie Chongyi 聶崇義 (fl. 956–962) presented to the court the twenty-chapter *Xinding Sanlitu* 新定三禮圖 (Newly examined illustrations [of the ritual systems] in the *Zhouli*, the *Yili*, and the *Liji*), in which he examines the three classics and illustrations of various ritual objects. He devotes one chapter, entitled “Gongshitu” 宮室圖 (Pictures of palaces), to the architecture in these classics on ritual.⁴⁵ The compilation of this *Sanlitu* was undertaken initially by order of Emperor Shizong 世宗 (r. 954–959) of the Later Zhou 後周 (951–960), the regime that Nie had served. As the Northern Song official Dou Yan 竇儼 (ca. tenth to early eleventh centuries) wrote in his preface to this book,⁴⁶ both the Later Zhou and Song courts, beginning with Emperor Taizu, who took power from the former, made it a point of their political and ritual agendas to restore and reinstate the rites of their forefathers of the classical Xia and Shang, an ancient period historically characterized by virtue, power, and wisdom. Since many forms and ritual objects of the classical system had been erroneously transmitted and were hence confusing during and after the Five Dynasties period, the emperors intended to establish official standards for rituals and

issue them to the entire nation.⁴⁷ As part of this effort, the classical system of Zhou ritual architecture, developed from the systems of the Xia and Shang, was studied and illustrated by Nie.

The section on architecture includes fourteen illustrations, each furnished with quotations from the original ritual texts, historical commentaries, and Nie's discussions of them. The first three pictures illustrate the three most important architectural systems related to classical rituals as recorded in these classics (including the "Jiangren" section of the *Kaogongji* that was added to the *Zhouli*). They are: (1) the Mingtang of the Zhou, the most important structure in ritual ceremonies; (2) the system relating to the palaces and private residences of the king and his empresses (宮寢制); (3) the system for the king's city (王城) (figures 2.3 and 2.4). In the accompanying text, Nie discusses details of the Zhou design of these buildings by referring to commentaries on the classics by great Han and Tang commentators. The other illustrations in this architectural section concern the system of administrative districts on all levels subordinated to the king's capital, the system of districts on all levels subordinated to a local capital, as well as the system of ditches and roads in the districts outside the suburbs of a capital city. These pictures illustrate the relationship in the scale of cities, districts, and buildings to the distinctive hierarchical system based in ancient rituals. All these represent the Zhou system except for the final picture, which illustrates the Qin-period Mingtang as reflected in the "Yueling" 月令 (Monthly [ritual] orders) of the *Liji*. By specifying the change in the Mingtang system from the Zhou to the Qin, and by placing this illustration at the end of this architectural section,⁴⁸ Nie intended to distinguish the authentic Zhou ritual system from that of any characterized by modifications made during later periods, even if the modified system had been added to the classics during the Han period. This reveals a remarkable aspect of the Song revival of classical rituals: priority was given to the Zhou system over that of the Qin-Han period.

In compiling his *Sanlitu*, Nie searched for and collected several versions of old illustrations of ritual objects that had been made by scholars from the Eastern Han to the Tang period,⁴⁹ very few of which are preserved today.⁵⁰ He examined and compared these old images and the classics and scrupulously made new illustrations himself, taking great pains to create accurate images that he believed followed the classics faithfully.⁵¹ The faithfulness of Nie's illustrations to classical ritual architecture was nevertheless a matter of how he perceived the Zhou palaces, ritual architecture, and cities. In the illustrations of the 1175 edition,⁵² the buildings are depicted in combined

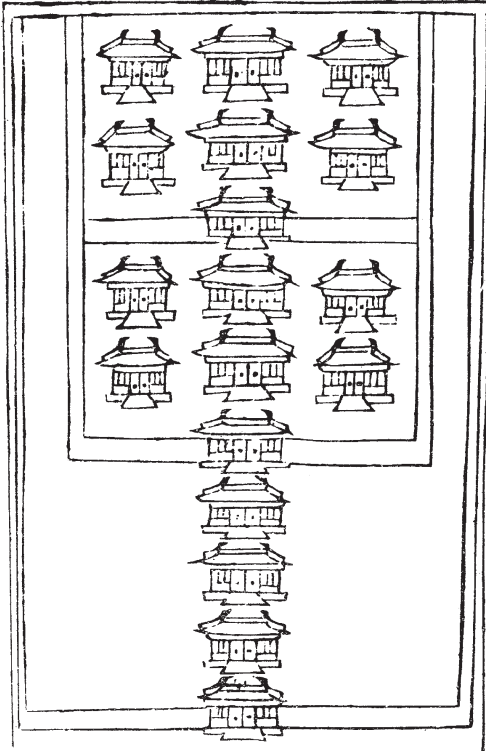


FIGURE 2.3. Classical system of palaces illustrated in Nie Chongyi, *Xinding Sanlitu*

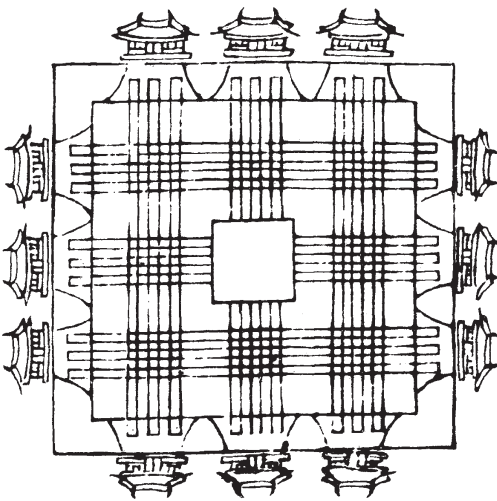


FIGURE 2.4. Classical system of the king's city in Nie Chongyi, *Xinding Sanlitu*

architectural styles from the archaic to the post-Northern Dynasties (386–581) periods. The rather simple three-bay, single-eave, hip-roofed halls and city-gate towers, and the straight-line eaves and roofs in some of these buildings, as well as the lack of bracketing under all the eaves, are reminiscent of the Zhou and Han styles. But the large-size tile decoration of owl-headed fish tails all facing one another, and the many curved eaves and roofs generally also represent a style used after the Northern Wei period. As shown by all the towers in the illustration of the king's city, the curvature of the eaves and roofs is so remarkable that even the main ridges bend upward at the two ends. Such a high degree of curvature is a style common in Tang-Song buildings. These combined architectural styles may be associated with the various versions of illustrations of classical rituals by scholars of different historical periods since the late Han. Although he must have sincerely intended to illustrate and reconstruct the Zhou palaces, when Nie reproduced these images he, like previous scholars, added to his illustrations a more or less characteristic contemporary style that was more familiar to him.

The pictorial work that Nie performed in his *Sanlitu* illustrates specific architectural systems of classical Zhou palaces and compounds according to classical ritual texts. In illustrating the architectural systems, he was illustrating, in particular, the layout of a compound and its composition of structures whose data could be found in or deduced from texts. As for the period style and appearances of individual buildings, Nie had to rely on the comprehensive knowledge at his disposal beyond his Confucian scholarship and his

judgment of the accuracy of previous illustrations that he consulted. The kind of illustrations Nie drew differed from those Li Jie would draw in compiling the *YZFS*, which entailed illustrating contemporary architectural technology, elements, details, and decorative arts. As an official of the imperial Directorate of Construction with abundant experience in supervising imperial projects, Li knew more about what he was illustrating than Nie did. Thus Li was better able to provide authentic images than Nie.

Nonetheless, Nie's pictorial study of classical architecture is a landmark in the history of Chinese architectural literature. In this work, all previous pictorial studies of ritual architecture recorded in the classics are synthesized in a superior manner. His illustrations of Zhou palaces, the Mingtang, and the king's city, along with his comments on the classical ritual texts, were highly influential over time and were often cited, referred to, discussed, and debated by Song literati and subsequent scholars. Nie's work raised the curtain on the Song revival of architectural classics that came into being after the old social order and traditional patriarchal values faced abandonment at the end of the Five Dynasties. Beginning with Nie, Song scholars continued to study the classical systems of the Mingtang and other ritual architecture, consistently with the intention of promoting classical rituals.⁵³ Within this tradition of Song scholarship, Li Jie began his discourse on state building standards by heavily quoting classical texts, including the *Zhouli*, the *Liji*, and the *Yili*, and setting them down as orthodox theoretical foundations for his compilation of the *YZFS*.

The *Taiping Yulan's* Terminology Sections and Format: Imperial Compilations of Encyclopedias and Literature

During the early Northern Song, Emperors Taizong and Zhenzong 真宗 (r. 998–1022) sponsored official compilations of several famous, massive book projects dealing with classics and historical literature in order to declare to the whole nation that the Song dynasty vigorously promoted civil administration. One of these book projects was the *Taiping yulan* 太平御覽 (Imperially inspected encyclopedia of the Taiping [Xingguo] [太平興國] era [976–984]), a compilation of imperial reference works sponsored by Taizong in 977, the second year of his reign. As Song sources say, Taizong promoted culture and education while discontinuing promotion of military development (*xiuwen zhige* 修文止戈) at a time of peace in the Song empire.⁵⁴ Intent on collecting classic works from the whole nation, Taizong ordered the compilation of a better-organized and more systematic all-inclusive reference work (*leishu* 類書) than had previously been available.⁵⁵

Completed in 983, the *Taiping yulan* was a thousand-chapter encyclopedic work of a scale unprecedented in China. The compilers consulted imperial reference works from earlier dynasties, broadly drew material from the classics, histories, philosophical and literary works, and classified them into fifty-five categories and more than forty-five hundred entries. These categories and entries covered all aspects of nature, life, and society.⁵⁶

Twenty-five chapters of the *Taiping yulan*, belonging to the eighth category “Juchubu” (Category of architecture), are devoted specifically to architecture.⁵⁷ Corresponding to this work’s basic aim, the architectural section comprises as many as ninety entries (and five subentries), organized by means of a meticulous division according to various types of architecture and architectural accessories, structural components, and building materials as well as classical concepts of architectural space (see appendix 4). The wide range of architectural types includes palaces, residences, cities, streets, and public buildings, as well as gardens, and so on. Various buildings are distinguished carefully from one another according to their practical functions or the subtle meanings of their names (such as *di* 第 [mansion] and *di* 邸 [residence of a high official]; *lu* 廬 [hut], *tusu* 屠蘇 [flat hut], and *an* 庵 [round hut]; *wei* 闈 [side gate in a palace], *gui* 闈 [small gate with a round top and square bottom], *he* 閣 [small gate or chamber in a palace], *ge* 閣 [small pavilion], *yi* 籜 [small room connected to a pavilion], and *ta* 闈 [gate or small chamber in a palace]). Such a meticulous distinction between entries is seen also in those on architectural elements and accessories, such as *jie* 階 (stairs), *bi* 陛 (stairs of imperial palaces), and *chi* 墀 (vacant space on the stairs of a hall).

The *Taiping yulan*’s broad treatment of architectural terminology is unprecedented. Its range is broader than any individual architectural section of the *Erya*, the *Shiming*, and the official Sui and Tang reference works including the *Yiwen leiju*, which has twenty entries on architecture.⁵⁸ Unlike previous reference works that had treated only architectural types, the *Taiping yulan* also dealt with specific structural elements and architectural decorations, such as *zhuo* 椀 (short post on beams), *jie* 窰 (block), *ji* 枅 (bracket), *zaojing* 藻井 (coffer), *zhichu* 質礎 (footing), *pushou* 鋪首 (door knocker), and *chiwei* 鴟尾 (owl-headed fish tail [tile decoration]). The inclusion of these technical terms in a reference work was an important development in Chinese architectural literature. Although the *Erya* and the *Shiming* had treated terminology related to structural components, all the Sui and Tang reference works left it out, and only with the *Taiping yulan* did scholars writing about architecture begin to pay attention to technically oriented terms. As Chinese wood-framed architecture became increasingly sophisticated, more and more technical terms

rapidly came into being. Without adequate recognition of their significance, these terms very possibly would have ended up being transmitted only orally from teacher to disciple, with no textual record, and, consequently, getting lost, becoming obscure or misunderstood, leaving later generations unable to recognize what structural elements or methods they represented. The *Taiping yulan's* compilers established individual entries not only for major structural components like columns, beams, and purlins but also for smaller structural elements such as bracketing (*jie* and *ji*). Although they were scholars and not experienced architects, they gave careful attention to historical literary sources detailing structural components in difficult, specific terminology.

In most entries, wide-ranging historical texts on the type of architecture or architectural element corresponding to the entry are quoted and, in most cases, arranged in the order of their periods of completion. As mentioned, the compilers extracted, in conformity with emperor's instructions, materials broadly from all kinds of writings. Thus, the architectural excerpts included in this work are rich, hailing not only from the classics but also from histories, literature, and philosophical and lexical works. The literary texts comprise various types of works, in particular a significant amount of miscellaneous writings and scholars' notes, such as the *Han gongdian shu* 漢宮殿疏 (Document on palaces of the Han), the *Sanfu gongdian ming* 三輔宮殿名 (Names of the palaces in the three administrative districts [of the Western Han]), the *Jin gongge ji* 晉宮閣記 (Record of palaces and pavilions of the Jin), the *Louguan benji* 樓觀本記 (Main record of towers and pavilions), and the *Gongque ji* 宮闕記 (Record of palaces and towers). Many of these texts are not preserved today. Moreover, historical texts on architecture were collected not only from major histories but also from minor histories, such as the *Zhaoshu* 趙書 (Book on [the history of] the Zhao [304–351]). The number of architectural texts under an entry is thus often enormous.

For instance, the entry for *yuanyou* 苑囿 (imperial hunting parks and gardens) alone is an entire chapter long,⁵⁹ providing more extensively than before classical and historical texts on the royal hunting parks and imperial gardens of the pre-Qin, Han, and Northern and Southern Dynasties periods. In table 1, I take as examples the first few entries in this architectural section, which are on *gong* (palace), *shi* 室 (palace), *dian* 殿 (hall), *tang* 堂 (residential hall), *lou* 樓 (tower), *tai* 臺 (high terrace), and *que* 闕 (watchtower), respectively, to show the great amount of historical texts collected under a single entry in the *Taiping yulan*.

TABLE 1. Numbers of Historical Texts Quoted in the Entries for Selected Building Types in the *Taiping Yulan*

Entries	Number of sources quoted and citations
<i>gong</i> 宮 (palace)	51 sources, 82 citations
<i>shi</i> 室 (palace)	40 sources, 67 citations
<i>dian</i> 殿 (hall)	36 sources, 64 citations
<i>tang</i> 堂 (residential hall) (with <i>tanghuang</i> 堂皇 [underground chamber] included)	32 sources, 39 citations
<i>lou</i> 樓 (tower)	38 sources, 47 citations
<i>tai</i> 臺 (high terrace)	70 sources, 152 citations
<i>que</i> 闕 (watchtower)	17 sources, 22 citations

It is important to note that in the *Taiping yulan*, the historical texts under each entry are arranged by title. Moreover, each source begins on a new line; in the case of multiple quotations from the same source, each quotation also starts on a new line (figure 2.5).⁶⁰ This format is entirely different from that used in most books, including commentaries and encyclopedias, in which citations of historical texts were mixed together or separated at most by a space between the two citations (figure 2.6). Obviously, by listing each historical text on a new line, the presentation of historical texts became much clearer and easier to read, thus easier to distinguish one source from another. It is significant that such a format was followed in the terminological sections of the *YZFS* (figure 2.7).

Among surviving pre-Song texts, such a format is seen also in the allegedly Tang-period hand-copied fragments of an earlier reference work found in Dunhuang, which has been identified as the imperial Northern Qi 北齊 (550–577) reference book *Xiuwendian yulan* 修文殿御覽 (A book for the emperor's inspection compiled at the Hall of Promoting Culture and Education; completed 572, now lost) or a reference book of the Liang 梁 (502–557) dynasty (figure 2.8).⁶¹ It is unclear if the format of these fragments represents the original, but unless the copyists of these fragments have been incorrectly identified, such a format would have been in use at least during the Tang period. In making full use of the resources from earlier official reference works, the compilers of the *Taiping yulan* certainly consulted the *Xiuwendian yulan*.⁶² Modern scholars have suggested similarities between the two works,

including an identical number of categories classified (fifty-five), stylistic rules, the layouts of certain entries, and the contents of many citations of historical texts.⁶³ Taking these points into consideration, it is possible that the *Taiping yulan* format faithfully preserved that of the *Xiuwendian yulan*. Whether or not Tang-period official reference books used such a format,⁶⁴ the *Taiping yulan*, as the first imperial Song encyclopedic work, rigidly adopted this format, leaving for later compilations an authoritative, official precedent.

The *Taiping yulan* is an entirely different

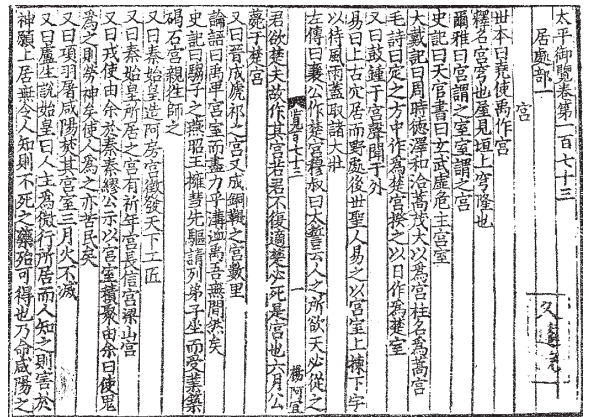


FIGURE 2.5. Song-period hand-copied *Taiping yulan* (juan 173:1)

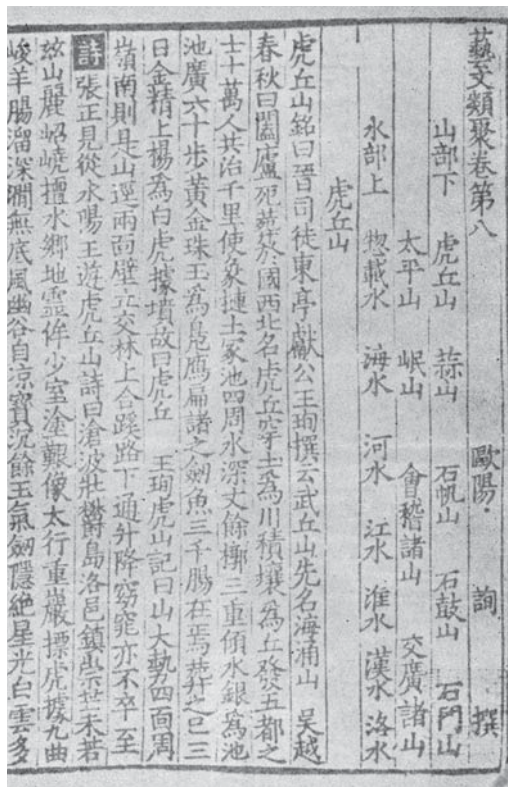


FIGURE 2.6. Southern Song edition of the *Yiwèn leiju* (collected at Shanghai Library; after Ouyang Xun, *Yiwèn leiju*, flyleaf)

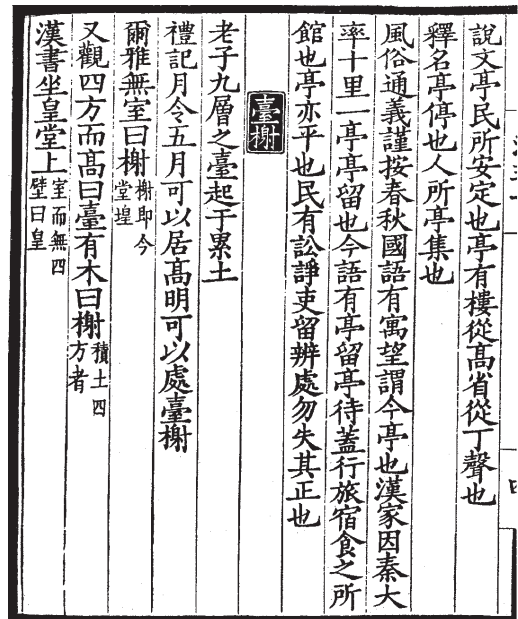


FIGURE 2.7. Format of the terminology section of the *YZFS* (juan 1:4b)

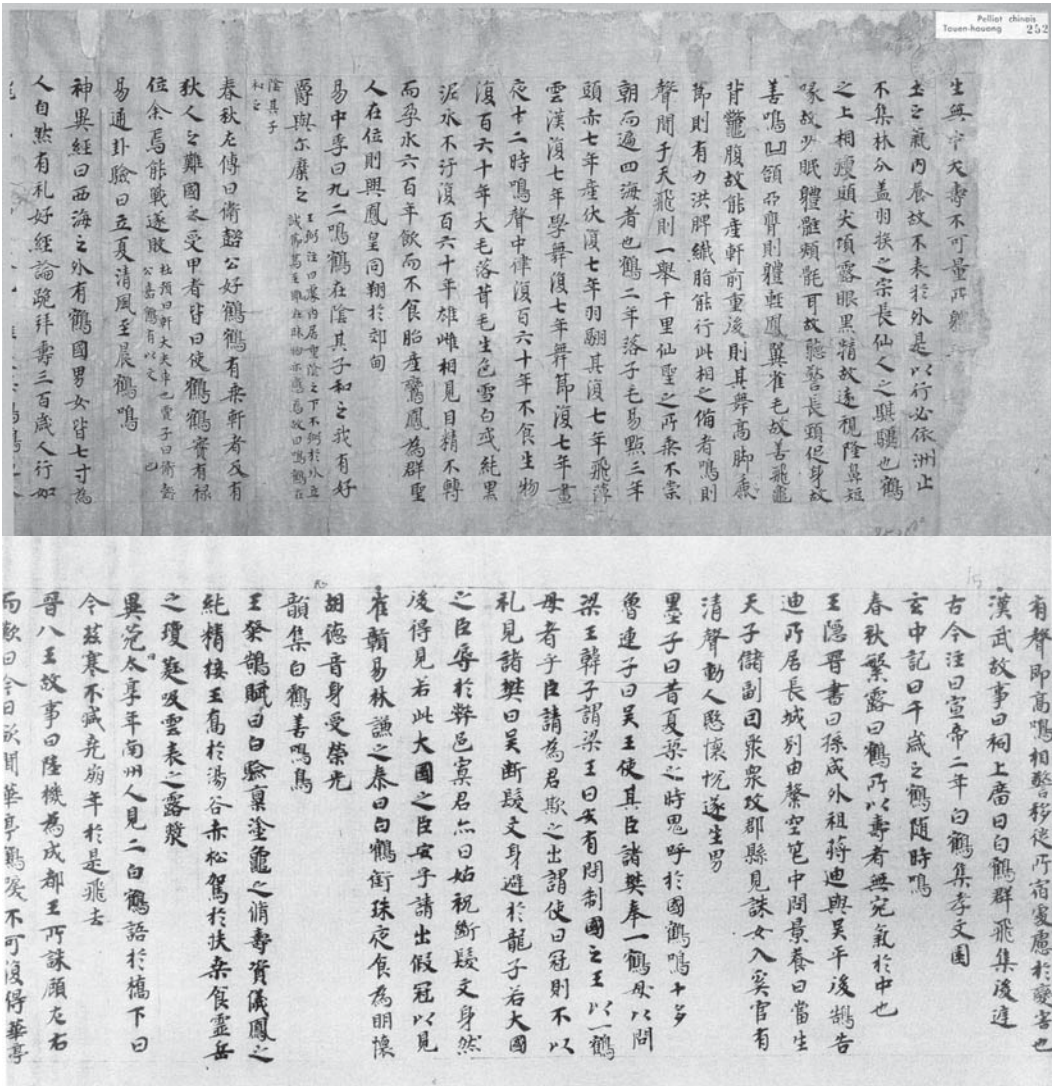


FIGURE 2.8. Tang-period hand-copied fragment of an earlier reference work found in Dunhuang (after Shanghai Guji Chubanshe, *Fa cang Dunhuang xiyu wenxian*, v. 15, color plate no. 6 and p. 135)

work from the *YZFS*, but what the compilers of the *Taiping yulan* did in their work is identical to what Li Jie would do in the terminology sections of his *YZFS*. Li provides, respectively, nine and forty-eight entries in the “Kanxiang” and the “Zongshi” sections, and cites classical texts related to the architectural terms corresponding to each entry. As a practical, specialized manual rather than a reference book, the *YZFS* deals mostly with technical

terms. In addition, it is very selective about historical texts on architecture, quoting only the most important ones. Nevertheless, the *Taiping yulan's* treatment of a broad range of architectural terminology making extensive use of historical texts, its establishment of individual entries both for major structural components and for small ones, such as bracketing elements, and its particular format of presenting historical texts all must have inspired Li Jie in his compilation of the *YZFS*.

Screening Traditional Sources on Architecture: The *Erya Shu*

In contrast to the *Taiping yulan's* all-inclusive use of historical texts on architecture, the *Erya shu* 爾雅疏 (Commentaries on the *Erya*), compiled by order of Emperor Zhenzong in 999, specifically selected from among the main classical and early-period texts related to architecture. In their commentaries on the architectural terms glossed in the “Shigong” section of the *Erya*, the compilers—Xing Bing 邢昺 (932–1010) and other officials—reveal a predisposition toward certain classics and early-period texts in their discussions of the *Erya* terms. As Xing writes in his preface to the work, they based their examination of the *Erya* on Confucian classics while preferring the great Eastern Jin scholar Guo Pu's commentaries on the classics to those of scholars from the Han and other periods (考案其事、必以經籍為宗、理義所詮、則以景純〔郭璞〕為主).⁶⁵ In keeping with such a principle of compilation, the compilers were very selective in choosing traditional texts for their work: they confined themselves mainly to essential classical texts and significant early-period sources. The traditional texts on architecture cited in the commentaries on the “Shigong” of the *Erya shu* thus represent those the compilers had carefully screened from among the most important sources. Many of these architectural texts were preserved in the terminology section of the *YZFS*.

As an example, let us compare the classical texts quoted by the *YZFS* and by the *Erya shu* for the terms *gong* and *shi* (palace, dwelling, or chamber) (see appendix 5). We can see that nine of the total eleven traditional texts quoted in the *YZFS* were quoted in the *Erya shu* (and the *Taiping yulan* as well), allowing for some variation in the wording and lengths of the excerpts drawn from the originals. Except for the *Liji* text, all six of the other texts quoted in the *Erya shu* are identical to those quoted in the *YZFS*, allowing for some variations in the quotations. Five of these six texts had also been collected in the *Taiping yulan*, but considering the huge amount of historical texts cited in the entry for *gong* or that for *shi* (at least forty sources and sixty-seven excerpts each) in the *Taiping yulan*, the mere handful of seven

quotations in the *Erya shu* represents a selection of the most important classical texts and the major early-period lexical texts.

In addition, while the proportion of lexical texts to other traditional texts in the *Taiping yulan* is quite low, the *Erya shu* and *YZFS* both reference relatively many early-period lexical texts; in the case of the historical texts for *gong* and *shi*, lexical texts constitute roughly one-half in both works. As the title “Zongshi” of the terminology section of the *YZFS* indicates, its purpose is to explain the meanings of those forty-eight terms, and thus Li Jie frequently uses dictionaries as his sources. The *Erya shu* is a commentary on the classical *Erya* dictionary and, compiled under a very selective criterion for traditional texts, also makes good use of significant lexical sources. Although not every text cited in the *Erya shu* is preserved in the *YZFS*, the *Erya shu*’s careful choice of traditional texts on architecture must have been a useful reference for Li Jie and the late Northern Song Directorate of Construction.

An example of how Li Jie benefited from the *Erya shu*’s commentaries in his investigation and employment of classical texts is his treatment of Guo Pu’s commentaries on the *Erya* relating to *gong*. In the *YZFS*, only Guo’s commentaries are mentioned in the quotations of the *Erya*. In relation to the sentences “西北隅謂之屋漏” (the northwestern corner [of the inside of a chamber] is called *wulou*) and “東北隅謂之宦” (the northeastern corner is called *yi*), Guo pointed to the classical sources (the *Shijing* and the *Liji*) of *wulou* and *yi*, respectively, but left their meanings unexplained.⁶⁶ Thus, inasmuch as the “Zongshi” section of the *YZFS* was meant to explain the meanings of architectural terms through historical texts, what would be the point of Li’s simply retaining Guo’s “其義未詳” (its meanings are unknown) comments without adding any explanations offered by other commentators, which were indeed available? As has been mentioned, Guo’s commentaries on the *Erya* were regarded as the best of all by the compilers of the *Erya shu* and were thus given strong preference over scholarship on that work from other periods. The compilers provided the relevant early-period commentaries on these mentioned classical texts, pointing out that Guo disagreed with them because they were not well founded.⁶⁷ Xing and his co-compilers’ investigation of why Guo did not agree with those earlier *Erya* commentaries must have helped their successors studying the *Erya* and other classics understand the context of Guo’s commentaries on the *Erya*’s architectural terminology. When Li Jie read Emperor Zhenzong’s commissioned *Erya shu*, he too must have referred to Xing’s comments on those historical commentaries and thus been convinced of the reasonableness of Guo’s criticism of them. This accounts for why Li also retained Guo’s

notes while leaving the meanings of those terms as “unknown” in his glossary of architectural terminology.

From the *Taiping yulan* to the “Shigong” section of the *Erya shu*, the corpus of traditional architectural sources was further refined and reduced to a more compact yet effective body. Although Li Jie did not expressly indicate that he drew great inspiration from the *Erya shu*, this official early Song classical commentary was, after the *Taiping yulan*, another prerequisite for the treatment of traditional architectural literature in the terminology section of the *YZFS*.

Official Manuals on Geomantic Practice: The *Dili Xinshu*

Since the time of Emperor Taizu, the Northern Song court not only engaged in setting official standards for ritual practice, which included classical ritual architecture, but also compiled official histories and literary anthologies, among them architectural texts. As a part of collecting and compiling traditional literature and, more important, defining standards for various aspects of social life, the dynasty engaged in preserving earlier geomantic theories. On the basis of these traditional theories, the court established official standards for contemporary geomantic practice in the construction of buildings and tombs.

From the Tang to the Song periods, geomancy was extremely popular at all levels of society, from emperors, to officials, to commoners. As early as the reign of Taizu, the Ministry of Celestial Phenomena (*Sitianjian* 司天監) had compiled the *Qiankun baodian* 乾坤寶典 (Treasured book on the universe), a geomantic manual developed primarily from an early-Tang imperial geomantic book that had been influential in geomantic practice for over three centuries.⁶⁸ The *Qiankun baodian* comprised 450 essays, 30 of which specifically treated *dili* 地理, the geographical features of a place or site chosen for the construction of a building or tomb. Beginning in the early Jinglyou 景祐 (1034–1038) period, this work underwent a series of collations and revisions by order of Emperor Renzong, and based on this, a book of thirty essays specifically dedicated to the geomantic arts related to *dili* was compiled, which the emperor entitled *Dili xinshu* 地理新書 (New book on [the geomantic arts for] geographical features of sites). In 1051, Renzong again ordered the correction of errors in this new book, and after twenty-one years of revision and recompilation, the corrected *Dili xinshu* was presented to Emperor Shenzong by Wang Zhu 王洙 (997, d. after 1071). It was subsequently distributed all over the empire.⁶⁹ It was apparently of great significance for the Northern Song court to create an authoritative official

standard for practical geomantic methods that correlated traditional theories with those fit for contemporary times. We must note that at almost the same time this treatise was completed (1071), Shenzong ordered the compilation of another official standard, the initial *YZFS* intended to strengthen central control of building practices.⁷⁰

In compiling this new *Dilixinshu*, the authors made full use of the resources of the imperial libraries that had been established by Taizu and consulted classical and contemporary geomantic works. From their understanding of the essence of geomantic theories, the authors classified practical geomantic methods into different categories and arranged them in order of importance. This work is structured in two parts: twenty essays on *dishi* 地事 (geographical aspects) precede ten essays on *zangshi* 葬事 (burial aspects); also included is one chapter of illustrations on the geographical features of mountain ridges and plains.⁷¹ The *dishi* essays generally treat theories and methods of geomancy related to basic construction technologies, such as leveling and determining directions, and also deal with the geographical features of cities, forts, government offices, inns for couriers, marketplaces, and dwellings, as well as streets and lanes. The *zangshi* pieces treat geomantic methods and constraints related to the construction and measurements of tombs, tomb passageways, and burial fields. Involving choices of a construction site and its surrounding setting, principles of the direction and the positioning of a building or tomb, and geomantically specific measurements of buildings, tombs, and compounds, these geomantic methods were part of the architectural theories of Song China.

In the preface, the imperial scholars refer to the documented observations of auspicious and ominous signs by the sages at construction sites before building palaces and residential districts.⁷² Thus, this book relates the contemporary demands of geomancy in building and tomb practice to the epic deeds of the glorious, virtuous, and powerful rulers of early China. As these compilers claimed, the purpose of compiling this official geomantic book was to manifest the imperial virtue of following the sages' practice and taking good care of the people by providing them with ways of avoiding misfortune and enjoying wealth and longevity.⁷³ Indeed, the geomantic methods set forth in this work significantly influenced building and tomb-construction practice of Northern Song society. For instance, the entire process of constructing the imperial Northern Song mausoleums, from tomb siting to the measurements of tumuli and underground chambers, wholly followed the geomantic theories and practical methods included in the *Dilixinshu*.⁷⁴

The importance of this work as an official architectural treatise of medieval China lies also in its inclusion of the fundamental technologies for all types of construction: orientation (based on the four directions) and leveling. At the very beginning of the book are three essays that discuss these most important building technologies, namely: *sifang dingwei* 四方定位 (orientation to the four directions), *riying quzheng* 日影取正 (correctly determining the directions with the aid of shadows), and *shuidi dingping* 水地定平 (finding level with the aid of the water-holding level instrument). Here, the authors first quote important classical texts that mention these technologies (both the Confucian classics and other early classical texts). Some of these classical texts are identical to those quoted in the *YZFS*, such as the *Kaogongji* texts in the *Zhouli*.⁷⁵ The authors of the *Dili xinshu* then provide practical building methods based in large part on these traditional theories. One of these traditional, yet practical, methods is the *shuidi (dingping)* 水地(定平) technology of leveling, in which craftsmen use the water-level instrument to obtain level at a construction site. Another is the technology of orientation, *quzheng* 取正 (correctly determining the directions), in which the instruments *tugui* or *dugui* 土圭 (tool for measuring the length of a shadow) and *biaonie* 表槩 (gnomon) are used to observe shadows. Another significant technology relates to determining the cardinal directions by observing the North Star. These technologies were unlikely to have been illustrated by the Song compilers, but Jin-period scholars added proper illustrations to this work (figure 2.9).⁷⁶

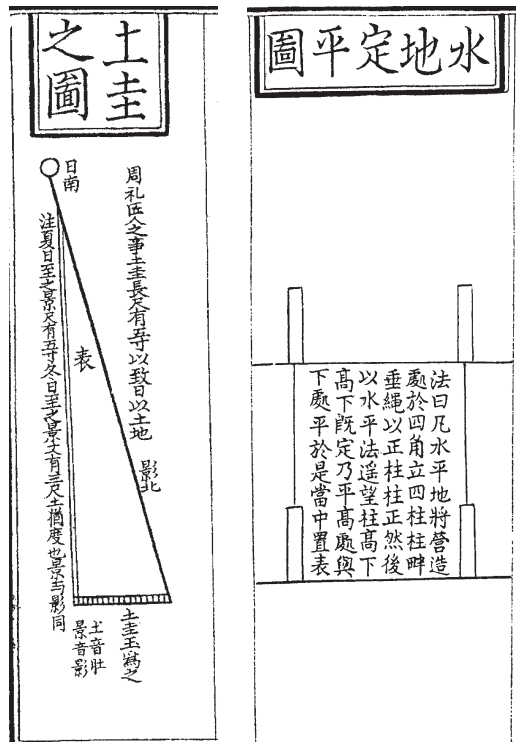


FIGURE 2.9. Jin-period illustrations of early-period leveling technologies as recorded in the *Dili xinshu*: (left) *tugui* for measuring the length of a shadow; (right) method of using water-level instrument for determining level

These technologies apparently originated in the pre-Qin period, as recorded in the *jiangren* section of the *Kaogongji*. As mentioned, in the beginning section of the *YZFS*, Li Jie also treats these fundamental technologies, stating clearly that he documented these practical technologies of orientation and leveling by following the *Kaogongji* and referring to other classics. Although the *YZFS* provided a more comprehensive system of the fundamental building technologies for orientation and leveling than did the *Dili xinshu* (see figures 1.3 and 1.4), the combination of those technologies recorded in both works represents a complete package of those technologies and their variations during different periods of Northern Song building practice. Considering that the *Dili xinshu* was compiled during the years 1051–1071 and based on the previous official compilations and revisions (such as the *Qiankun baodian* of the Emperor Taizu's time), these variations suggest that the official building standards as given in the *YZFS* were produced in some respects by absorbing and adjusting the methods of previous practice and in official documentation. Having treated fundamental building technologies connected with official geomantic standards at least thirty years before the *YZFS* was completed, the *Dili xinshu* represented an important precedent especially in relation to the *YZFS*'s systems of moats and fortifications (*haozhai* 壕寨).

Official Manuals on Military Arts: The *Wujing Zongyao*'s Sections on Cities and Defense Structures

In addition to the official geomantic book, Emperor Renzong also sponsored the compilation and issue of an official manual on the military, the *Wujing zongyao* 武經總要 (Essentials of the military, 1044). This book records and, in many places, illustrates traditional and contemporary military systems, the practical arts of war (tactics and strategies), deployment of troops, military regulations, weapons and gunpowder formulae, geographical features of frontiers, and historical object lessons, as well as relevant astronomical and meteorological factors. The purpose of this compilation, as indicated in its preface by Renzong, was to provide high-ranking officers with a useful reference on essential military theories.⁷⁷ As part of the military strategies, methods of attacking and defending a city and of pitching camp are recorded, in which some fundamental building technologies such as leveling and practical methods of constructing a city are also treated.

In a section on *shuigong* 水攻 (attacking [an enemy's city or camp] with water), the compilers briefly summarize several object-lesson battles and stress that a proper use of topographical advantages is essential to the application

of the water-attack art. The compilers thus instruct that the first thing to do before considering the water-attack method is to set up a *shuiping* (water-level instrument) to survey the heights of the terrain involved:

凡水因地而成勢……其道非一。須先設水平、測度高下、始可用之也。⁷⁸ All waters gain their power depending upon the topography of the terrain . . . The principles of it [the use of water in attacking] are more than one. It is essential, first of all, to set up a water-level instrument and survey the difference in heights [of the terrain], and then the water-attack art can be used.

Here, we again encounter the fundamental technology of leveling, as discussed earlier in connection with the *Kaogongji* and the *Dili xinshu*, but there, no illustrations were provided. The above text in the *Wujing zongyao* was basically transmitted from a Tang-period manual of military arts—*Shenji zhidi Taibai yinjing* 神機制敵太白陰經 (Secret classic of the Grand White for defeating an enemy using superb strategy)—which did not include corresponding illustrations, either.⁷⁹ The traditional texts are made good use of in the *Wujing zongyao*, which provides not only the detailed structure and measurements of the water-level instrument but also how to calibrate it and use it to determine level and the differences in the heights of the terrain. Moreover, the text included relevant illustrations, although all the Song images—both the Northern Song edition (1044) and the Southern Song edition (1231)—have been lost.

Judging from the illustrations in the extant Ming-period (1368–1644) edition, which is a reprint of the 1231 edition and presumably more or less a reflection of the Southern Song edition (figure 2.10),⁸⁰ the construction of this instrument is similar to and yet different from what is recorded and illustrated in the *YZFS*.⁸¹ It is composed of a horizontal wooden trough supported by a vertical stake.⁸² In the trough, three little water holders (called *chi* 池 [ponds] in both works) are positioned at its two ends and in its center, respectively (the discourse related to this instrument in the *YZFS* also includes an alternative form in which the trough has only two water holders at its ends). These “ponds” of water are connected by a small groove (*cao* 槽 in the *YZFS* and *tongshuiqu* 通水渠 [literally, “water-passing channel”] in the *Wujing zongyao*); a small floating wood block (*shuifuzi* 水浮子 in the *YZFS* and *fumu* 浮木 in the *Wujing zongyao*) with a vertical alveolus (*lichi* 立齒) carved into it is placed in each of the “ponds” and floats when water is poured into the groove. When the tops of all the floating blocks are observed and judged to be even, the water-level instrument indicates true horizontal

and can be used to determine the difference in the heights of terrain or in the heights of the four corners of a chosen construction site. This principle of accurately gauging true horizontal is clearly recorded in the *Wujing zongyao*.⁸³ Although this technology was handed down from a Tang manual, its inclusion in the *Wujing zongyao* as part of essential military theories probably suggests that the principle was still useful in the mid-eleventh century. It complements the *YZFS*'s discourse on the instrument.

The *YZFS* mentions two ways of calibrating the water-level instrument: Make an ink line (*moxian* 墨線) in the center of the supporting stake, hang a string from the top (center of the trough), and place the string at the very center of the ink line; thus the trough will be even. This method is used in the event that “water cannot be used inside the groove” (若槽內如有不可用水處), and this principle is “the same as that when using water” (與用水同).⁸⁴ As for the second method, the instruction is simply to use water, but its concrete operational method is not elaborated. The same method as recorded in the *Wujing zongyao*, that is, observing the tops of the floating

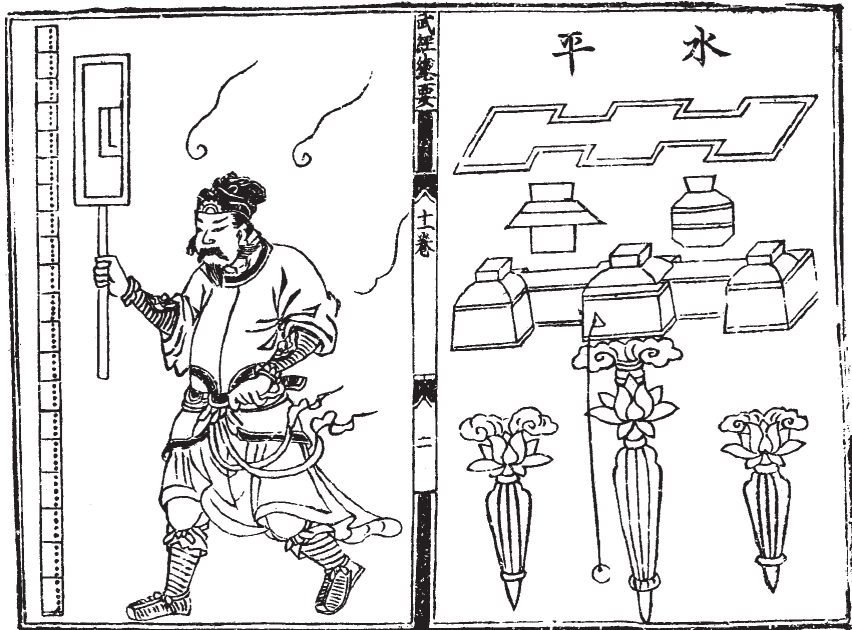


FIGURE 2.10. Ming-period illustration of leveling technologies and tools in the Song treatise *Wujing zongyao* (*juan* 11:2a–b), featuring a water-level instrument, measuring pole, and reflecting board held by a soldier. In the illustration, modified in Beijing Kexue Chubanshe, *Zhongguo gudai jianzhu jishushi*, 3:897, the reflecting board is shown in black in the lower part and white in the upper part.

blocks, is only suggested through the *YZFS*'s discourse on the method of surveying terrain.⁸⁵ At the same time, the illustration of the water-level instrument in the *Wujing zongyao* shows a string hanging from the center of the horizontal water trough, just as illustrated and described in the *YZFS*. Thus, both methods of calibrating the water-level instrument, using water and using a string, are not only identical in the two works but also were in common use in contemporary construction practice. In addition, although the measurements of the instruments in the two works vary, they are close to each other and the lengths of the troughs are the same (2.4 *chi* 尺).

As the *YZFS* states,⁸⁶ the method of surveying for level of a construction site was to set up four poles (*biao* 表) of the same length at each corner of the site and observe each pole from a distance, using the water-level instrument, which was set up at the center of the site, then mark the height on each pole even with the top of the water-level instrument, and measure the differences in the heights; thus one could determine the difference in heights of the terrain. The *Wujing zongyao* records the same method but in greater detail and includes it in its discourse on how to survey the terrain of an area at greater distances—as was needed for the application of the water-attack art.⁸⁷

The detailed description of the principles of the water-level instrument and other tools helps us better comprehend the leveling technology that developed from its early-period prototype to the advanced, compact implements of the Northern Song dynasty. In the *jiangren* section of the *Kaogongji*, the principles of leveling are given only briefly. The inclusion of the water-level instrument in the section on attacking a city in the *Wujing zongyao* also makes clear why the technology of leveling, along with others such as the technology of orientation, are included in the system of *haozhai* in the *YZFS*. Once the terrain has been precisely surveyed, appropriate use of the topographical advantages became possible: in the case of this military manual, attacking an enemy city or camp using water; for an architect, removing or adding earth in order to construct buildings on level terrain. Such a fundamental process is necessary prior to any construction, whether a building, city, moats, or a camp.

In the section on defense, the *Wujing zongyao* summarizes the principles of choosing a city's site, one of which stresses the importance of positively exploiting the topographical advantages of the potentially chosen site (*jiu dili* 就地利).⁸⁸ In its discussion of “defending a city” (*shoucheng* 守城), the work describes and illustrates the structure of a city, city walls, and many other related structures built in the city and on the city walls. The entry

for *cheng* 城 (city) in the *YZFS* contains only limited information, mostly measurements of city walls and foundations, and no images of a city or its structures are given. Thus, both the passages and the illustrations on the form of a city and its architectural components in the *Wujing zongyao* provide us with a glimpse of the features of Northern Song cities and the relationships between these structures. As illustrated in the pictures of the *chengzhi* 城制 (principle of a city) and city walls (figures 2.11 and 2.12), and as explained by the accompanying textual descriptions,⁸⁹ a city has the following buildings and structures that are significant for its defense: *wengcheng* 甕城 (city gate, deeply concave, high wall or kettle-shaped barbican entrance to a city), *yangmacheng* 羊馬城 (hitching walls, low walls parallel to the city walls for securing goats and horses), *hao* 壕 (moat), *diaoqiao* 釣橋 (drawbridges), *mamian* 馬面 (“horse faces,” walls protruding from the city wall), *nüqiang* 女牆 (crenellations), *nutai* 弩臺 (crossbow terraces), *dipeng* 敵棚 (defense sheds), *dilou* 敵樓 (defense towers), *zhanpeng* 戰棚 (battle sheds) on the “horse face” protruding walls, *tuanlou* 團樓 (round towers, i.e., *dituan* 敵團 [round defense shacks]) at the corners of the city wall, and *bailuwu* 白露屋 (white open structures to watch for enemies). The accompanying text describes the structure of the buildings and their materials, measurements, and functions. Such a detailed recording of the principle of a city and the structures built on city walls are not available in the *YZFS*. The entry for “city” in the *YZFS* mentions none of these structures but the kettle-shaped concave wall (barbican entrance to a city) and the “horse face” protruding walls, which are mentioned in its discussion of the structure and measurements of city walls in the section on moats and fortifications.⁹⁰

Comparing the texts on cities in these two works, one can see that their difference in contents is closely related to the character of each work. The *Wujing zongyao* is an encyclopedic compilation of all aspects of the military. Thus, when stating the methods of attacking and defending a city, it records almost every detail or as much detail as needed (mentioning almost every building involved in defense and describing its structure, dimensions, and material) so that generals, soldiers, and city builders have a guide to constructing a good, defensible city. In contrast, the *YZFS* is not an encyclopedia of architecture. Although a government standard for building, this standard was not concerned with what a city or a palace compound was composed of nor how to create a certain type of architecture meeting a specific need, such as building a garden with a Daoist aesthetic or a defensible city or structures (as in the case of the *Wujing zongyao*).

The *YZFS* was compiled under imperial orders for the purpose of managing materials and manpower related to construction and therefore finances appropriated for construction. It was meant for distribution to government offices in all administrative districts, which would have to follow its standards in construction practice. Thus, the target audience was mainly those who knew about architecture or general construction matters from their experience in supervising or designing architectural projects. Its discourse on architecture is consequently focused mostly on general building methods for any palatial or public structure rather than those on a particular structure; the methods presented are applicable to any building of a certain kind whose structural properties are classified in a specific category in the building manual. At the same time these standard methods concern measurements and their adjustments corresponding to an increase or reduction in certain dimensions, and so the manual sets forth standards for appropriate measurements, materials, and manpower. Moreover, often in its discussion of building standards, the *YZFS* explains architectural elements and methods concisely, summarizing similar or related buildings, elements, or decorative motifs in the same group, as in the following instance:

每筑高五尺、橫用絰木一條。
 (注) ……護門甕城及馬面之類準此。⁹¹ [In building a city wall,] whenever built five *chi* high, use one strip of cross timber transversally. (Annotation) . . . For the gate-defending kettle-shaped

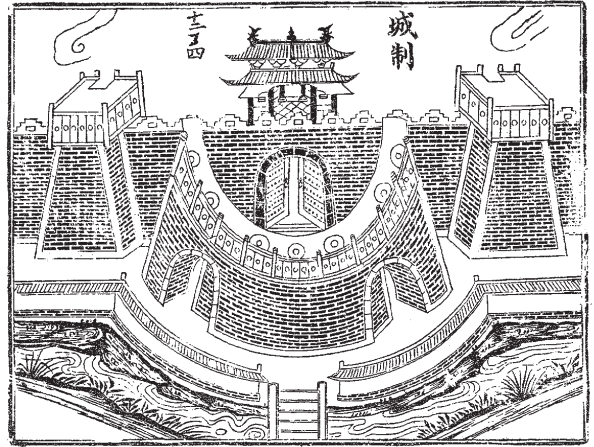


FIGURE 2.11. Illustration of system of cities in the *Wujing zongyao*, featuring a city gate, kettle-shaped barbican entrance (*wengcheng*), hitching walls (*yangmacheng*), moat (*hao*), drawbridge (*diaoqiao*), “horse-face” walls (*mamian*), defense towers (*dilou*), and crenellations (*nuqiang*)

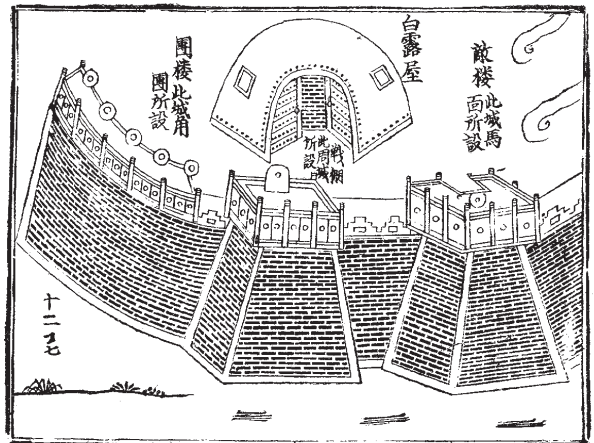


FIGURE 2.12. Illustration of defense structures in the *Wujing zongyao*, featuring a round defense shack on the corner of the city wall (*tuanlou* or *dituan*), defense towers (*dilou*) on top of “horse-face” walls (*mamian*), battle sheds (*zhanpeng*), and a white, open watch house (*bailuwu*)

barbican entrances and the “horse face” protruding walls and the like, the standard is [the same as] this.

Here we see its typical language, “. . . walls and the like, the standard is the same as this” (……之類準此). Such an approach and its emphasis on providing effective standards for measurements, materials, and manpower, as well as the nature of its compilation, account for why this building standard does not elaborate on every type of architecture or include every detail related to contemporary architecture.

The *Wujing zongyao* records methods for building city walls, which are applied to two different situations: building a city on flat land (平陸築城) and building one on a sloped site, such as a mountain or hillside (山城).⁹² Between these two cases, the measurements and proportions of widths and heights of the city wall vary. The methods are different from those stipulated in the *YZFS*. So we see again that some of the methods contained in the *YZFS* reflected very recent technology or adjustments to earlier ones. Despite the variations in some construction methods between this military manual and the later *YZFS*, the *Wujing zongyao* was another preparatory work for the treatment of fundamental building technologies and the systems of moats and fortifications in the *YZFS*.

The *Xiucheng Fashi Tiaoyue*: Government Regulations for Buildings on City Walls

The methods pertaining to the construction of defensible cities were the subject of ongoing discussion among high-ranking officials during the mid and late Northern Song period. During the reign of Emperor Shenzong, regulations were promulgated specifically for building cities. In 1075, a two-chapter book entitled *Xiucheng fashi tiaoyue* 修城法式條約 (Regulations on standard methods of constructing cities) was compiled and presented to the court by a group of officials including Shen Kuo (1031–1095), then the director of the Office for the Supervision of Ordnance (Production) (判軍器監), who later quoted from the *Timberwork Manual* (*Mujing*) in his *Mengxi bitan*. The *Xiucheng fashi tiaoyue* provides models of structures erected along and upon city walls, including defense towers, “horse face” protruding walls, and *tuandi* 團敵 (or *dituan* or *tuanlou* as seen in the *Wujing zongyao*: defensive round-cornered towers).⁹³ It is not clear whether the court approved the proposed regulations, since Song-period sources only record the compilation of this treatise.⁹⁴ Nevertheless, one item in the *Song huiyao* 宋會要 (Record of essential affairs of the Song) suggests that regulations for the

construction of cities were indeed established during the reign of Shenzong. In the ninth year of the Xining period (1076), an official of Fujian District named Xu Yi 徐億, who, under imperial orders, had been directed to supervise the repair of city walls in several military units subordinate to Fujian, wrote a memorandum to Shenzong with an estimate of the great amounts of manpower, materials, and costs needed. He requested imperial approval to requisition the locals and to pay them in grain.⁹⁵ In response to this memorandum, an imperial edict was issued:

詔億量歲時豐凶、州軍緊慢、依條差夫修筑。⁹⁶ The imperial edict ordered Yi to estimate times of bumper crops and bad harvests, [and to figure out when] the district armies would be occupied and [when] not, [and then,] in compliance with regulations [*tiao* 條], to assign adults to construct [the city walls].

Although this record does not specify the title and content of the *tiao*, or regulations, likely they were among those pertaining to the construction of cities, city walls, and defenses of the kind that the *Xiucheng fashi tiaoyue* was meant to transmit to local officials. It should be noted that the *Xiucheng fashi tiaoyue* was presented to the court one year before the mention of regulations in this account. No matter whether the “regulations” here and the *Xiucheng fashi tiaoyue* referred to the same thing, the *Xiucheng fashi tiaoyue*’s treatment of standard city-wall structures clearly indicates that before the *YZFS*, the Northern Song court had at least already intended to establish, and possibly had already issued, official standards specifically for buildings, although at this point such standards were focused on the buildings involved in the construction of defensible cities.

The courts of Renzong and of Shenzong were greatly concerned about national safety and border defenses. There were increasing demands on the state to build defensible cities, resulting in more military expenditures. Accompanying this widespread demand was a great waste of materials and official funds and the corruption of officials at all levels. As the *Song huiyao* records, from the early Northern Song, emperors had ordered local administrative offices to build defensible cities or approved local officials’ requests, if judged reasonable, for funds for building or repairing cities. At the same time, the central government normally sent high-ranking officials to local districts where cities were about to be built or were newly built or repaired to check on construction activities and projects.⁹⁷ During the late Northern Song period in particular, the court was greatly concerned about false statements and reports related to amounts of materials, manpower,

and funds. Another item in the *Song huiyao* records that in 1077, in response to a memorandum from local officials about the construction of cities, Shenzong ordered the Imperial Secretariat (中書) and the Imperial Advisory (門下) to “draw up regulations and report to the court” (立法以聞). The following passage is their report, approved by the emperor, which is helpful in understanding the actual situation of construction practices at the time and the strict central control over it:

看詳天下州縣城壁……今欲令逐路監司相度、委知州、知縣檢視城壁合修去處、計會工料……令及縣城、丈尺分擘、工料紐筭、卻計合用人工物料若干數目、申差官檢覆、委無虛計工料、即各令置簿抄錄、依料次興修。⁹⁸ [Your subjects] examined in detail the walls of the cities of districts and counties all over the state . . . Now [your subjects] intend to order the ministries and departments of all districts to examine [this matter], entrust chiefs of prefectures and counties to inspect the city walls and the places in need of repairs, and count [the needed] work and materials . . . [When] orders reach the counties [concerned], minute calculations of measurements and comprehensive estimates of labor and materials [must be made]; [the counties must] further calculate specific items of manpower and materials needed and report to the dispatched officials for inspection. [If] indeed there are no false estimates of materials, then all [these counties should be] ordered to establish account books and make out a list [of the detailed items as approved] and start construction according to the list of materials.

This text indicates that it was important for the late Northern Song central government to strengthen its control over the financing of city construction and to find effective ways to counter the corrupt practices of administrative officials in charge of financial statements and construction budgets. The *xuji gongliao* 虛計工料 (false estimates of labor and materials) specifically mentioned in this official document was one of the corrupt practices. The court and high-ranking officials thus earnestly sought to draw up effective regulations as to the actual materials and manpower needed for construction. In addition, the central government strove to save money unnecessarily directed to construction, as indicated by the instructions to seek the possible transfer of building materials from other sites. This report, which later became part of the actual regulations related to construction practice, also included the following instructions:

一應合用修城動使衽木、榑子、椽之類、並委轉運司勘會、有處移那之撥。⁹⁹ Also, regarding the employment of cross timbers, purlins, rafters, and other [timbers] that should be used in the construction of cities, for all these uses, entrust the Transshipping Department to inspect whether there are some places from where [these timbers can be] transferred.

In order to effectively apply controls based on the exact needs of a construction project and to evaluate itemized accounts in the budgetary statements before and after construction as reported by local administrative officials, a powerful imperial standard on constructing cities and buildings became a must. Such an imperial standard would serve both as authoritative instructions on standardized city building and architectural methods and use of materials and manpower, and as an official standard to be consulted and followed in the central government's monitoring and approval of construction projects. The compilation of the *Xiucheng fashi tiaoyue* and the regulations for building defensible cities stipulated by the Imperial Secretariat and the Imperial Advisory and other ministries during the reign of Emperor Shenzong occurred under such political and financial demands by the court. During precisely this period, the compilation of a large-scale, comprehensive imperial building standard intended to meet such imperial demands was in progress.

Almost at the same time as the *Xiucheng fashi tiaoyue* was presented to the court, Emperor Shenzong ordered the compilation of an official standard on building, entitled the *Yingzao fashi*, the work that was later recompiled by Li Jie. Unlike the *Xiucheng fashi tiaoyue*, which treated and stipulated regulations pertaining only to the forms of defensive structures on city walls, the *YZFS* dealt with aspects of all official and public buildings. Those regulations set up by the Imperial Secretariat and others were merely administrative measures to be carried out in the supervision of the construction of cities. But the *YZFS* included specific technical standards for buildings and elements as well as decorations, measurements, materials, and manpower, to be followed in the implementation of those administrative measures. Meaningfully, subsequent to the *Mujing*, Chinese architectural technology received a comprehensive, substantial study in the *YZFS*.

3

The *Yingzao Fashi*

The Making of Widespread Legitimated Building Knowledge

Your subject examined classics, histories, and a wide variety of books, and in addition compelled craftsmen to explain item by item and compiled this *Yingzao fashi* for common use (臣攷究經史群書、並勒人匠逐一講說、編修海行《營造法式》).

Yingzao fashi, “Zhazi”¹

For his compilation of the *YZFS*, Li Jie took advantage of two kinds of resources, classics, histories, and other texts on architectural traditions, and oral accounts from architectural professionals working under his supervision. This tells us how such a masterpiece of architectural writings could be produced by Li Jie. In addition to his post in the Directorate of Construction (Jiangzuojian 將作監), Li was a painter, calligrapher, scholar, and writer of many works on subjects including geography, history, philology, horses, and gambling.² Relying both on his scholarly attainments and on his professional expertise in construction and experience in supervising imperial building projects, he was able to draw on architectural knowledge in both the practical and textual traditions. Valuing both traditions equally accounts for the reason that, in a long history, only Li Jie accomplished an extraordinary, grand architectural treatise encompassing discussion of almost all architectural systems.

It is also important to note that, as he clearly indicated, he compiled the *YZFS* for the purpose of making it available to the public (*haixing* 海行, “for common use”). This suggests that he intended this building manual for a broader audience than merely the imperial court and local administrative officials in charge of construction. He must have aimed to spread architectural knowledge to all of society. Indeed, with the circulation of the *YZFS*, the architectural knowledge it contained was disseminated to all districts and became accessible to different social groups: officials, men of the letters, and even craftsmen, who perhaps improved their skills by referring to it, as discussed below.

Imperial Patronage and the Social Setting of the Compilation

The whole process of the completion of the *YZFS* took nearly thirty years and involved three emperors. Around 1071–1074, the mid-Xining period (1068–1077), Emperor Shenzong ordered the Directorate of Construction to compile a state building standard. This comprehensive manual, the *YZFS*, was completed in 1091 during the reign of Emperor Zhezong 哲宗 (r. 1086–1100). Six years later, Zhezong ordered Li Jie, then assistant in the directorate (將作監丞), to recompile it.³ Li was not a member of the compiling team for the former *YZFS*, but he had been serving in the directorate since 1092.⁴ He was an experienced superintendent of many official and imperial building projects, most of which were accomplished after the new *YZFS* was compiled. It is said that while writing this treatise, he was still in charge of the construction of the magnificent Five Princes’ Mansions (五王邸, likely a palatial compound dedicated to the five younger brothers of Zhezong).⁵ In 1100, after the mansions had been built, he completed the new *YZFS*. This was the third year of the Yuanfu 元符 period (1098–1100), the final year of Zhezong’s reign, and it is not clear how the court responded to Li’s presentation of the *YZFS* at the time. What we know is that at first, upon the advice of high-ranking officials, the emperor (Huizong?) ordered that copies of the work be distributed to the offices in the capital only.⁶ It was at Li Jie’s request, who had been promoted to vice director of the directorate (將作少監, in 1102), that this recompiled *YZFS* was officially published, in 1103, and widely distributed to all districts of the empire from that time on.

Some Southern Song and Yuan sources record that the former *YZFS* was issued in 1092,⁷ but this was not indicated in Li Jie's memorandum to Huizong regarding the imperial orders for the treatise mentioned above. Instead, Li indicated that the former *YZFS* "previously was not put into effect at all" (先次更不施行).⁸ Li clearly stated the reason for this, which was directly related to Zhezong's unfavorable assessment. It is important to understand why Zhezong did not approve the first compilation of the *YZFS*. It is equally important to see what Li stressed in his memorandum to Huizong related to distributing the new *YZFS* nationwide. Both are important for an understanding of the purposes of this treatise.

As Li stated, Zhezong was dissatisfied with the former *YZFS* because it was "merely a description of materials, lacking in adaptable building systems of the application of *cai* [材 (modular unit)]; and in it, [the estimates for] labor and materials are too generous, [stipulating] no ways to prevent [waste and graft]" (祇是料狀、別無變造用材制度、其間工料太寬、關防無術).⁹ Here, we see that Zhezong identified the shortcomings of the former *YZFS* from two points of view: (1) the comprehensiveness of its content: whether or not it contained a building system adaptable to practice; here, the treatise lacked a significant aspect of architecture, the modular system; (2) the feasibility of the rules for managing material and labor needs and preventing (*guanfang* 關防) officials from practicing graft. Likewise, Li Jie reminded Huizong that this *YZFS* was "the standard for construction and setting down labor and other [rules], [which is] completely essential for preventing [waste and misuse of] man-hours and materials, and therefore, [it] should be in force both within and outside [the capital]" (營造制度、工限等、關防功料最為要切、內外皆合通行).¹⁰ Clearly, Li knew exactly what most concerned the Song court regarding construction practices, and that concern—reducing waste, correcting bad practices, and preventing graft by effectively controlling materials and labor—must have been foremost in his mind in compiling the new *YZFS*.

Indeed, in his preface to the *YZFS*, Li criticizes the shortcomings of previous building practices:

而斲輪之手、巧或失真。董役之官、才非兼技、不知以材而定分、迺或倍料而取長。弊積因循、法疎檢察。¹¹ The hands of the vehicle makers [i.e., craftsmen] were skillful but sometimes [what they made] was misshapen. The officials supervising construction were talented but did not have all the professional skills. They did not know that the *cai* [材, module, section of a bracket

arm] [should] be used to determine *fen* [分, smaller modular units]; surprisingly, [they] sometimes obtained measurements by multiplying the length of the block.¹² This age-old poor practice was continued, and there was neglect of regulations for inspecting [the problem].

Here Li points out the long-standing poor practice by which a great waste of materials and incorrect form were caused by both officials and craftsmen. On the one hand, he recognized craftsmen's skills in general and acknowledged the competence of local administrative officials, but on the other, he keenly felt local officials' lack of architectural knowledge and skilled craftsmen's lack of technical accuracy, both common problems in contemporary practice. He gave shocking examples of such problems, in which, for one, local officials supervising construction were not even aware of the efficient *cai* modular system—using the section of a regular bracket arm as the universal module in the design and construction of buildings. This lack of knowledge of the *cai* module reminds us of the primitive modular systems presented in the tenth-century *Timberwork Manual*. It may partly account for why this earlier building manual fell out of use even before a new one like the *YZFS* appeared.

Thus, Li emphasizes the necessity of establishing a regulation (*fa* 法) related to inspecting (*jiancha* 檢察) this kind of poor practice. He particularly eulogizes the Song emperor's merits in promoting classical morality by living simply and residing in humble palaces: “恭惟皇帝陛下仁儉生知……丹楹刻桷、淫巧既除、菲食卑宮、淳風斯復”¹³ (My compliments to the emperor, His Majesty, on his policy of benevolence and restraint from indulgence, [which are] his innate wisdom . . . Extravagances such as red columns and carved rafters have been removed completely. [He eats] meager food and [lives in] humble palaces [like the ancient king Yu 禹], [and he] has completely restored a plain lifestyle). In accord with the imperial promotion of classical morality, Li reports to the emperor that he did the following in compiling this building standard:

臣攷閱舊章、稽參衆智。功分三等、第為精粗之差；役辨四時、用度長短之晷。以至木議剛柔而理無不順、土評遠邇而力易以供。類例相從、條章具在。¹⁴ Your subject examined and read previous treatises and regulations and investigated [them by] referring to the wisdom of everyone. [I] divide workmanship into three classes, the order of which corresponds to differences in quality. Labor hours are distinguished according to the four

seasons and adjusted by the length of daylight. Even timberwork is evaluated according to the hardness and softness [of the timber] and thus nothing is not logical [all principles for classification of workmanship and labor hours apply correspondingly]. [The work of transporting] soil is evaluated based on distances, making it easy to supply [the proper] labor. Categories and examples [like these] are arranged systematically. Principles and regulations are fully provided.

As Li claims here, a great effort was made in his compilation to produce effective, strict rules for manpower and materials as well as expenses. In fact, throughout the *YZFS* there are many clear principles for the reasonable use of building materials and other resources. A typical example can be seen in the chapter on “Sawing System” 鋸作制度, which includes detailed rules for processing timber reasonably and economically:

凡材植、須先將大方木可以入長大料者、盤截解剖、次將不可以充極長極廣用者、量度合用名件、亦先從名件中就長或就廣解剖。¹⁵ For all timber materials, one must start with large square timbers that can be used for long, large elements and then cut up [from the raw timber]. Then, for timbers that cannot be used for fairly long or wide elements, carefully consider appropriate elements for which they are suitable; and in that situation, one must also first consider the length or width of elements before cutting the material.

The principle here of sawing timbers according to their natural sizes and appropriate applications for building components is quite concrete and strict. This principle is rephrased in the rules for using carpenter's markers prior to cutting timber: “務在就材充用、勿令將可以充長大用者截割為細小名件”¹⁶ (Ensure that timbers are properly used according to their material properties. Do not cut those that can be used as long, large elements into thin, small elements). Moreover, the text specifically includes a rule for making use of leftover bits and pieces of timber:

凡用木植、內如有餘材、可以別用、或作版者。其外面多有壘裂、須審視名件之長廣量度、就壘解剖；或可以帶壘用者、即那〔挪〕餘材於心內、就其厚別用、或作版、勿令失料。¹⁷ Whenever using timber materials, if there is a remnant, it can be used for other situations, or as boards. The outside of the remainder often contains cracks, and one must consider the

dimensions of the element [that the remnant would be used for], measure it, and cut it properly according to the condition of the crack. If the remnant is usable by leaving the crack alone, then cut the remnant [with the cracked part] from the center [of the piece] and use it in other situations according to its width, or use it for boards. Do not let the material be wasted.

Such detailed instructions relating to the principles of sawing timber and saving every single piece of material well demonstrate the Song court's particular concern about material resources and expenses involved in construction. Clearly, one of the primary purposes of the *YZFS* was to set forth detailed official standards for building materials and labor and thus minimize waste and graft.

As discussed, during the 1070s, precisely when the compilation of the former *YZFS* was begun, Emperor Shenzong promoted the formulation of regulations on the construction of defensible cities and city structures. The most important part of those regulations related to estimating and controlling labor use and materials in order to prevent waste and false estimates. Those regulations most likely were among those “previous treatises and regulations” (*jiuzhang* 舊章) that Li Jie consulted in his recompilation of the *YZFS*. Indeed, the state's financial deficiencies were among the greatest crises that Shenzong had to address during his reign.¹⁸ Exerting himself to make the country prosperous, Shenzong approved his prime minister Wang Anshi's initiatives in institutional reform (1069–1074). Modern scholarship has suggested that Shenzong's commission of the *YZFS* compilation was closely associated with Wang's reform.¹⁹ While there is no direct textual evidence backing this suggestion, it is significant that in 1071, probably the same year or one or two years before Shenzong's commission of the former *YZFS* compilation (around 1071–1074), a law called *guyifa* 雇役法 (alternatively known as *muyifa* 募役法, wage labor law) was issued as one of the essentials of Wang's reform.²⁰ Under this law, craftsmen began to be paid rather than working as part of a corvée labor assignment (*yaoyi* 徭役), which increased the demand for accurate work estimates.²¹ Managing state finances effectively and making the empire rich and strong were the core of the reform. The reform encountered great resistance from its beginning and was repudiated completely during the Yuanyou 元祐 period (1085–1093) under Empress Dowager Gao's 高太后 provisional administration on behalf of the underage Zhezong. This may have affected the compilation of the former *YZFS*, which progressed slowly

and took as long as twenty years. In 1093, Zhezong came of age and took over the reins of government, and, in response to the strong request by scholar-officials to restore Shenzong's reforms, Zhezong changed the title of the reign to Shaosheng 紹聖 (literally, "carrying out the saint-emperor's policies") and reinstated Shenzong's policies. This period was known as one of *shaoshu* 紹述, carrying out Shenzong's new reforms. This may have been the political background to Zhezong's order for the new *YZFS* in 1097.

During the Shaosheng and Yuanfu reigns, the court vigorously promoted military development and engaged in active defense, including the construction of defensible cities, as discussed. This situation resulted in large expenditures that increased concerns regarding the management of financing from the central government to local districts. Zhezong's purpose in issuing an effective official building standard was to regulate building practices and prevent graft and waste. This concern likely continued when Huizong ascended the throne. Thus, upon Li Jie's strong request, Huizong approved the issuing of the *YZFS* in the third year of his reign. Huizong probably expected that strengthening central control over official building practices would help his rule and boost the prosperity of the empire.²² The central government's insistence on reforming state economic systems, strengthening central financial management, and achieving a strong empire was consistent from Shenzong through Zhezong to Huizong's patronage of the *YZFS*.

Despite the main purpose for compiling the *YZFS*, we need to consider the whole package of imperial expectations placed on this treatise. Zhezong expected it to present a discourse on a whole architectural system rather than mere rules for materials. In Li Jie's statement of his principles of compilation, the imperial order in which Zhezong criticized the former *YZFS* was cited again and further elaborated:

先準朝旨、以《營造法式》舊文、祇是一定之法。及有營造、位置盡皆不同、臨時不可攷據、徒為空文、難以行用。先次更不施行。²³ Earlier, according to the imperial decree, the content of the former *Yingzao fashi* was only a treatise on fixed methods. In the event of construction, the [structural] positions and situations are all different from one another; at the time [when the situation is different, the former treatise] cannot be used as a reference. [Therefore, it] will be nothing but an ineffective rule and is unable to be put into practice. [Thus,] earlier, [it] was not put into effect at all.

Apparently, in addition to imperial rules related to construction practice, the Song court intended to make the *YZFS* an authoritative, comprehensive building standard that would be effective under any conditions of design and construction. Such a treatise would need to deal with a wide spectrum of architectural aspects and summarize architectural systems, specifications, and building technologies, corresponding to the regulations pertaining to labor and materials. Creating such a treatise was by no means easy because architectural systems had become increasingly specialized and complicated. As Shen Kuo commented in connection with the obsolescence of the *Mujing*, producing a new building manual would be a masterpiece in itself. From late Northern Song and early Southern Song accounts, we can see how individuals of the Song valued the architectural-system portion of the *YZFS*. The scholar-official Chao Zaizhi 晁載之 (fl. early twelfth century), who served as the prefectural governor in the greater capital area, cites extensively in his work *Xutanzhu* 續談助 (Continuation of talks [on history] for references, completed in 1106) from the entries in the first fifteen chapters of the *YZFS*, namely the terminology and architectural-system sections, but he only mentions the titles of the remaining chapters (16–34), concerned with rules on labor and materials as well as illustrations.²⁴ Likewise, the scholar-official Zhuang Jiyu 莊季裕 (fl. early twelfth century), in a southeastern district, cites in his *Jilei pian* 鷄肋篇 (Jottings of things as valueless as chicken ribs, 1133) only the “Kanxiang” and first four chapters of the *YZFS*, related to terminology and systems of moats, stonework, and major carpentry.²⁵ We thus know that the detailed building methods and terminological studies in the *YZFS* were indeed received by Song officials and scholars as the essential part of this treatise.

The Contents and Principles of Compilation

The voluminous *YZFS* includes thirty-four chapters in four basic parts: the two-chapter “Zongshi” 總釋 (General explanations) terminology section (including “Zongli” 總例 [General principles]); the thirteen-chapter “Zhidu” 制度 (Architectural systems) building-methods section; the thirteen-chapter “Gongxian” 功限 (Work limits) and “Liaoli” 料例 (Rules for materials) work-quota section; and the six-chapter “Tuyang” 圖樣 (Illustrations) section. At its head, it has a table of contents and the foreword, “Kanxiang” 看詳 (Examination of details). The treatise classifies all architectural work into thirteen systems recorded in thirteen chapters, although some systems share one chapter while others span several chapters.

These systems include

- moats and fortifications 壕寨 (orientation, leveling, foundations, and rammed-earth walls)
- stonework 石作 (elements of stone platforms, stairs, balustrades, carving techniques, and motifs)
- major carpentry system 大木作 (modules, beams, columns, framework, bracketing, eaves, and rafters)
- minor carpentry system 小木作 (doors and windows of various shapes, partitions, ceilings, coffers, wood balustrades, obstructing bars, niches, and sutra cabinets)
- [wood] carving system 彫作 or 彫木作 (wood sculptures and motifs)
- turnery system 斲作 (using turnery techniques to make architectural elements of cylindrical or other shapes such as lotus-flower capitals)
- sawing system 鋸作 (principles of sawing and employing timbers economically, such as making full use of leftover pieces)
- bamboo system 竹作 (bamboo elements such as bamboo-strip roof boards and palisades)
- tile system 瓦作 (tiles, ridges, and tile decorations)
- clay system 泥作 (sun-dried mud-brick walls, painting a wall with lime mud, techniques of preparing a wall for polychrome painting)
- color-painting system 彩畫作 (principles, techniques, styles, and motifs of polychrome painting)
- brick system 磚作 (sizes for each type of building, brick walls, platforms, ground paving, aprons, stairs, and ramps)
- kiln system 窯作 (methods for making tiles, bricks, and glazed tiles)

These systems reflected the precise specialization in contemporary building practice. Although the specialization of work during the control of the Northern Song Directorate of Construction was more precise, including more than twenty systems,²⁶ not all were related to architecture. Li's classification of architectural systems was more precise in that it also included moats and fortifications, wood carving, and turnery work. The Song's division of carpentry into major and minor systems, as recorded in the *YZFS*, was unprecedented and profoundly influenced the builder-craftsman specifications of later times.

The structure of the treatise is well designed. The equal length of its discourses on technical methods and on quotas reflects their equal importance in this imperially commissioned building manual. Yet its discussion of building methods appears first. This reflects the author's goal to set forth the most effective imperial standard not only clarifying rules relating to work and materials but also guiding officials in the "imperial commissioned version" of principles of architecture, building technologies, and methods and measurements pertaining to work quotas. References to these principles would help officials to evaluate and examine the quotas, inspect craftsmen's work, differentiate between refined and ordinary work and pay reasonable rates for both types, and eventually apply the rules more effectively than they otherwise would be without adequate knowledge of architecture. Providing officials with such information would enable them to avoid long-standing inferior practices by which, as Li criticized, even talented officials mismanaged construction activities due to their ignorance of architectural knowledge. The quality of individually manufactured elements and of an entire building would be guaranteed by virtue of the elaborate building methods put forth in the *YZFS*. While the treatise was oriented toward strict, official rules, the regulations and standards were not intended to be followed at the expense of sacrificing or compromising artistic quality and criteria. The drawbacks of the former *YZFS* that Zhezong had pointed out would be eliminated because the references to architectural principles provided by this new *YZFS* would help officials to apply and adjust the rules properly in the event of variations in construction.

As Li Jie explains in the "Kanxiang," all the contents are derived from two resources: texts and practice, that is, classical and earlier texts and, predominately, practical methods that "had been in transmission among craftsmen for a long time and had been feasible methods over time" (自來工作相傳、並是經久可以行用之法).²⁷ He acquired these practical methods through detailed oral accounts by experienced craftsmen of all systems and through careful discussions with them on architectural principles and the advantages and disadvantages of all systems. He also came to understand the practical principles of adjusting the measurements of architectural elements and therefore the principles of adjusting work limits according to the different sizes of [architectural] elements (隨物之大小、有增減之法).²⁸ He thus included specific entries on these building methods and principles of adjustment in the "Zhidu" section and in that on work quotas. At the same time, Li also read through classics and earlier texts searching for architectural traditions of practical methods and terminology. For those contemporary

methods that he found to be identical to classical principles (至或制度與經傳相合),²⁹ he created specific entries in the “Kanxiang” section of the manual. In order to enhance his discussions of building standards, he provided illustrations for some of the building technologies and methods at the end. He explains the principle of providing illustrations as follows: “其逐作造作名件內、或有須於畫圖可見規矩者、皆別立圖樣、以明制度”³⁰ (In the discussions of the construction and processing of components for all systems, if there are things whose principles cannot be understood unless illustrated, [I] specifically provide drawings for all, so that the systems are clarified).

It appears that from the 1070s (post–Ouyang Xiu) through the end of the eleventh century (Shen Kuo’s time) until the completion and distribution of the new *YZFS* in 1103, there was not any *Mujing*-like building manual that dominated Song building activities, not even a nominal one, as the *Mujing* had been during the later stage of its so-called one-hundred-year influence. These last thirty years of the eleventh century were a period during which an old building standard fell into oblivion but a new one had yet to be established. As indicated by Shen Kuo, the builders at this time had become much more precise and skillful. So it is very likely that this transitional period (1070s–1103), or perhaps starting even earlier, in the 1060s, provided a good opportunity for master builders, or forced them to seek opportunities, to develop their talents freely by exploring more complicated yet effective architectural technologies. Many new building methods and technical terms had emerged, and in the meantime the architectural module had long since been developed from the primary one in the *Mujing* toward a unifying, standard module that was most suitable for an increasingly comprehensive architectural system. On the other hand, among the newly developed methods and terms, there may also have been gaps among those used in different regions. Work of mixed methods and terms may have characterized the construction practices of the capital at Bianliang because of the various regional origins of the craftsmen and builders who were chosen to serve the court. Thus, a variety of technical methods and terminology must have confronted the compilers of both the former and the new *YZFS*. Collecting those various technical methods and sorting them out by tracing their sources in textual traditions while understanding their specific meanings in light of architectural procedures, Li Jie was able to compile a thorough body of architectural knowledge, the most distinguished scholarship on architectural technology in China.

The Surviving Text and Illustrations

Before discussing the practical architectural knowledge as recorded and illustrated in the *YZFS*, it is necessary to clarify the authenticity of the text and illustrations that have been passed on to us. Following its first publication in 1103, the text was republished at least twice during the Southern Song period. In 1145, a copy of the text was found during the court's promotion of a nationwide search for books of the previous emperors of the Song. Based on this copy, the prefecture of Pingjiang 平江府 (modern Wu County 吳縣, Jiangsu) republished the *YZFS*. During the Shaoding 紹定 period (1228–1233), the same prefecture republished it again. Neither of the two earliest editions survived, but fragments of the Shaoding edition, which was repaired during the Yuan period, did survive. Found in the storehouse of the Inner Office 內閣 of the imperial Qing in 1956, these fragments include several leaves of chapter 10 (minor carpentry system) and all of chapters 11 to 13 (minor carpentry, wood-carving system, turnery system, sawing system, bamboo system, tile system, and clay system).³¹ Analysis of the block-printing formats revealed that the fragment found in the same place in 1920—containing the first half of the first leaf of chapter 8 and presumed to be from the 1103 edition³²—was part of these fragments discovered later. These fragments are now at the State Library of China, Beijing, and a photo-offset copy of them was published in 1992.³³ Although Chen Zhongchi had, in the 1960s, identified this edition as the Shaoding-period reprint of the 1145 edition,³⁴ modern scholarship before the 1990s still commonly believed it to be the 1145 edition,³⁵ ignoring the fact that many of the workers who cut blocks for the printing of this edition were active in the official publishing projects during the Shaoding period.³⁶

Other than these early-thirteenth-century fragments, all extant editions are copies of copies of the 1145 edition that were produced during the Ming and Qing periods. These editions provide us with a complete text, although they contain scribal errors. The most popular edition of the text used today is the 1925 edition, but readers should be aware that new drawings made then were added to it.³⁷

No Song illustrations of this text have survived. The images in extant editions are also copies of copies of the Song editions. In the course of transmission, it is problematic whether the extant images exactly reflect the original look of the architecture and decorative patterns depicted in the original Northern Song edition. However, as was suggested by Walter Perceval Yetts (1878–1957), the fragments (eighteen folios) of the *YZFS*

color-painting system in the *Yongle dadian* 永樂大典 (Great encyclopedia of the Yongle period, 1403–1424) resemble the Song style the most.³⁸ While these hand-copied woodblock-printed illustrations are still not the Song illustrations, these reproduced images done by Ming artists can serve as a reference for the earlier versions of the *YZFS* color painting that the Ming artists were able to observe.

Still, the *YZFS*'s six chapter-long sets of illustrations are regarded (by, e.g., Joseph Needham) as a precious cultural heritage of the world.³⁹ It is important to see what kinds of building knowledge were, in Li Jie's view, essential but difficult to describe and so demanded illustration in this state-commissioned building standard. The illustrations correspond to certain methods or principles in seven sections: the geometrical principles related to making a circular element from a square piece and vice versa (under *zongli*, or "general principles"); instruments for determining orientation and level (under "moats and fortifications"); column bases, elements on platforms, balustrades, and carved stone, as well as wine-cup-flowing miniature channels (under "stonework"); the methods for bracketing elements and composition, techniques of making raise-and-break roofs, mortises for bracketing, beams, columns and lintels, framing, corner-bracket sets, various arrangements of columns and sections of column-beam structures (under "major carpentry"); shapes of doors and windows, inscribed boards and interior miniature structures such as niches for buddhas or Daoist worthies, and sutra cabinets (under "minor carpentry"); decorative patterns for wood carving (under "carving"); and decorative patterns and styles for polychrome features (under "color painting"). These illustrated elements and methods are among the most important items in the text. The illustrations of color-painting patterns provide the names of colors and patterns, but given the fact that the surviving illustrations are not original, it is not clear whether the labels were created by Li Jie or added in Ming or Qing times (figure 3.1).

Liang Sicheng 梁思成 (1901–1972) pointed out many shortcomings of the extant illustrations, including the line thicknesses, the images' lack of measurement indications, and incorrect perspective in some illustrations.⁴⁰ He wrote, for instance, that there was no "scientific" technique for architectural representation in the ancient period and that, therefore, the illustrations lacked "accuracy and precision."⁴¹ But we should not expect such illustrations to have had the same goals as those of brush painting, the techniques of which reached their summit during the Song period. The main purpose of the *YZFS* illustrations was to provide clear information.

The illustrations were intended as diagrams, a code for specialists. As part of a text written with a specialist audience in mind, they were produced for people who would know what the diagrams meant. Thus, as long as the diagrams were clear and adequately explained the elements, structures, and methods concerned, they could effectively provide an understanding of the text and building practices as well.

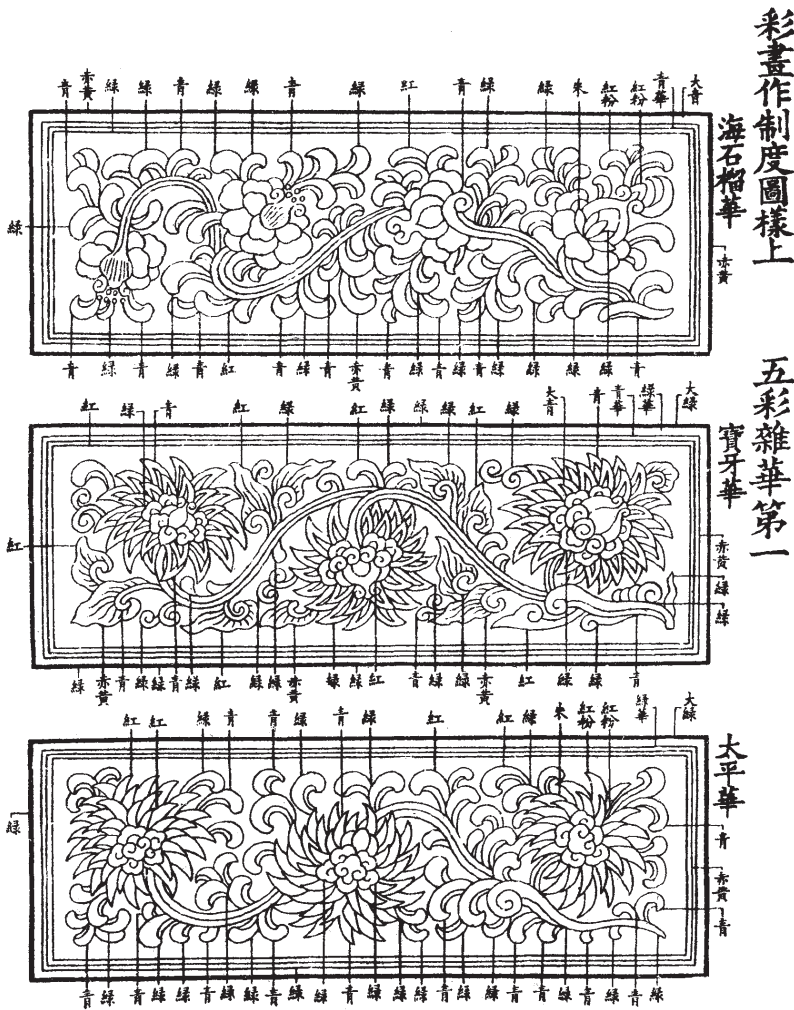


FIGURE 3.1. YZFS illustration of the color-painting system (*juan* 33:2a) (not clear when the indications of colors were made)

Seeking Classical and Orthodox Roots: The Foundation of the Architectural Methods and Terminology in the *YZFS*

Modern scholarship has questioned the notion of a relationship between practical architectural methods and the classical texts that Li Jie presented in the *YZFS*. Li's citation of classical and earlier texts under forty-nine architectural terms in the "Zongshi" (General explanations) section has been regarded as having no direct relation to the building technologies, or as a mere matter of Li's personality as a book collector and scholar.⁴² Such views suggest that it was superfluous for Li to investigate classical texts in formulating the work's practical building standards. However, Li stresses repeatedly, in his "Zhazi" and "Kanxiang" prefatory sections, that, upon receipt of the imperial order, he "had examined classics, histories, and all kinds of books" (攷究經史群書) and "had read previous treatises" (攷閱舊章) in addition to hearing oral accounts from craftsmen. In the "Kanxiang," he states specifically that in the *YZFS*, forty-nine entries for 283 items in total were "gathered and examined from classics, histories, and all kinds of books" (於經史等群書中檢尋攷究), and that those he found identical to contemporary practice were examined especially in the "Kanxiang." Classical and historical texts must have had significance for his compilation. Let us look at those traditional texts referred to by Li Jie and the practical building principles that are enumerated in the *YZFS*.

In the "Kanxiang," Li extracts from the classics and histories and treats those references as part of the architectural tradition to be compared with the fundamental building technologies of his time. As we have seen, in the instances in which the traditions recorded in these texts are found to be identical to what he had learned from his experiences and to the craftsmen's oral accounts, he summarizes the basic principles of contemporary building practice and specifically stresses that the contemporary methods "exactly conform to those in the classics" (正與經傳相合).⁴³ Although the concrete technologies or methods that Li formulated are far more complicated than those of the classics, it is important to understand that Li's object was not to make them precisely equivalent. Rather, before offering his standard principles for contemporary practice, he strongly feels the need to point out that the technical principles—for instance, the 3:1 ratio between the height of a wall and its width or the technologies of orientation using the "shadow-gauging" and "North Star-observing" methods—are consistent from the classics to his day.

In addition to the classics, there are instances where Li cites other earlier-period authoritative texts. For example, regarding the principle of evaluating work (定功), the only text Li cites is the *Six Codes of the Tang*. Li based his general principle of work evaluation on the four seasons by following this Tang precedent. A primitive concept for estimating needed manpower had emerged during the pre-Qin period, as recorded in the *Kaogongji* and the *Chunqiu Zuozhuan*.⁴⁴ Li certainly consulted these sources, but he put the passage involving the estimation of labor in the *Chunqiu Zuozhuan* under the entry for “city” (*cheng*).⁴⁵ Most likely, there was not an imperial regulation relating to the elaborate principles of estimating labor until the Tang period. Thus, Li sought authoritative theoretical foundations for his architectural standards from both the classics and other important early-period texts.

From the “Kanxiang” to the “Zongshi,” Li’s search for classical and orthodox traditions in architecture is evident. The forty-eight architectural terms (forty-nine if counting the term *tang* attached to the entry for *dian*) treated in the “Zongshi” include not only those related to fundamental building technologies and principles, such as determining level, orientation, the *cai* module, and the “raise-and-break” method of building roofs, but also major types of architecture such as palace, hall, tower, pavilion, and watchtower, as well as many architectural elements such as bracketing, components of beam structures, ceilings, and railings. Compared with the treatments of architectural terminology in official Tang-Song reference works, the *YZFS*, written by the experienced architect-official Li Jie, paid much more attention to individual elements and treated for the first time specific fundamental building technologies. The classical and historical text excerpts referenced under each entry for these terms, totaling some 280, come from more than seventy sources categorized in nine types of architectural literature: the Confucian classics, histories, philosophy, literature (poems, rhapsodies, and jottings), commentaries, dictionaries, government documents, mathematical works, and treatises on painting. I tabulate in the following all these sources (and those cited in the “Kanxiang” as well) and group them in the nine categories (for more detail, see appendix 7):

Confucian Classics (Pre-Qin to Early Han Periods)

This category includes the following eleven sources: the *Yijing* (Classic of changes), *Kaogongji*, *Zhouli*, *Yili*, *Liji*, *Shangshu*, *Chunqiu Zuoshizhuan*, *Chunqiu Gongyang zhuan* 春秋公羊傳 (Gongyang’s commentaries on the

Spring and Autumn Annals; oral accounts attributed to Gongyang Gao 公羊高 [Warring States period], recorded in written form by Gongyang Shou 公羊壽 [fl. 156–143 B.C.E.] and Mr. Huwu 胡毋 [also known as Humu 胡母, fl. 156–143 B.C.E.], *Shijing*, *Erya*, and the *Lunyu* 論語 (Analects; by Confucius and his disciples). The total number of citations of these sources is seventy-three (excluding repeated citations). The *Erya* is cited as many as twenty times.

Commentaries on and Studies of the Classics (Qin, Han, and Tang Periods)

This category includes the following five sources: The *Shangshu dazhuan* 尚書大傳 (Great commentary on the *Shangshu*; attributed to Fu Sheng 伏勝 or 伏生 [fl. Qin period], completed during the second century B.C.E.; later attributed to Kong Anguo 孔安國 [d. ca. 100 B.C.E.]), *Wujing yiyi* 五經異義 (Peculiar meanings of the Five Classics; probably by Xu Shen 許慎 [ca. 55–ca. 149]), *Yizhuan* 易傳 (Commentary on the *Classic of Changes*; earliest by Wang Bi 王弼 [226–249]), *Chunqiu Zuoshizhuan yinyi* 春秋左氏傳音義 (Pronunciation and meaning of *Zuo's Commentary on the Chunqiu*; by Lu Deming 陸德明 [556–627]), and the *Shiyi* 詩義 (Meaning of the *Classic of Odes*; by Lu Deming). The total number of citations is seven (excluding a repeated citation).

In an annotation, Li also cites the *Litu* 禮圖 (Illustrations of the [Three Classics of] Rituals) with Zheng Sinong's 鄭司農 (d. 83) commentary.⁴⁶ While this source was written and added to by scholars from the Han to the Northern Song periods, including Zheng Xuan 鄭玄 (127–200), Ruan Chen 阮譔 (Jin 晉 period), Zhang Yi 張鎰 (Tang period), and Nie Chongyi 聶崇義 (tenth century), Li's citation of Zheng Sinong's commentary suggests that he preferred the Han-period scholarship and was selective concerning historical sources.

Histories, Historical Studies, and Commentaries (Pre-Qin, Han, Southern Dynasties, and Tang Periods)

This category includes the following nine sources: The *Lüshi Chunqiu* 呂氏春秋 (Mr. Lü's [commentaries on the] *Spring and Autumn Annals*; by Lü Buwei 呂不韋 [d. 235 B.C.E.]), *Guoyu* 國語 (Annals of historical personages of eight states [from the Western Zhou to the early Warring States periods], completed during the early Warring States period), *Shiben* 世本 (Genealogy [of lords, vassals, and ministers from the Yellow Emperor to the Spring and Autumn periods], completed during the Warring States

period; commentary by Song Zhong 宋衷 [Han period]), *Shiji* 史記 (Records of history, or Records from the Grand Scribe; by Sima Qian 司馬遷 [ca. 145–ca. 86 B.C.E.]), *Wuyue chungiu* 吳越春秋 (Annals of the Wu and Yue kingdoms; by Zhao Ye 趙曄 [fl. 40]), *Hanshu* 漢書 (History of the [Western] Han; by Ban Gu 班固 [32–92]), *Hanji* 漢紀 (An abstract of the *Hanshu*; by Xun Yue 荀悅 [148–209], presented to the throne in 200), *Gushikao* 古史考 (Examinations of history of ancient times; by Qiao Zhou 譙周 [third century]), *Songshu* 宋書 (History of [Liu] Song [420–479], by Shen Yue 沈約 [441–513]), and the *Qianhanshu zhu* 前漢書註 (Commentaries on Ban Gu's *Qianhanshu* 前漢書 [History of the Former Han; also known as the *Hanshu*] from the Han to Tang periods). The total number of citations is seventeen. In addition, Li also cites in an annotation the *Shiji suoyin* 史記索隱 (Search for the profound truth of the *Shiji*; by Sima Zhen 司馬貞 [early eighth century]).⁴⁷

Philosophy (Pre-Qin, Han, and Jin 晉 Periods)

This category includes the following seven sources: The *Mozi* 墨子, *Hanfeizi* 韓非子, *Guanzi* 管子, *Zhuangzi* 莊子, *Laozi* 老子, *Huainanzi* 淮南子 (Collected essays of Prince Liu An 劉安, Lord of Huainan 淮南 [ca. 179–122 B.C.E.]; presented to the court in 139 B.C.E.; eclectic, but mostly Daoist ideas), and the *Fuzi* 傅子 (Collected essays of Fu Xuan 傅玄 [Western Jin period (265–316)]; Confucian thought). The total number of citations of these sources is seventeen (excluding repeated citations).

Lexical Works (Qin, Han, Jin, Tang, and Early Northern Song [?] Periods)

This category includes the following thirteen sources: the *Cangjie pian* 蒼頡篇 (Contents of the characters created by Cangjie; by Li Si 李斯 [ca. 280–208 B.C.E.], with Xu Jian's 徐堅 [659–729] commentaries), *Fangyan* 方言 (Local dialects; by Yang Xiong 揚雄 [53 B.C.E.–18 C.E.]), *Baihu tongyi* 白虎通義 (General comprehension [of the Five Classics] compiled at the White Tiger Hall; by Ban Gu), *Fengsu tongyi* 風俗通義 (Comprehensive meanings of customs; by Ying Shao 應劭 [140–ca. 208]), *Tongsuwen* 通俗文 (Words of common use; by Fu Qian 服虔 [second century]), *Shuowen jiezi* 說文解字 (Explanations of words; by Xu Shen 許慎 [ca. 55–ca. 149]) with commentary by Xu Kai 徐鍇 [920–974]), *Shiming* 釋名 (Explanations of terms; by Liu Xi 劉熙 [fl. 200]), *Boya* 博雅 (Extended *Literary Exposition*; by Zhang Yi 張揖 [fl. 227–233]), *Gujinzhhu* 古今註 (Explanations of [terminology of] ancient and present times; by Cui Bao

崔豹 [fl. 290–306]), *Shenglei* 聲類 (Phonetic similarities; by Li Deng 李登 [Wei period]), *Zilin* 字林 (Forest of words; by Lü Chen 呂忱 [fl. 266]), *Kanmiu zhengsu yinzi* 刊謬證 (or 正) 俗音字 (Correction of errors, popular forms, and sounds of characters, also known as the *Kuangmiu zhengsu* 誣謬正俗 or *Zhengsu yinzi* 證俗音字; by Yan Shigu 顏師古 [581–645]), and the *Yixun* 義訓 (Explanations of meanings of words; probably by Dou Yan 竇儼 [tenth century]).⁴⁸ The total number of citations is 116. Among them, the *Shuowen jiezi*, *Shiming*, *Boya*, and the *Yixun* are cited 26, 27, 17, and 29 times, respectively.

Government Documents (Tang Period)

The *Tang liudian* 唐六典 (Six codes of the Tang, 735) is the only government document that is cited.

Mathematical Treatises (Han Period, with Tang-Period Commentaries)

Two sources are included in this category: the *Zhoubi suanjing* 周髀算經 (Mathematical classic of the Zhou shadow-gauging instrument; completed during the first century B.C.E.) and Li Chunfeng's 李淳風 (602–670) commentary on the Han-period *Jiuzhang suanjing* 九章算經 (Nine-chapter mathematical classic). Each of these sources is cited once.

Literature: Poems, Rhapsodies, and Jottings (Han to Early Song Periods)

Twenty-two sources are included in this category, sixteen of which are poems and rhymed prose: the *Han Boliangshi* 漢柏梁詩 (Poems composed at the Boliang Terrace of the Han; by Han-period composers: emperors, court officials, et al.), Sima Xiangru's 司馬相如 (179–117 B.C.E.) *Changmen fu* 長門賦 (Rhapsody on the Changmen Palace), Yang Xiong's 揚雄 (53 B.C.E.–18 C.E.) *Ganquan fu* 甘泉賦 (Rhapsody on the Ganquan Palace), Ban Gu's *Xidu fu* 西都賦 (Rhapsody on the Western Capital), Zhang Heng's 張衡 (78–139) *Xidu* (or *Xijing*) *fu* 西都[西京]賦 (Rhapsody on the Western Capital), Wang Yanshou's 王延壽 (ca. 124–ca. 148) *Lu Lingguangdian fu* 魯靈光殿賦 (Rhapsody on the Hall of Numinous Brilliance in Lu) with Li Zhouhan's 李周翰 (Tang-period) commentary, Liu Liang's 劉梁 (fl. 147–167) *Qiju* 七舉 (Seven-set refined verses exemplifying [historical affairs to memorialize the emperor]), Zhang Jingyang's 張景陽 (fl. 301–307) *Qiming* 七命 (Seven-set rhapsody on fates), He Yan's 何晏 (190–249) *Jingfudian fu* 景福殿賦 (Rhapsody on the Hall of Great Blessings) with

commentaries by Li Shan 李善 (ca. 630–689) and the Five Tang Officials (Li Zhouhan 李周翰 et al.), Zuo Si's 左思 (?–306) *Wudu fu* 吳都賦 (Rhapsody on the Capital of Wu) and *Weidu fu* 魏都賦 (Rhapsody on the Capital of Wei), Xue Zong's 薛綜 (Three Kingdoms–period) commentary on Zhang Heng's *Xidu fu*, Bian Lan's 弁蘭 (Wei-Jin period) *Xuchanggong fu* 許昌宮賦 (Rhapsody on the Palaces at Xuchang), Xu Ling's 徐陵 (sixth century) *Taijidian ming* 太極殿銘 (Epigraph for the Supreme Ultimate Hall), Li Bai's 李白 (701–762) *Mingtang fu* 明堂賦 (Rhapsody on the Mingtang), and Li Hua's 李華 (Tang period) *Hanyuandian fu* 含元殿賦 (Rhapsody on the Hall of Enfolding Vitality). The total number of citations is forty-three. Among them, the *Lu Lingguangdian fu* and the *Jingfudian fu* are cited most frequently.

The other six sources in this category include Zhang Hua's 張華 (232–300) *Bowuzhi* 博物誌 (Record of legendary stories and exotic animals and plants), Guo Pu's 郭璞 (276–324?) *Shanhaijing tu* 山海經圖 (Illustrations of the *Classic of Mountains and Seas*), Hu Qu's 胡璩 (Tang period) *Tanbinlu* 譚賓錄 (Record of anecdotes of contemporary personages), Shangguan Yi's 上官儀 (seventh century) *Toubujing* 投壺經 (Manual of the pitch-pot game), Liu Zongyuan's 柳宗元 (773–819) essay *Zirenzhuan* 梓人傳 (Biography of a carpenter), and Song Qi's 宋祁 (998–1061) jottings that Li Jie entitled *Huangchao jingwengong Song Qi bilu* 皇朝景文公宋祁筆錄 (Jottings of our dynasty's Master Jingwen Song Qi), one of only two Northern Song sources (if the *Yixun* was indeed one). Each of them is cited once or twice.

Treatises on Painting (Northern Dynasties Period)

Xie He's 謝赫 (fl. 479–501) *Huapin* 畫品 (Appraisals of paintings) is the only source of this kind to be cited. This Southern Qi (479–502) work is the earliest Chinese critical writing on the art of painting. The cited text is about polychrome painting.

As shown above, among the total of seventy-two texts cited, the majority date to the pre-Qin and Han periods. Only about ten Tang texts (including Li Shan's and the Five Officials' commentaries on the Han rhapsodies) and only one or two contemporary texts (Song Qi's note and, perhaps, the *Yixun* dictionary) are cited, which represent only one-sixth of the total sources. Apparently, Li Jie had a strong preference for earlier texts in his collection and incorporation of traditional architectural sources. To Li, those pre-Qin and Han classics, philosophical, historical, literary, and lexical works as well as mathematical works, from far before his time, were the most venerated architectural sources. He therefore frequently cites literary texts from early

periods but very few from near or during his own time. He relied heavily on dictionaries, but most of them belonged to the Qin, Han, and Six Dynasties (222–589) periods, despite the availability of many contemporary lexical works compiled under imperial orders, such as the *Guangyun* 廣韻 (Spreading rhymes, 1007–1008), the *Jiyun* 集韻 (Comprehensive rhymes, completed 1067), and the *Leipian* 類篇 (Conforming to [the standard of] the *Yupian* 玉篇 [Jade thesaurus], 1066–1067). While he cites often from the *Erya* and the *Shuowen jiezi* dictionaries, he seldom used contemporary commentaries on them, such as Xu Xuan's 徐鉉 (916–991) and Xu Kai's 徐鍇 (920–974) commentaries on the *Shuowen jiezi* (Li cites Xu Kai's only once, in an annotation), or Xing Bing's 邢昺 (932–1010) imperially commissioned commentary on the *Erya*, the *Erya shu*. He also excerpts from the Southern Qi treatise on painting, the *Huapin*, disregarding the Tang-period *Lidai minghua ji* 歷代名畫記 (Record of famous paintings of all times, 847; by Zhang Yanyuan 張彥遠 [815–907]) and the contemporary *Tuhua jianwen zhi* 圖畫見聞誌 (Experiences in painting; by Guo Ruoxu 郭若虛 [fl. 1070–1080]), two great works on the subject.

It is important to note that some of the classical texts Li cites neither explain nor define the given architectural term but merely contain a short sentence or a phrase in which the term appears. For example, in the entry for *jing* 井 (well), the quoted *Shangshu* 尚書 (Book of documents) text contains only the brief mention “Huangdi chuan jing” 黃帝穿井 (The Yellow Emperor dug a well).⁴⁹ This excerpt does not tell us anything about the classical form of wells, their structural features, materials used, or measurements. This bit of text thus does not serve in any way to help readers understand the building standards for wells in this imperial manual. Instead, it is just a matter of preference for precedents, that is, the significance of the quote here is that the ancestors had constructed wells, and that *jing*, referring to a well, had existed for several thousand years. By virtue of this precedent, the term *jing* was shown to be an orthodox term that could be used in contemporary practice and was thus entitled to treatment in the imperial building manual. Seeking such orthodox roots for an architectural term or element is evident in many similar cases in the *YZFS*. For example, the *Baihu tongyi* extract in the entry for *gong* (palaces and chambers) includes only “Huangdi zuo gong” 黃帝作宮 (The Yellow Emperor made houses), and the *Shiben* excerpt has only three words: “Yu zuo gong” 禹作宮 (Lord Yu made houses).⁵⁰ The *Shijing* reference in the entry for *qiang* reads, “Chongyong yiyi” 崇墉屹屹 (Tall walls stand towering), and the *Chunqiu Zuoshizhuan* extract includes

only the phrase “you qiang yi bi’e” 有牆以避惡 (there are walls to protect people from evil).⁵¹ As with the *Shangshu* quote, these mentions do not convey any information about structural features, except for the *Chunqiu Zuoshizhuan* excerpt, which at least tells readers about the function of a wall—protection from bad fortune. All these texts served only as classical precedents for contemporary terms and building practices—in other words, the traditional, orthodox roots of contemporary architectural theory and practice.

Moreover, in cases where Song terms for architectural elements differ semantically from the classical or earlier terms, Li often notes the classical terms and their corresponding contemporary names or references. For example, in connection with the *Lu Lingguangdian fu* excerpt, “胡人遙集於上楹” (Tartar figures gather far away in the upper posts [on beams]), in the entry for *zhuruzhu* 侏儒柱 (dwarf post), Li annotates as follows: “今俗謂之蜀柱” (Today [it] is commonly called the *shu* [Shu-region] post).⁵² Here, Li draws a connection between the traditional term *shangying* 上楹 (upper post) in the famous Han rhapsody and the contemporary term *shuzhu* 蜀柱. In the entry for *pingqi* 平棊 (chessboard-like ceilings), Li cites a mention in the *Shiji*, “漢武帝建章後閣平機” (*pingji* ceiling in the back hall of the Jianzhang Palace of Emperor Wu of the Han), and the *Shanhaijing tu* text explaining *pinglao* 平櫺 in the *Shanhaijing* as *pingqi*. Then Li writes a long note, stating,

古謂之承塵。今宮殿中、其上悉用草架梁椽承屋……於明椽背上架算程方、以方椽施版、謂之平闇；以平版貼華、謂之平棊。⁵³ In ancient times, it was called *chengchen*. Nowadays, in palaces, the superstructures all use rough-beam units to support the [roof of] buildings . . . On top of the visible [thus refined] beams, a *suanting* lintel is installed [and on top of it] square rafters are used to install ceiling boards, [the ceiling] being called *ping'an*; if flower decorations are added to the flat boards, [the ceiling] is called *pingqi*.

Li thus connects the terms *chengchen* 承塵, *pingji* 平機, *pinglao*, and *pingqi* of ancient times and earlier periods with contemporary building practices related to this element and, furthermore, connects them with the contemporary terms *ping'an* and *pingqi*, which had been in use in earlier times. At the end of his note, Li specifically corrects an erroneous contemporary term for this element: “俗亦呼為平起者、語訛也” (The term *pingqi* 平起 [with an erroneous character for *qi*, in a different tone

as well, meaning “to rise,” instead of the one meaning “chessboard”) that people popularly use for [this element] is a word error). Clearly, Li intended to demonstrate that the architectural terms recorded in the *YZFS* were all correct and made legitimate by tradition.

Examples like these indicate that Li was tracing contemporary terms and building practices back to historical traditions in the classics and early authoritative texts. Thus, on the one hand, those esteemed classical texts are studied and referenced with the goal of finding the orthodox and the norm; on the other, the identification of contemporary terms with classical ones establishes a consistency in meaning and practice that was judged to be commensurate with orthodoxy. Li’s intention was to claim the legitimacy of the Northern Song architectural standards (both methods and terminology) that he included in his compilation.

At the same time, Li was very selective about traditional architectural literature. His goal was not to collect as many texts as possible.⁵⁴ He chose only those most significant to his establishment of a connection between the classical tradition and contemporary building practices. He thus deliberately chose traditional architectural texts. While he generally recognized the validity of classical works and used them as powerful precedents in most cases, some texts define architectural elements in entirely different ways from one another. In studying, selecting, and quoting classical texts, Li carried out a policy in which only those meeting a certain criterion were chosen and incorporated. The criterion was whether a classical text or a classical term represented what Li judged to be correct and validated by tradition. In cases where the historical literature was confusing or contradictory, Li’s own judgment of which text was correct became critical. Based on his studies and knowledge of the classics and histories, he excluded some texts he judged confusing and kept those that best represented the historical context and progressive changes related to the glossed architectural terms.

Take the term *lu* 櫨 (blocks) as an example. Li surveyed early texts related to *lu* and selected only those glossing it either as “cap blocks” or as “bearing blocks” for citation in his terminology section. He excluded all pre-Song texts that confused these two meanings of *lu* or that gave a third meaning. For instance, he excluded a *Shuowen jiezi* passage in which *lu* is associated with *ji* 枱 (brackets).⁵⁵ Any other pre-Song texts that connected *lu* with “brackets” were also excluded, including Li Shan’s 李善 (d. 689) famous Tang-period commentaries on Han rhapsodies that interprets *lu* to be the same as “brackets.”⁵⁶ By excluding early texts that take *lu* as “brackets” from both the entry for *dou* (blocks) and that for *gong* (arms)

in the “Zongshi” section, Li Jie imposes a sharp distinction between *lu* (regarded exclusively as “blocks”) and any terms for “brackets.”⁵⁷

Avoiding the confusions in the textual tradition was part of his work in establishing an orthodox standard of contemporary architectural theory and practice. Yet the confusion that Li found in his study of traditional sources on architecture also indicates an ongoing conflict between the textual tradition and the contemporary practical knowledge of architecture. Li tried to deal with such conflicts while incorporating the new concepts of architecture and new knowledge of building practice. Li’s manner of treating the textual tradition in architecture reflected how scholars in the Song period perceived the tradition and confronted innovation.

As a court official in the Directorate of Construction, Li’s intellectual orientation to the classical tradition and his search for historical norms and orthodoxy are significant. While compiling a practical treatise on architectural methods and construction principles, he engaged in a textual review of the fundamental principles, technologies, terminology, and concepts composing the architectural tradition and thus set a solid foundation for imperial Northern Song architectural theories and methods. He strenuously sought orthodox roots from the classical texts and earlier, legitimate documents for the official Song standards on building practice. He attempted to fuse the practical tradition and the classical, orthodox, literary tradition.

The YZFS Building Methods and the Material Record: The Practiced, the Recorded, and the Adjusted

The *YZFS* summarizes architectural principles and methods, accompanied by some illustrations, but how faithful were the methods and architectural knowledge it presents to actual practice? Looking at the material record of Northern Song architecture, a large part of the building methods in the *YZFS* are indeed identical or very close to those that were in use at that time. Yet there are significant differences in some aspects of technical methods between the text and the material record. The following few cases can serve as examples.

First, many decorative motifs in the physical record are identical to those in the *YZFS*. For instance, the carved clouds and dragons on the horse-mounting platform (*shangmatai* 上馬臺) of the Yongyu Mausoleum 永裕陵 (built 1085) for Emperor Shenzong 神宗 (r. 1068–1085) in Gongxian 鞏



FIGURE 3.2. Clouds carved on an entwining-dragon stone column as illustrated in the *YZFS* (*juan* 29:12a)

縣, Henan, are largely identical to the styles of clouds and dragons on the carved stone column as described and illustrated in the *YZFS* (figures 3.2 and 3.3). The *wanzi* 萬字 (*wan*-character symbol for ten thousand) pattern in the form of 卍 (swastika) is one of the major decorative motifs in the *YZFS*, used mostly in stone and wood balustrades as well as in decorations painted on timber elements (figures 3.4 and 3.5).⁵⁸ The system of color painting in the *YZFS* stipulates that the *wan* character is one of several forms of “linked pattern” (瑣文) and should be painted on the front and back of a *pupaifang* 普拍方 (a longitudinal tie beam on top of the architrave),⁵⁹ but in the *YZFS* illustrations of color painting, this motif is used on beams as well (see figure 3.5). From these illustrations, the central cross of this form is potentially either of counterclockwise rotation or of clockwise movement. Symbolizing longevity, richness, continuing good fortune, and power, the *wan* motif in architectural decorations was closely associated with a high social status in premodern China. It was used in imperial and official architecture or that for patrons from



FIGURE 3.3. Carved clouds and dragons on the horse-mounting stone of the Yongyu Mausoleum (1085) of Emperor Shenzong at Gongxian, Henan (author photograph)

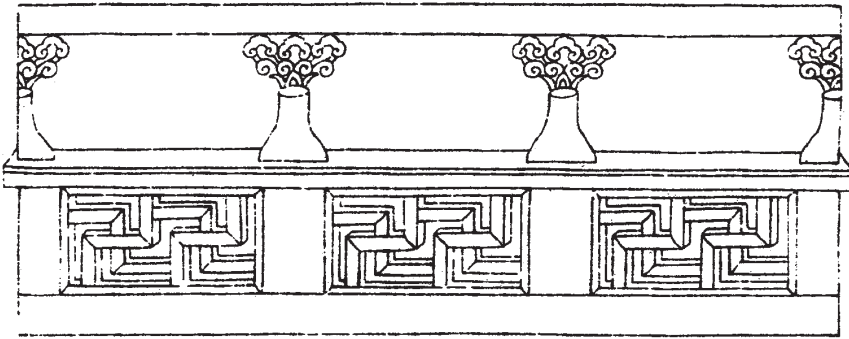


FIGURE 3.4. *Wan*-character (counterclockwise-oriented swastika) motif used in a single-layer stone balustrade as illustrated in the *YZFS* (*juan* 29:11b)

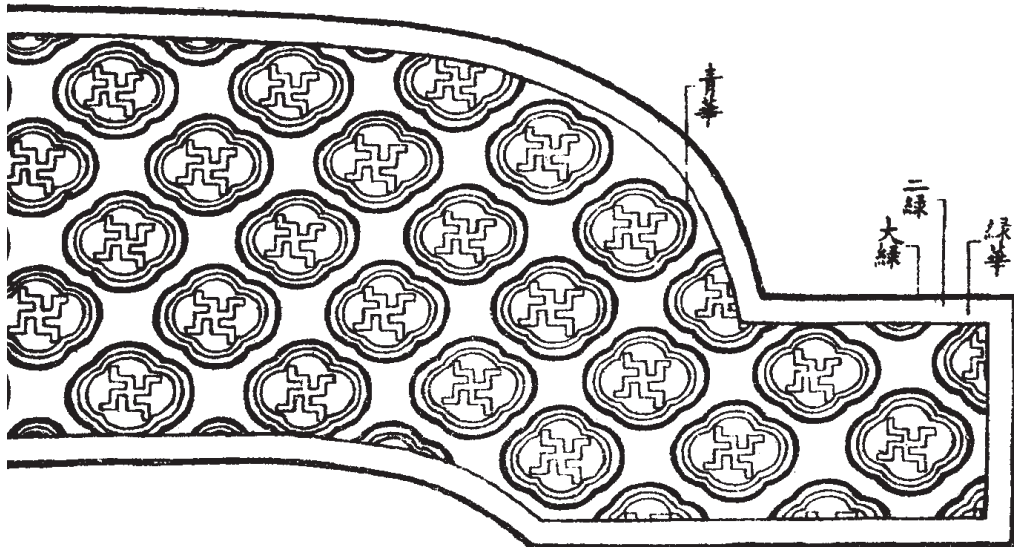
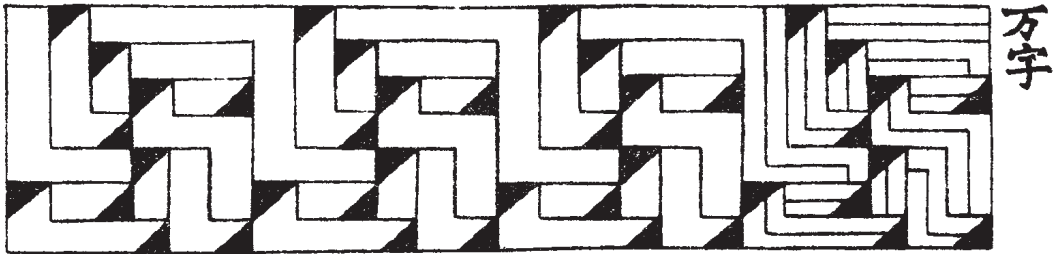


FIGURE 3.5. *Wan*-character motif in the *YZFS* illustrations of the color-painting system: (top) linked pattern in the form of a clockwise-oriented *wan* character (*juan* 33:8a); (above) *wan*-character (counterclockwise orientation) motif for painting on beams (*juan* 34:3b)

a high social class. In the physical record, remnants of brick railings with such a motif have been found in the imperial Northern Song mausoleums in Gongxian, Henan, and the *wan* character indeed has a variant form, either clockwise or counterclockwise (figure 3.6). In addition, the *YZFS* stipulates that a *wan*-character board (萬字版) is used only in a “single-layer balustrade” (*dan goulan* 單鉤闌)—never in a “double-layer balustrade” (*chongtai goulan* 重臺鉤闌)—as consistently illustrated in the text (see figure 3.4).⁶⁰ Moreover, in such a board, the *wan* character can be either hollowed out (*toukong* 透空) or not.⁶¹ The remnants of *wan*-character brick railings from the imperial mausoleums present the following variation: some are carved through while others are not. In the architectural compound of Jidumiao 濟瀆廟 (Shrine for the God of the Ji River, Jiyuan 濟源, Henan) patronized by the imperial Northern Song court, where the emperors offered sacrifices to the God of the Ji River (Jidu 濟瀆, one of the Four Great Rivers worshiped by rulers throughout all of Chinese history⁶²), elements having survived from Song times include the beam structure and bracketing of the Qingong 寢宮 (Soul-Sleeping Hall, 973), a sacrificial hall for holding the ceremony for the God of Ji River (figure 3.8),⁶³ and a stone balustrade with such a “swastika” motif in front of the Lingyuange 靈淵閣 (Pavilion of Spirit River) at the Shrine for the North Sea (北海祠), a part of the compound of the Shrine for the God of Ji River where several structures built or rebuilt during the Ming and Qing periods are preserved. Here again, the *wan* character is used in a single-layer balustrade, and this example shows the motif completely hollowed out (figure 3.7).

Looking at the bracketing of the Soul-Sleeping Hall, not only the structure of each bracket set, composed of two layers of protruding arms with the upper-layer arm supporting a lateral arm, but also the identity between the sets on top of capitals and those in the center of a bay, as well as the proportion of bracketing elements, are on the whole identical to what is presented in the *YZFS* (figures 3.9 and 3.10). The bracketing structure corresponds exactly to what is termed in the *YZFS* “five *puzuo* with two layers of protruding arms, having no lateral arms on the lower layer” (五鋪作出兩杪[下一杪]偷心造); and the lateral arm supported by the second layer of protruding arms (*linggong* 令拱 in the *YZFS*) intersects with a timber element whose head stretches forward (*shuatou* 耍頭 in the *YZFS*). The *linggong* functions as a support to the eave purlin, and a cushionlike timber (*timu* 替木 in the *YZFS*) is installed between the arm and the purlin. The column sets and the intermediate sets are of exactly the same construction, both containing protruding arms that in both cases protrude from the same

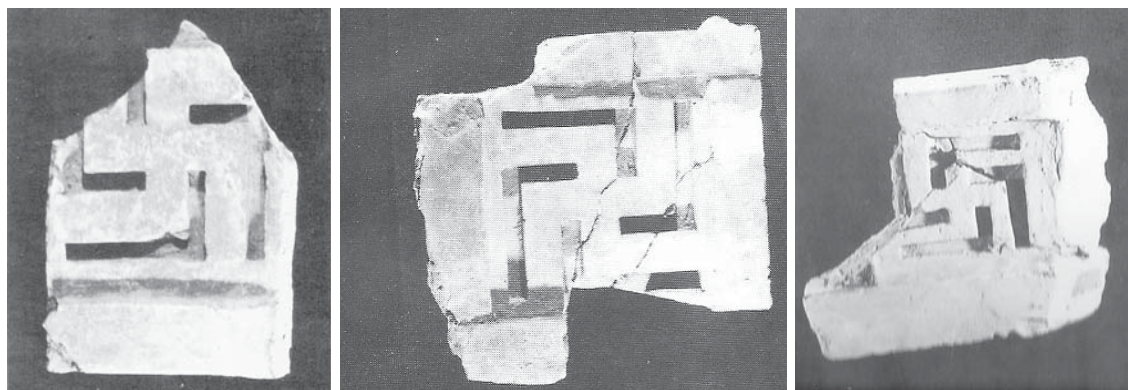


FIGURE 3.6. Remnants of brick railings in *wan*-character motif excavated from imperial Northern Song mausoleums in Gongxian, Henan: (left) excavated from the tomb for Empress Yuande, Ms. Li, of Emperor Taizong of the Song; (middle and right) excavated from the imperial kiln for bricks and tiles (from Henansheng Wenwu Kaogu Yanjiusuo, *Bei Song huangling*, plates 75 and 87)

level, all these being of an authentic period style of Song architecture.⁶⁴ At the corner sets, two arms protrude at an angle of forty-five degrees, and on top of the second layer of such arms, the lateral arms (*linggong*) supported by the arms protruding straight meet by extension from two directions and intersect a *shuatou* that protrudes at an angle of forty-five degrees. Such construction, termed *liegong* 列栱 (intersected arms from two directions [at the corner]) in the *YZFS*, and the two connected lateral arms that share the same small block, *yuanyang jiaoshou gong* 鴛鴦交首栱 (mandarin-duck head-crossing arms), are also frequently seen in the extant wood-framed structures of the tenth to thirteenth centuries. In addition, on top of the architrave, a lateral tie beam is installed to allow bracket sets to sit on it. When such tie beams (*pupaifang* in the *YZFS*) meet the corner column, they stretch their heads from two directions, and the two heads intersect each other. Both the *pupaifang* and the architrave are raised slightly from the central bay to the corner, where the corner column also rises slightly. Technically, such a building technique—*jiaozhu shengqi* 角柱生起 (rise of corner columns) as summarized in the



FIGURE 3.7. Stone balustrade with *wan*-character (counterclockwise orientation) motif at the Shrine for the God of the Ji River in Jiyuan, Henan (author photograph)



FIGURE 3.8. Soul-Sleeping Hall at the Shrine for the God of the Ji River in Jiyuan, Henan, with Song beam structure and bracketing (built 973): (top) front view; (above) side view (author photograph)



FIGURE 3.9. Bracketing under front eave of the Soul-Sleeping Hall at the Shrine for the God of the Ji River in Jiyuan, Henan: note identity between the column sets and the intermediate sets, both of five *puzuo* with two layers of protruding arms, having no lateral arms on the lower layer (author photograph)

YZFS—functions to strengthen the entire structure and facilitates making the eaves turn upward at the corners. In the construction under the corner eave, which is supported by the corner bracket sets, a special timber element is installed on the eave purlin and rises from the last bay. Such a timber, which is termed *shengtoumu* 生頭木 (head-raising timber) in the *YZFS* (figure 3.10), and all those elements mentioned above facilitate the creation of a gentle, elegant curvature of the roof and eaves that characterizes Song architecture. These building features found in extant Song structures or architectural remains of Song times illustrate the faithfulness of some of the building methods recorded in the *YZFS* to reality.

Yet not all actual methods of Song times were summarized and recorded in this treatise. This is clear when we compare cases of bracketing methods. In extant Song buildings, particularly those in the south, we often see a small, flat board installed under a block, which, in Japanese architectural terms, is called *minban* 皿版 (platelike board). Examples of use of this board in bracketing include both extant wood-framed structures, such as the Sanqing Hall 三清殿 (1015) at the Yuanmiao Daoist Monastery 元(玄)妙觀 in Putian 莆田, Fujian (figure 3.11), and those masonry structures in imitation of wood-framed buildings, such as the Renshou Pagoda 仁壽塔 (1237) of the Kaiyuan Monastery 開元寺 in Quanzhou 泉州, Fujian (figure 3.12), yet this feature is not included in the *YZFS*. The reason for excluding this building method from the state building manual was probably because it was restricted largely to local areas. Similarly, the inner, concave contour of a bracket arm as seen in extant buildings—Sanqing Hall, for example—was also not included in this treatise. The angled protruding arms as seen in the Moni Hall 摩尼殿 (1052) at the Longxing Monastery 隆興寺 in Zhengding 正定, Hebei (figure 3.13), are also unrecorded in the *YZFS*. Such arms were not common in magnificent, official Song buildings, although most recent studies suggest that such arms



FIGURE 3.10. Corner bracket sets in the Soul-Sleeping Hall at the Shrine for the God of the Ji River in Jiyuan, Henan, featuring intersected arms from two directions (*liegong*), “mandarin-duck head-crossing” arms (*yuanyang jiaoshou gong*), *pupaifang* supporting all sets and stretching their heads from two directions, and the “head-raising” timber (*shengtoumu*) facilitating the eaves’ turning upward (author photograph)



FIGURE 3.11. Bracket set (front part) of the Sanqing Hall (1015) at the Yuanmiao Daoist Monastery in Putian: note platelike board (*minban*) under blocks and inner concave contour of arms (courtesy of the Bureau of Culture of Putian, Fujian)

might have been popularly used in some local areas.⁶⁵ In general, such angled protruding arms are still more often found in the architecture of the Liao (907–1125, Khitan) and the Jin (1115–1234, Jurchen),⁶⁶ dynasties that Song society perceived as “barbarian.” Further studies are needed regarding the emergence of angled protruding arms in the architecture of the Liao, Song, and Jin and how such a construction method was transmitted between the “barbarian” areas, their surrounding areas, and the central plain of the Northern Song. Nevertheless, this angled-arm construction must have been regarded as an unorthodox method in Song building practices, and thus, even though the Longxing Monastery received imperial patronage in the early Northern Song period, the angled-arm construction was not valued as an effective building method to be included in the dynasty’s building standard.



FIGURE 3.12. Bracket sets imitating timber structure on the western pagoda (1237) of the Kaiyuan Monastery in Quanzhou, Fujian: note the *minban* under the blocks (author photograph)

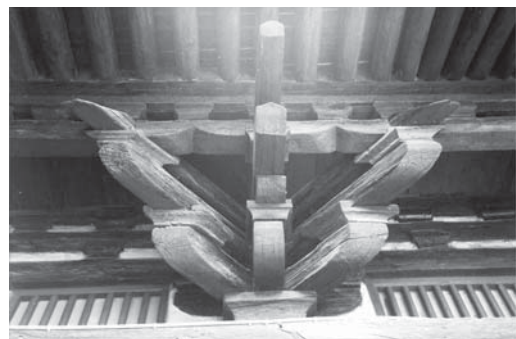


FIGURE 3.13. Angled protruding bracket arms of the Moni Hall (1052), Longxing Monastery, Zhengding (author photograph)

In the *YZFS* discourse on decorative patterns in the wood-carving system (雕木作), three kinds of floral patterns are included in the standard on “carving a background-indented raised-relief-sculptured scrolled-leaf flower” (雕剔地起突卷葉華). They are the *haishiliuhua* 海石榴華 (exotic pomegranate flowers), the *baoyahua* 寶牙華 (precious spike-petal flowers), and the *baoxianghua* 寶相華 (precious roses). The pattern of peonies (牡丹華) is considered to be the same type as the *baoxianghua*. All of these flowers have “scrolled leaves” (卷葉華). The *YZFS* states the following rule for classifying the grades of these flowers by the number of scrolls on each leaf of a flower:

彫剔地起突 [(註) 或透突] 卷葉華之制有三品：一曰：海石榴華……三曰寶相華 [(註) 謂皆卷葉者；牡丹華之類同]。每一葉之上、三卷者為上、兩卷者次之、一卷者又次之。⁶⁷ The carving system of background-indented, raised-relief-sculptured [(annotation) alternatively, full-relief-sculptured] scrolled-leaf flowers has three kinds: Number one is the exotic pomegranate flower... Number three is the precious rose [(annotation) which refers to roses whose leaves are all scrolled; the peony and its kind are (of) the same (class)]. On each leaf, the one having three scrolls is superior [in quality], the one with two scrolls takes second place, and that with one scroll is even more inferior.

In this text, *ye* (leaf) in *juanyehua* is not defined as a (green) leaf in the narrow sense; instead, it denotes petals as well. As the above text shows, the more scrolls a petal has, the higher the class its flower belongs to.

As Takeshima Takuichi 竹島卓一 (1910–1992) pointed out, the differences between “one scroll” 一卷, “two scrolls” 兩卷, and “three scrolls” 三卷 are not distinctive in the *YZFS* illustrations related to the carving system (figure 3.14).⁶⁸ Indeed, from all surviving versions of the *YZFS*, it is unclear what these “scrolls” mean and how they are distinguished from one another. The Ming and Qing artists who copied these images must have had no idea of the distinctions among the different numbers of scrolls and their importance, but the pictures from which they were copying might already have been unclear as to such distinctions. More important, there is no example of pre-Song wood carvings that has survived, and there are scarcely any comparable examples from the Song period. However, if we investigate the material record of Northern Song stone carving, we may manage to get an idea.

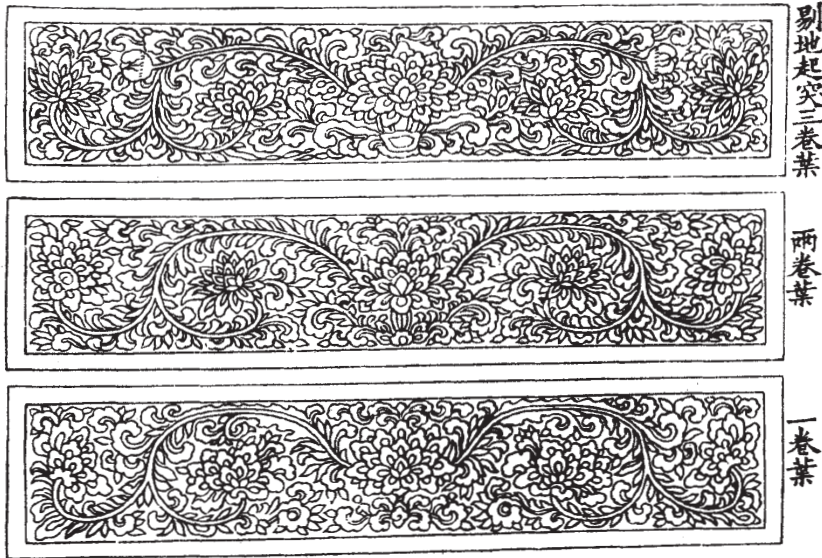


FIGURE 3.14. YZFS illustration of the carving system of “background-indented relief-sculptured” scrolled-leaf flowers, with Chinese labels indicating, from top to bottom, “three-scroll leaves,” “two-scroll leaves,” and “one-scroll leaves” (*juan* 32:24a)

The background-indented relief-sculptured carving (*tidi qitū* 剔地起突) is also one of the four carving systems in the stonework section of the YZFS, and many of those flower motifs as classified in the wood-carving system are included in the decorative motifs related to stone carving as well: “其雕鏤制度有四等、一曰剔地起突、二曰壓地隱起華……其所造華文制度有十一品、一曰海石榴華、二曰寶相華、三曰牡丹華……”⁶⁹ (The [stonework] carving system has four classes: Number one is background-indented relief sculpture; number two is background-recessed low-relief flowers . . . Its system of decorative flower patterns includes eleven kinds: the first is exotic pomegranate flower; the second is precious rose; the third is peonies . . .). Here, as the second class of carving techniques, the *yadi yinqi* 壓地隱起 (background-recessed low relief) refers to a method in which the background is carved lower while patterns are carved in low relief and do not protrude from the stone surface.⁷⁰ Compared with this technique, the wood-carving technique of “background-indented relief sculpture” is described in the YZFS as follows:

凡雕剔地起突華、皆於版上壓下四周、隱起身內華葉等。雕鏤葉內翻卷、令表裏分明。⁷¹ Whenever a background-indented relief-sculptured flower is carved, the background on all sides

of the board is indented, and the flowers, leaves, and other features are to be raised within the space of the board. Carve the petals [and leaves, making them] turned inward and rolled, and make their exteriors and interiors distinct.

It appears there is some similarity between the wood-carving technique of *tidi qitu* and the stone-carving technique of “background-recessed low relief” (*yadi yinqi*), or to some extent the technique of *tidi qitu* wood carving is closer to that of *yadi yinqi* stone carving than to that of *tidi qitu* stone carving (figure 3.15). Presumably, the principles of carving flower patterns and scrolled petals in the wood-carving system should be similar to those for stone carving. Also, the text specifies that the flowers and leaves should be “turned inward and rolled” (葉內翻卷). We can look at some examples of carved flowers made in the “background-indented relief sculpture” or “background-recessed low-relief” technique, in which flower petals and leaves are rolled and turned inward.

The physical evidence examined here includes the flowers carved in low relief on the stone platform of the Southern Tang 南唐 (937–975) Sarira

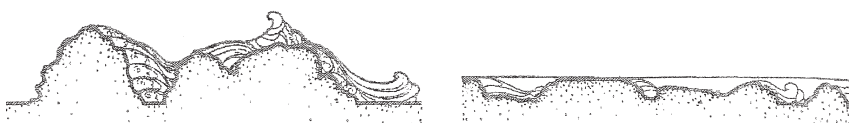


FIGURE 3.15. Difference between stone-carving technique of “background-indented relief sculpture” (*tidi qitu*) (left) and that of “background-recessed low relief” (*yadi yinqi*) (right) in the YZFS (after Hou Youbin and Li Wanzhen, *Zhongguo gudai jianzhu lishi tushuo*, fig. 6.10.24)



FIGURE 3.16. Flowers carved on the platform of the Sarira Dagoba of the Qixia Monastery, Nanjing: “background-recessed low relief,” featuring one or two scrolls on each petal (after Liang Sicheng, *Yingzao fashi zhushi*, 45)

Dagoba 舍利塔 at the Qixia Monastery 棲霞寺, Nanjing, and the exotic pomegranate flowers carved on the masonry wall of the Pota 繁塔 (Po Pagoda, built 974) in the Northern Song capital of Bianliang 汴梁 (modern Kaifeng) (figures 3.16–3.18). In addition, the main hall of the Chuzu'an 初祖庵 (Nunnery of the Sect Founder, built 1125) at Songshan Mountain 嵩山 in Dengfeng, Henan, is the only extant Northern Song timber building that was built after the completion of the *YZFS*. The stone columns of this hall are carved with various flower patterns, providing us with a rare example of Northern Song stone carving. Among the carved patterns, the exotic pomegranate flowers carved on the eastern column of the central bay on the façade of the hall can be compared with the above examples (figure 3.19).

Whereas several lines are included on each petal in these examples, the petals and leaves are apparently turned inward and rolled, and their exteriors and interiors are indeed distinct. Moreover, it is clear that one or two scrolls have been carved on a petal or leaf, mostly at the tip. In the flower petals carved on the Dagoba of the Qixia Monastery, some possess one scroll while the others have two. The exotic pomegranate flowers carved on the Po Pagoda include those carved in the “background-recessed low-relief” and those in the “background-indented relief-sculpture” styles. The flowers carved in the former style consistently show one scroll on the tip of every single petal. The “background-indented relief-sculptured” flowers basically have one scroll as well (see top of figure 3.18), although some petals seem to possess two scrolls. As regards the pomegranate flowers on the



FIGURE 3.17. Exotic pomegranate flowers carved on the Po Pagoda (974), Kaifeng: (top) flowers carved as decorations on the masonry wall with images of the Buddha (author photograph); (above) detail of “background-recessed low-relief” flowers, one scroll on each petal (courtesy of the Kaifeng Wenwuchu)

stone column of the Chuzu'an Nunnery, which were produced after the nationwide distribution of the *YZFS*, the petals are all turned inward and have two scrolls on them, while the leaves all have one scroll.

These petals are all carved on Buddhist monasterial buildings, and none of them has three scrolls. It should nonetheless be clear what “one scroll,” “two scrolls,” or “three scrolls” means in these carving systems of the *YZFS*. Although we have no extant examples of carved flowers with three-scroll leaves in the techniques of “background-indented relief sculpture” or “background-recessed low relief,” we can assume that the three scrolls must have been carved on the tip of a petal and the interior and exterior of the petal must have been made distinct owing to the inward-turned petal and the scrolls on it. As the text states, a bigger number of scrolls on a petal or leaf represents a higher level of flower pattern. Focusing on the decorative patterns themselves—the scrolls on petals and leaves—instead of the difference in carving methods, the image of the peonies carved on the western stone column (*wangzhu* 望柱) along the sacred way at Emperor Shenzong's Mausoleum Yongyu 永裕陵 (built 1085) in Gongxian, Henan (figure 3.20), may help in understanding the meanings of the flower scrolls.

The peonies here are carved in the technique of *jiandi pingsa* 減地平鈹 (even carving on a slightly indented background), designated as the third kind of stone carving in the *YZFS*,⁷² in which the background is indented slightly while the carved pattern is even with the stone surface.⁷³ Compared



FIGURE 3.18. Two “background-indented relief-sculptured” exotic pomegranate flowers carved on the Po Pagoda: (*top*) one scroll on each petal and leaf; (*above*) one or two scrolls on each petal (courtesy of the Kaifeng Wenwuchu)

with the petals on the two nonimperial buildings, all the peonies carved on this imperial mausoleum contain three or even more scrolls on each petal. Of the six petals, four (on the stem and top of the peony, respectively) are carved with at least three scrolls on each, and the other two petals are carved so elaborately that each contains one or two scrolls at the place not far from the starting point and two or three more at its end. Compared with the (green) leaves carved at the Po Pagoda and the Chuzu'an Nunnery, each of which includes only one scroll, the leaves on the "imperial peony" are intermingled with petals and are elegantly made with scrolls varying from one to three.

The physical evidence basically interprets the textual record. The terms "one scroll," "two scrolls," and "three scrolls" are standard terms denoting scrolled petals and leaves, in most cases at their ends. If a flower pattern is designed to have more than one scroll, the additional scrolls can be made in the middle of a petal and below the scrolls at its tip. The more scrolls a petal or leaf has, the more superior the carved flower is. Moreover, the higher grade a building has, the more superior are its flower decorations.

Both similarities and differences exist between the actual building methods and those stipulated in the *YZFS*. Given the fact that the *YZFS* was compiled and completed only in the late Northern Song period, one may be tempted to think that the *YZFS* certainly had no way of embodying every single technical method or describing precisely every detail of a technical method in use in contemporary construction practice prior to its completion. Nevertheless, it is necessary



FIGURE 3.19. Exotic pomegranate flowers carved on the stone columns of the main hall (1125) of the Chuzu'an Nunnery in Dengfeng, Henan, featuring two scrolls on each petal and one scroll on each leaf (after Guo Daiheng, *Zhongguo gudai jianzhushi*, 3:678)



FIGURE 3.20. Peonies carved on the stone pillar of the Yongyu Mausoleum (1085) for Emperor Shenzong, featuring three or more scrolls on each petal: (*left*) line drawing of two peonies on a twining spray (after Henansheng Wenwu Kaogu Yanjiusuo, *Bei Song huangling*, 216); (*right*) photograph of peony at the bottom (author photograph)

to be reminded that Li Jie specifically claims that the practical building methods he presents in the *YZFS* were those having been transmitted from earlier practice and proven to be “feasible” “over time.” Li Jie also specifies that he “discussed with highly experienced craftsmen of all systems and carefully examined the *guiju*” (與諸作諳會經歷造作工匠、詳悉講究規矩).⁷⁴ Here, *guiju* 規矩, or “rules,” is an important word. It certainly refers to architectural principles and procedures that had proven to be feasible and had been widely followed in practice. But on the other hand, it represents the *legitimization* of practical technologies and principles in all building systems. Instead of simply transcribing whatever the craftsmen told him, he investigated whether the practical methods followed the *guiju*, and in

doing so, he set a strict criterion for determining what was to be included in this Song building manual: legitimated methods only. Thus, such building methods as the “angled protruding arms” or bracket arms with “an inner, concave contour” or the “platelike board” under a block, which either had no textual tradition or originated possibly from remote regions or foreign lands or had been practiced in merely one or a few instances within a small area of the central plain, lacking broad applicability, may have been judged “illegitimate” or “unfeasible over time” and thus excluded from his official, orthodox, legitimated building standard.

Li Jie’s consideration of the legitimacy of practical building methods shows no difference from his strenuous yet unshakable pursuit of the classical tradition and orthodox roots underlying official state architectural theory and standards. In this aspect, the textual tradition and the practical tradition were reviewed consistently in the *YZFS*. Li Jie may also have imposed some adjustments in some details of certain building methods to make them more “legitimate,” which may account for some of the differences between the technical contents of the *YZFS* and what can be seen in the material record. That is to say, the building standards as presented in this official treatise may have represented, to some extent, an artificial, authoritative ideal of the practical method, an adjustment at a level of appropriateness that Li Jie and the Directorate of Construction deemed at a specific time—the late 1090s, when the importance of the practical tradition in architecture was recognized by the central government and all of society equally with the classical, textual tradition.

4

The *Yingzao Fashi* Architectural Terminology (I) — Bracketing Likened to Flowers, Branches, and Foliage

Architectural Metaphors and Conceptualization in
Tenth to Twelfth Century China

The state building standards that Li Jie claims as legitimate in the *YZFS* include comprehensive construction methods and numerous architectural terms. No matter how “technical” these contents may be perceived, they must have contained culture-bound elements given the fact that most of these technical methods and terminology had their roots in the actual practices of Song craftsmanship. Specific professional and intellectual settings, social customs related to the building profession, and popular architectural conceptualizations must have been involved in the creation and transmission of these methods and terms. These social and cultural factors must have been retained in the technical methods and terminology sorted through and accepted for presentation in the *YZFS*. In fact, underlying the architectural discourse in the *YZFS* is indeed a plentiful store of distinctive social and cultural connotations.

The myriad architectural terms presented in the *YZFS* are very specific, and many are difficult to understand. In the “Kanxiang” (Examination of details) section of the *YZFS*, Li writes about his policy for treating these terms:

屋室等名件、其數實繁、書傳所載各有異同……按羣書及以其曹所語參詳去取、脩立《總釋》二卷。¹ The terms for buildings, chambers, and others are indeed of a large number. [For] those that are recorded in books and texts, [some] are different from [one another] and [some are] identical to one another . . . [Now your subject] excludes or collects [those terms] by referring to all books and what the offices [in charge of construction] said and has compiled the two chapters of the “Zongshi” [General explanations].

Li Jie faced a great number of architectural terms and tried to sort them by referring to written sources and what the scholar-officials working under him said. In compiling the two-chapter terminology section of the *YZFS*, however, he was able to deal with only a small portion of their vast number.

Although modern architectural historians and sinologists have developed general identifications of most textual terms with actual architectural elements, few of them have given attention to the semantic meanings of the terms themselves. When an architectural term was created for a specific building element, the words used in the term had to make sense according to the specific architectural procedure and the specific structure related to the element. The word choice was a matter of how people (builders or viewers) conceived of these elements. Therefore, architectural terminology is a faithful carrier of popular architectural culture and distinctive architectural concepts.

In the *YZFS*, some elements are termed according to their structural positions and functions, such as *jitian* 脊樑 (main-ridge purlin) and *chengchuanfang* 承椽方 (rafter-supporting tie beam), but others are named based on their outstanding physical features. Two typical examples are *chashou* 叉手 (literally, “raised, folded hands”), an inverted V-shaped brace under the main ridge, and *zhaqian* 劄牽 (literally, “pin-pricking connector”), a very short beam with a span of only one rafter, which was considered to be as short as a pin inserted between two columns (figure 4.1). It is often

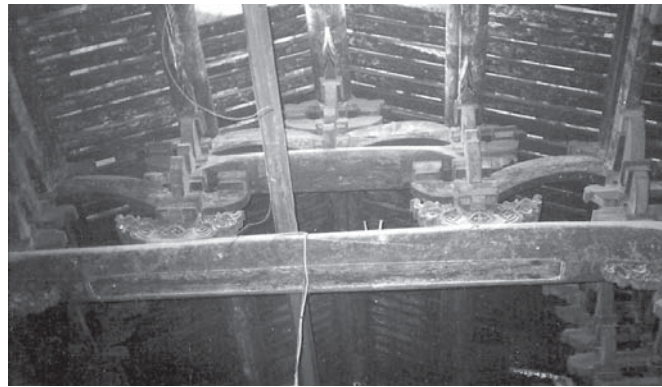


FIGURE 4.1. Beam structure of the Sanqing Hall (1015) at Yuanmiao Daoist Monastery in Putian, Fujian: note four short, curved beams (*zhaqian*, or “pin-pricking connectors”) (author photograph)

the case that words denoting the physical features of a building element are metaphorical.

In the particular bracketing nomenclature used in the *YZFS*, two of the terms for bracket arms that protrude from a column or from the wall plane are *huagong* 華栱 (flower arms) and *miaogong* 杪栱 (twig arms). The *YZFS* does not give semantic explanations of *hua* 華 or *miao* 杪 in these terms, both being polysemantic words in ancient Chinese. The word *hua* in *huagong* has long been written either in its traditional form (華) or in its simplified form (华) in almost all modern scholarship, without any discussion of how its semantic meaning is related to the particular architectural element. From Paul Demiéville to Takeshima Takuichi 竹島卓一 (1901–1992), from Liang Sicheng 梁思成 (1901–1972) to Chen Mingda 陳明達 (1914–1997),² the major figures who contributed to twentieth-century scholarship on the *YZFS*, not one dealt with the specific meaning of *hua* in *huagong*. However, in Western scholarship of the 1970s and 1980s, as scholars attempted to make English-language translations of these Chinese terms, *huagong* was translated as “flower arms” (by Else Glahn)³ and “flower or petal arms” (by Nancy Steinhart).⁴ These scholars did not explain, however, why they translated *hua* into those English words. Furthermore, in 1984, Xu Bo’an and Guo Daiheng commented, “华（華）即花。所謂华（華）栱、就是花栱”⁵ ([The character] *hua* is [the character] *huā* [花]. So-called *huagong* is just *huāgong* [花栱]). The authors identify *hua* 華 as *huā* 花, which is commonly understood as “flowers” (but also means “pattern,” “fireworks,” “garish,” or “profligate”), but they did not specify whether either of the *hua* characters indeed stood for flowers and, if so, why. Because of a dearth of scholarly discussion on these words, the interpretation of *huagong* as “flower arms” has not been accepted in the field.

We must ask the following questions: Why were protruding arms named “flowers” and “tree branches”? More important, what are the significant implications of this naming for the history of Chinese architecture? A careful reading of the text reveals that an impressive number of terms for bracketing in the *YZFS* indeed incorporated botanical—flower or tree—nomenclature. These terms may be divided into three categories: (1) terms for individual elements, (2) terms for composite units, (3) terms for methods of combining individual elements. I highlight these terms in tabular form (table 2).

These terms cover the most fundamental elements and construction features of a bracket set. I propose that a systematic architectural metaphor underlies this distinctive bracketing terminology in the *YZFS*. In this metaphoric system, bracketing elements generally are likened to “flowers,”

TABLE 2. YZFS Bracketing Terms Incorporating Botanical Nomenclature

Bracketing terms	Literal translation	Structural properties
<u>Individual elements</u>		
<i>huagong</i> 華拱	flower arms, flowering arms	protruding arms, arms jutting toward front and rear
<i>juantou</i> 卷頭	scrolled head	protruding arms
<i>miaogong</i> 杪拱	branch arms, treetop arms, spray arms	protruding arms
<i>yimiao</i> 一杪 or <i>danmiao</i> 單杪	one branch (spray), single branch (spray)	one protruding arm
<i>liangmiao</i> 兩杪 or <i>shuangmiao</i> 雙杪	two branches, double branches (sprays)	two protruding arms
<i>yizhi</i> 一枝	single branch (spray)	one protruding arm
<i>ye</i> 葉	leaf (or petal)	cross arms, usually perpendicular to protruding arms
<i>ying'ang</i> 英昂	flower or petal cantilevers	cantilevers projecting from wall plane
<i>huatouzi</i> 華頭子	flower head	strut under a downward-pointing cantilever; an incomplete protruding arm whose head is cut by a downward cantilever
<i>huaxindou</i> 華心斗	flower-heart block	block installed on the center of an arm
<i>dinghua mohagong</i> 丁華抹頰拱	“chin”-erased little flower arm	incomplete protruding bracket arm placed between two arms of inverted V-shaped brace under ridge purlin
<u>Composite units</u>		
<i>duo</i> 朵	flower, cluster of flowers	measurement for counting a whole bracket set that includes at least one protruding arm
<i>yiduo</i> 一朵 or <i>liangduo</i> 兩朵	one flower, two clusters of flowers	one or two bracket sets
<u>Methods of combining elements</u>		
<i>chuyizhi</i> 出一枝	protruding single branch	method by which arm projects from wall plane
<i>zhuanye</i> 轉葉	rotating leaves	method by which cross arms are installed on the head of a protruding arm
<i>buzhuanye</i> 不轉葉	without rotating leaves	method in which a protruding arm supports no cross arms

“branches,” “flower sprays,” “leaves,” or “petals”; and, a bracket set as a whole is likened to a flower and counted in one cluster or more. Let us go over these terms and related indications in the *YZFS* and search contemporary literary texts, looking at how bracketing was perceived to be like flowers or flowering trees in Song times. Furthermore, we need to consider whether such imagery was shared by different social groups and what kind of architectural conceptualization it was associated with.

The Making of “Flowering” Brackets

Protruding Arms as “Flower Arms” 華拱 and the Bracket Set as a “Cluster of Flowers” 一朵

In the earliest Chinese dictionaries, the *Erya* and *Shuowen jiezi*, the character *hua* 華 as in *huagong* has two basic meanings: “flowers” or “to burst into flower.”⁶ Throughout the literary record, *hua* with these two meanings is very common.⁷ *Hua* as “flowers” is frequently used in all sections of the *YZFS*, as in *xiashenghua* 寫生華 (lifelike flowers), *juanyehua* 卷葉華 (scrolled-leaf flowers), and so on. These two basic meanings of *hua* were extended to mean “magnificent,” “gorgeous,” “beautiful,” or “ornate,” and, in addition, *hua* can stand for ancient China or the Han 漢 ethnicity. Approximately during the Jin (265–420) and Northern Dynasties (386–581) periods, a popular form of *hua* for “flowers” appeared, written 花,⁸ and, as defined in the sixth-century dictionary *Yupian* 玉篇 (Jade thesaurus), this popular form often replaced the former character: “今為華莠字” (Nowadays [花] is [used as] the character for *hua* [華, flower] and *fu* [莠, flower]). But the former *hua* as “flowers” is used frequently in official documents and scholarly texts throughout all eras. During the Song dynasty, the interchangeability of 華 and 花 was recorded in the imperial rhyming dictionary *Guangyun* 廣韻 (Spreading rhymes).¹⁰ Since it was still common to formally use the original *hua* as “flowers,” the character *hua* 華 could stand for either “flowers” or “come into bloom” or for other meanings extended from those. A Northern Song account indicates the confusion of these different meanings that existed before the completion of the *YZFS* (in 1100). Wang Anshi 王安石 (1021–1086), in his *You Baochanshan ji* 游褒禪山記 (Travel notes of Baochan Mountain), wrote as follows:

褒禪山亦謂之華山……距洞百餘步、有碑仆道、其文漫滅、獨其為文猶可識、曰「花山」。今言「華」如「華實」之

「華」者、蓋音謬也。¹¹ Baochan Mountain is also called Huashan . . . More than one hundred steps away from the cave, there was a stele fallen prostrate on the roadside, [on which] the inscriptions had been effaced and nearly disappeared. The only inscription that was still legible reads “Huashan” [花山, Mountain of Flowers]. [The fact that] modern people say “hua” [華] as in the “hua” of “huashi” [flowering and fructifying; flashy and substantial] is because of a wrong pronunciation.

Wang’s observation indicates a contemporary phenomenon in the Song dynasty: when *huā* 花 and *hua* 華 (as “flower”) are interchanged, *hua* 華 as “flowers” (*huā* 花) is easily confused with *hua* 華 (same form) in other meanings and pronounced differently. Here, *hua* 華 in “Huashan” should mean and be pronounced the same as *huā* 花, but many Song people pronounced it using other tones that carried meanings other than “flower”—in this case, “flowering,” “flashy,” or “literarily talented.” Regarding this phenomenon, Wang lamented,

余於仆碑、又以悲夫古書之不存、後世之謬其傳而莫能名者、何可勝道也哉!¹² I, regarding the prostrate stele, also feel sad that because of the extinction of ancient books, later generations have mistaken things in transmission and cannot name [them correctly]—[instances] too many to possibly speak of!

Thus, for instances of the same character *hua* 華 in Song texts, it is necessary to distinguish its appropriate meaning according to its context. Likewise, the differentiation of *hua* 華 in *huagong* 華拱 as it occurs in the *YZFS* becomes an academic matter not to be ignored.

In spite of the many extended meanings of *hua*, none of them would make sense architecturally in the term *huagong*. There is no reason why only protruding bracket arms would be associated with a “Chinese” (*hua*) style. Likewise, although bracketing as a whole in Chinese architecture does possess an ornamental function, there is no convincing reason why only projecting arms would be characterized as “ornaments” (*hua*). As for the meaning “beautiful” (*hua*), it could be appropriate only in that those jutting arms were decorated with color or, sometimes, carving.¹³ However, brackets in a Chinese wood-framed structure are not necessarily polychrome or carved, and in instances where color or carving has been applied, every kind of arm and element could be painted or carved.

Therefore, there is no compelling reason for craftsmen using the word *hua* to emphasize protruding arms as colorful or carved elements. If we exclude these inappropriate extended meanings, only the meaning of “flowers” or “to burst into flower” remain as logical interpretations of *huagong* from an architectural point of view.

Chinese architecture is characterized by a historically long-standing system of wood-framed structures, but extant wood buildings do not include an example of pre-Tang construction. Early-period architecture is discernible in representations on excavated objects that imitate wood structures and in architectural depictions on recovered pictorial stones and bricks. The archaeological evidence indicates a history of the development of building technologies, including that of bracketing. During the pre-Qin period, bracket arms were installed only along the wall plane (under the eaves) or parallel to the wall plane (under the purlins) (figure 4.2). While bracketing arms of this kind were still common in Han times (figure 4.3), protruding arms appeared approximately during the Eastern Han period. By extending protruding arms to the front and rear, bracketing changed its otherwise solely laterally extending feature and began to extend in two directions: parallel or perpendicular to the wall plane (figure 4.4). Correspondingly, bracketing supported eaves, beams, or purlins along the

two directions as well and enabled eaves to extend farther from the wall plane. With this new structural function, bracketing later developed an increasingly comprehensive form in which layered protruding arms extended one after another, and each layer tended to be intersected by one or two layers of cross arms sitting on their ends in a perpendicular orientation. The consequence of the projections of protruding arms and their intersections with lateral arms is that a whole bracket set took on the appearance of a flower in full bloom when it was seen from the front, side, or from below (figure 4.5). Such flower-shaped bracketing was typical during the Tang, Five Dynasties, and Song periods, when wood-framed Chinese architecture was maturing structurally and aesthetically. Such flowerlike bracketing is



FIGURE 4.2. Architectural image on the Spring and Autumn-period lacquerware fragment excavated at Linzi, Shandong (after Shandong Bowuguan, “Linzi Langjiazhuang yihao Dongzhou xunrenmu,” 82)

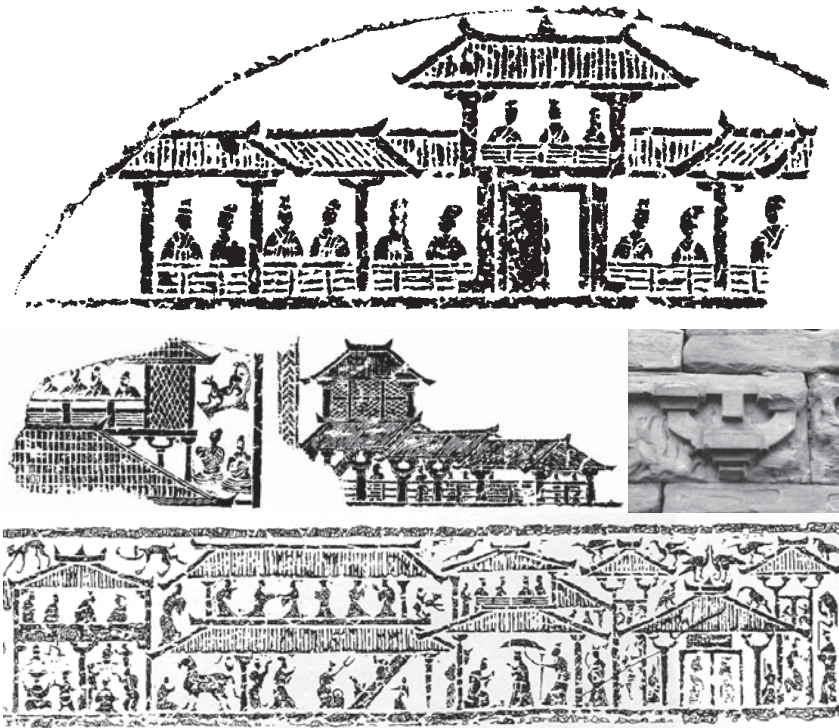


FIGURE 4.3. Architectural images on Han-period pictorial stones and masonry watchtowers: (top) Suining, Jiangsu; (middle top left) Tongshan, Jiangsu; (middle) Suining, Jiangsu; (above) Xuzhou, Jiangsu (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 51, 70, 74); (middle top right) brackets on the watchtower of Pingyang Fujun, Sichuan (author photograph)

seen not only on extant timber structures and in murals but also in masonry structures and tombs imitating timber bracketing (figures 4.7–4.9).

The protruding arms are critical for visualizing this flowerlike bracketing structure. If we were to remove the protruding arms one by one from the uppermost layer down to the lowermost layer, the whole bracket set would shrink correspondingly and the flower shape would ultimately disappear (figure 4.6). Song or pre-Song craftsmen must have observed this critical visual feature of the protruding (“jumping”) arms and fully appreciated the

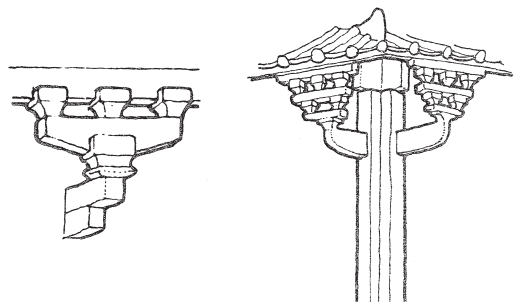


FIGURE 4.4. Han-period bracketing with protruding arms: (left) brackets on burial object excavated at Sanmenxia, in Henan; (right) burial object excavated at Wangdu in Hebei (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 75, 77)

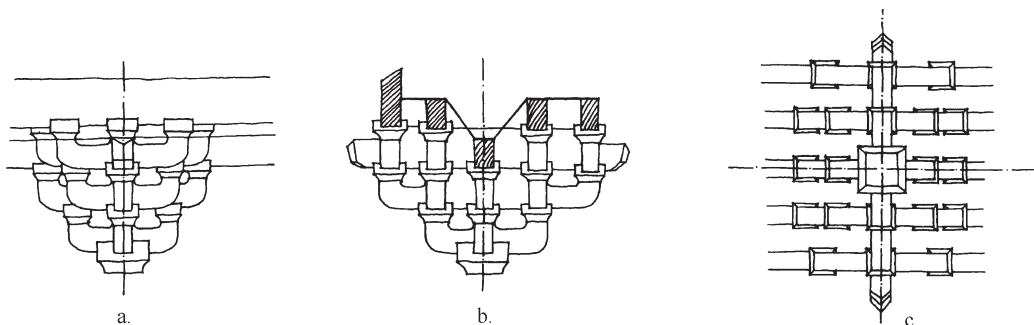


FIGURE 4.5. Sketch of the making of a flower-shaped bracket set: (a) front; (b) side view; (c) from below (author sketch)

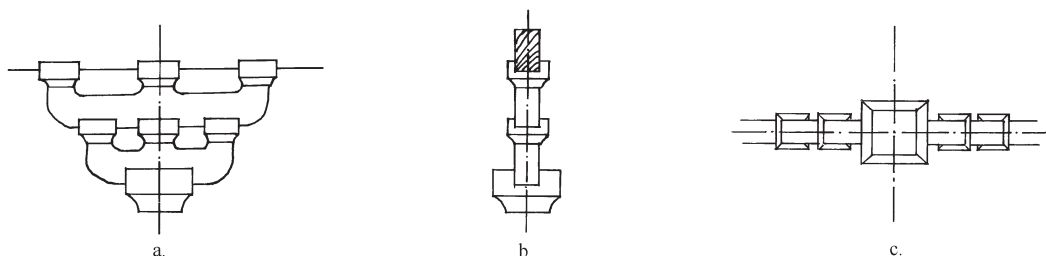


FIGURE 4.6. Sketch of bracketing with no protruding arms: (a) front; (b) side view; (c) from below (author sketch)

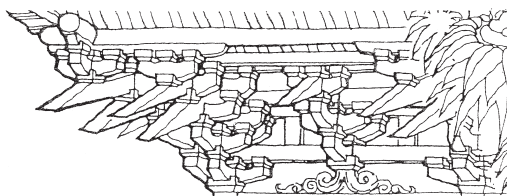


FIGURE 4.7. Tang-period mural on the southern wall of Cave No. 172 at Dunhuang (after Xiao Mo, *Dunhuang jianzhu yanjiu*, 229)

visual effect of a flower coming into bloom as protruding arms were added one by one. They thus named these protruding arms *hua*—“flower” or “flowering.”

In the *YZFS*, a complete bracket set composed of “flower arms” is referred to as *yiduo* 一朵, that is, “a flower” (or “cluster of flowers”), regardless of whether it is a column set, an intermediate set, or a corner set.¹⁴ *Duo* as a term of measure for flowers is clearly defined in tenth-century texts. Xu Kai 徐鍇 (920–974), a Southern Tang 南唐 (937–975) scholar-official, whose study of the *Shuowen jiezi* was quite influential during the Song period, wrote, “今謂華為一朵”¹⁵ (Nowadays a flower is referred to as “one *duo*”). During the Tang and Song periods,

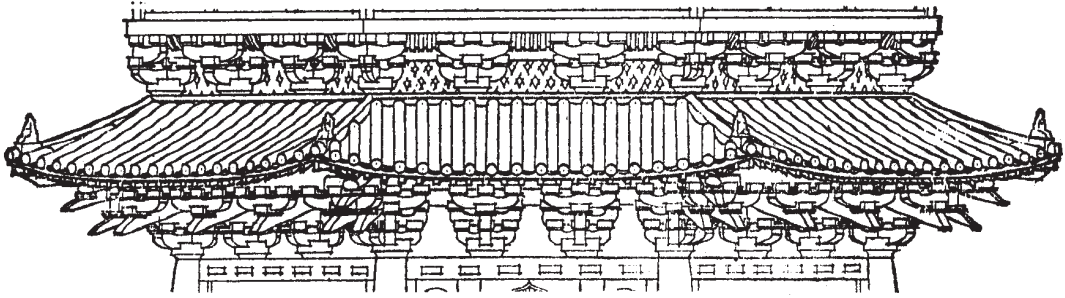


FIGURE 4.8. Wuyue-period (904–978) masonry at the White Pagoda at Zhakou, Hangzhou (after Liang Sicheng, *Liang Sicheng quanji*, 3:290)

duo occurs frequently in literature and poetry and almost exclusively stood for “flower.”¹⁶ In the *YZFS*, having at least one protruding arm is the prerequisite for a bracket set to be designated as one “flower set.” This is evident from its discussion of regular and simpler bracket sets, where sets that do not have at least one protruding arm are never termed “flower clusters.”

In the treatise, regular sets range from four *puzuo* 四鋪作 (literally, “four-tiered bracket sets”) to eight *puzuo* 八鋪作 (eight-tiered sets) consisting of from one to five protruding arms (i.e., no more than five in one direction). All these are termed *duo* (flower set) for a unit.¹⁷ But the situation varies for *doukoutiao* 料口跳 (literally, “jumping at the mouth of the cap block”) and *batou jiaoxiangzuo* 把頭絞項作 (literally, “rake head intertwined-neck structure”), two special types of bracket sets that are structurally simpler than regular ones. The *doukoutiao* comprises a central wall arm intersecting a beam that extends its front end in the form of a “jumping” arm (figures 4.10a and 4.11a). Because this “jumping” arm does not support any arms but, rather, directly supports the eave purlin, a *doukoutiao* set is not regarded as a regular set. However, a *doukoutiao* set is still termed *duo*, as indicated in the text as follows: “料口跳、每柱頭外出跳一朵用栱、料等下項” (The next item [is the number of] arms, blocks, and others used on each *duo* of *doukoutiao* jumping out from the capital).¹⁸ The *batou jiaoxiangzuo* is composed of a

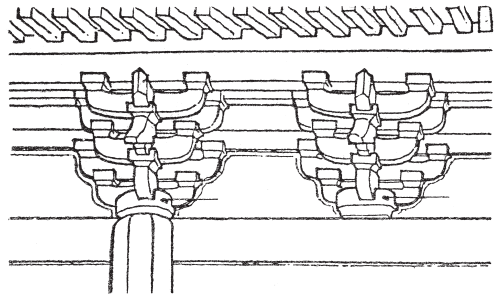


FIGURE 4.9. Brackets in the main hall of the Chuzu'an Nunnery (1125) (after Liang Sicheng, *Yingzao fashi zhushi*, 98); added arrows indicate the cap blocks (*ludou*)

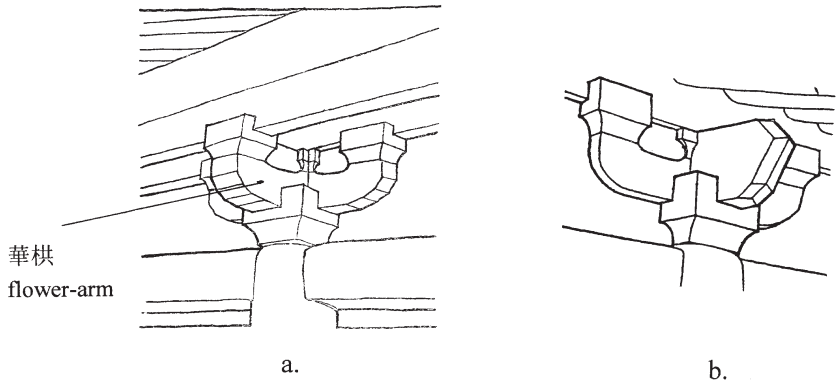


FIGURE 4.10. Two special bracket constructions (front view): (a) *doukoutiao*; (b) *batou jiaoxiangzuo* (after Xu Bo'an and Guo Daiheng, "Song 'Yingzao fashi' shuyu huishi," 50, 3); added arrow indicates the flower arm

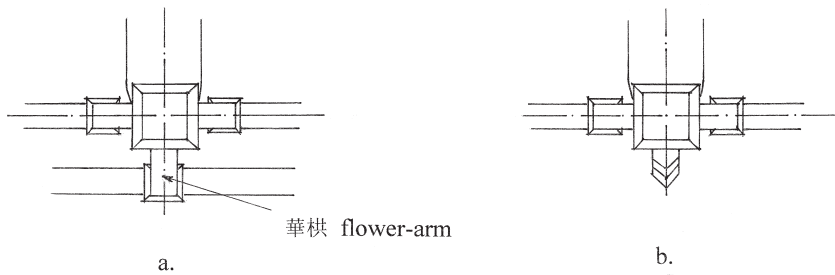


FIGURE 4.11. Sketch of (a) *doukoutiao* and (b) *batou jiaoxiangzuo* bracket constructions (from below) (author drawing)

wall arm intersecting a transverse beam that penetrates the arm only with a short head (figures 4.10b and 4.11b), and for this bracketing structure *duo* is never used throughout the *YZFS*.¹⁹ Comparing these two types, it is only because there is no protruding arm that a *batou jiaoxiangzuo* is not treated as a “flower set.” That the designation of a bracket set as a “flower set” depends exclusively on the presence of a “jumping” arm (i.e., *huagong*) also proves that the *hua* of *huagong* refers to “flower” or “flowering.”

In the *YZFS*, *miaogong* 杪拱, an alternative standard term for protruding arms, has a variant form—*chaogong* 抄拱—in the surviving editions of the treatise. *Miao* 杪 (twig) and *chao* 抄 (grabbing) look very similar (*miao* is written with the “wood” 木 element at the left, *chao* with the “carrying hand” 手 element) but have entirely different meanings. Takeshima Takuichi is one of the earliest scholars who identified *miao* as correct, but

he did not specify his reasons.²⁰ In Xu Bo'an and Guo Daiheng's glossary of the terminology of the *YZFS*, they pointed out that in the transmission of the text, *miao* was more likely to be mistaken for *chao* than the reverse. They considered that a protruding arm was called *miao* "probably because both a tree branch and the head of a protruding arm have an end."²¹ Their interpretation lacked ample analysis of the word in connection with the critical role of the element in the making of a distinctive appearance of a bracket set. Their interpretation was therefore criticized by Chen Mingda as a subjective and groundless conclusion.²² Chen, who also ignored the particular role of protruding arms, argued by posing the following question: architectural elements that have "an end" are large in number, but why were all the others not named "tree branches"? The debate between these scholars did not provoke much further discussion in the academic world, and the question as to which is the proper term for protruding arms, *chaogong* or *miaogong*, is still a matter of confusion. In fact, just as with the naming of protruding arms as *hua*, or "flowers," the naming of these arms as *miao* was strongly associated with the striking structural and physical features of a whole bracket set that was created by the "protrusion" of these arms.

As defined in classical dictionaries, *miao* as in *miaogong* has the basic meaning of "the end of a tree branch" or "tall and distant branches."²³ *Miao* in this sense is also common in literature. Examples of the occurrence of *miao* in the literature of the Tang, Five Dynasties, and Song periods include Su Ting's 蘇頲 (670–727) verse "栖鸞樹杪出行宮"²⁴ (Going out of the imperial retreat while *luan* [鸞] birds are perched on the ends of branches), Quan Deyu's 權德輿 (759–818) verse "重樓迴樹杪"²⁵ (Multilayer towers encircled by treetops), He Ning's 和凝 (898–955) *ci* 詞 (lyric) verse "殘月光沉樹杪"²⁶ (Waning moonlight set on treetops), Li Gefei's 李格非 (fl. 1080s) phrase "臺出竹木之杪"²⁷ (the terrace emerges from the bamboo and tree branches), and Lu Dian's 陸佃 (1042–1102) phrase "作巢取在木杪枝"²⁸ ([a magpie] makes [its] nest in the treetop). As the term *huagong* compares protruding arms to "flowers" or to "to blossom," so too *miaogong* is a figurative term for protruding arms. When protruding arms sitting on top of a column or on the upper section of walls jut out layer upon layer from a column or the wall plane, they may look like branches extending from a tree and stretching forward one after another. Extending farther and farther, they become taller and taller (figure 4.12). This structural function and visual feature belongs to protruding arms only. Nonprotruding arms (cross arms) do not extend themselves to the front and rear. Thus, they cannot protrude farther and farther away from the wall plane. A cross arm

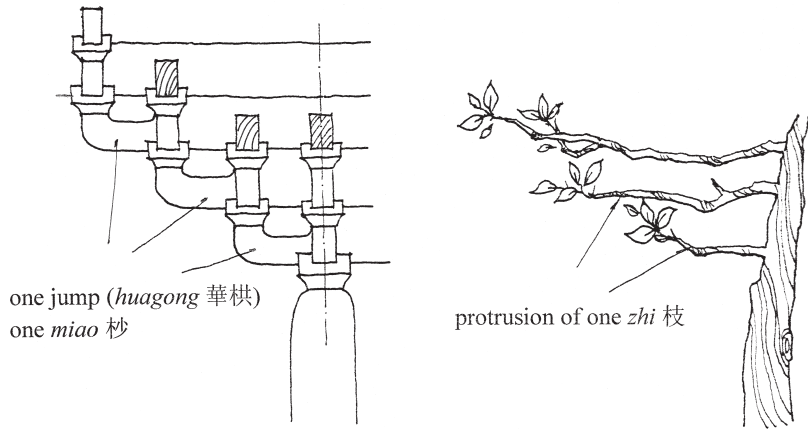


FIGURE 4.12. Protruding arms likened to branches (author sketch)

either stays on the wall plane or, if distant from (and of course parallel to) the wall plane, it has to rely on support from a protruding arm. In the *YZFS*, a structure of more than three cross arms piling up directly one upon another does not exist. Therefore, neither a single cross arm nor a combination of a few cross arms can get taller and taller while farther and farther as “jumping” arms do so prominently. It must have been because of this peculiar feature of protruding arms that craftsmen termed them “twigs” (*miao*) and not any other architectural element in that way.

Evidence in the *YZFS* indicates that during the Song period, people of different regions all used botanically derived terms for bracketing. I quote an important passage containing a significant annotation by Li Jie in the discussion on the “order of putting together all bracketing elements”:

凡鋪作逐跳上（下昂之上亦同）安拱、謂之計心；若逐跳上不安拱而再出跳或出昂者、謂之偷心（凡出一跳、南中謂之出一枝。計心謂之轉葉、偷心謂之不轉葉、其實一也。）²⁹ Whenever a bracket set [is designed] to have [cross] arms on each single “jumping” arm ([author’s annotation] [which would be] the same as if [they were] on [each single] downward cantilever), it is called “filled heart”; if no [cross] arms are installed on each “jump” while “jumping” arms or cantilevers continue to extend [from the “jump”], [the structure is] called “stolen heart” ([annotation]. Whenever [a set] protrudes one “jump,” southerners call it “protruding one branch.” [Our standard terms] “filled heart

[construction]” is called “rotating leaves,” [and our] “stolen heart [construction]” is called “no rotating leaves”; actually [these two pairs are] the same).

Here, by pointing out the identicalness between the standard terms and those of the dialect of southern China,³⁰ the annotation explicitly states that the protrusion of every “jump” (i.e., a projecting arm) was likened to “extending a branch” (出一枝), and all cross arms installed on the heads of “jumping” arms were likened to “leaves” (*ye* 葉). The phrasing “extending a branch” for a protruding arm is powerful proof that *miao*, instead of *chao*, is without question the correct word for the designation of protruding arms.³¹ This annotation is in a passage that defines two important technical methods of combining protruding arms and cross arms: having cross arms installed on the end of a “jumping” arm (*jixin* 計心, “filled heart”) or, in contrast, protruding arms continuing to “jump” forward without supporting any cross arms on them (*touxin* 偷心, “stolen heart”). In southern China, these two methods were called “rotating leaves” (*zhuanye* 轉葉) and “no rotating leaves” (i.e., “no leaves at all”) (*buzhuanye* 不轉葉), respectively. Indeed, cross arms sitting on protruding arms may look like leaves growing lushly on branches (figure 4.13*a*). Where there are no cross arms on “jumping” arms, a bracket set looks as if all the leaves had fallen from the branches (figure 4.13*b*).

Such a vivid, logically consistent architectural metaphor, contained in an annotation to the text, has long been ignored by twentieth-century scholarship.³² Not until recently did Chinese scholarship begin to mention this metaphor.³³ Having interpreted and communicated this building metaphor in unpublished form since 1995,³⁴ I am giving more thought to these particular terms and, more important, to the whole of the *YZFS* bracketing terminology. In doing so, we will gain a better understanding of Song-period architectural imagery beyond just “branches” and “leaves on branches.”

Semantically, “flower” (*hua*) can refer to a tree in blossom,³⁵ while “branch” (*zhi* or *miao*) can represent flower sprays; moreover, “leaves” (*ye*) can mean not only leaves under a flower but also flower petals. In Chinese literature, flowers are commonly counted using the measure word *zhi* 枝 (sprays) as well, and “one spray” as *yizhi* 一枝.³⁶ During the Tang-Song period, expressions such as *huayizhi* 華一枝 (a spray of flowers)³⁷ or *huazhi* 華枝 (flower sprays)³⁸ were so popular that Song scholars created *yizhihua* 一枝華 (a spray of flowers) as a *cipai* 詞牌, or name of a tune to which a song

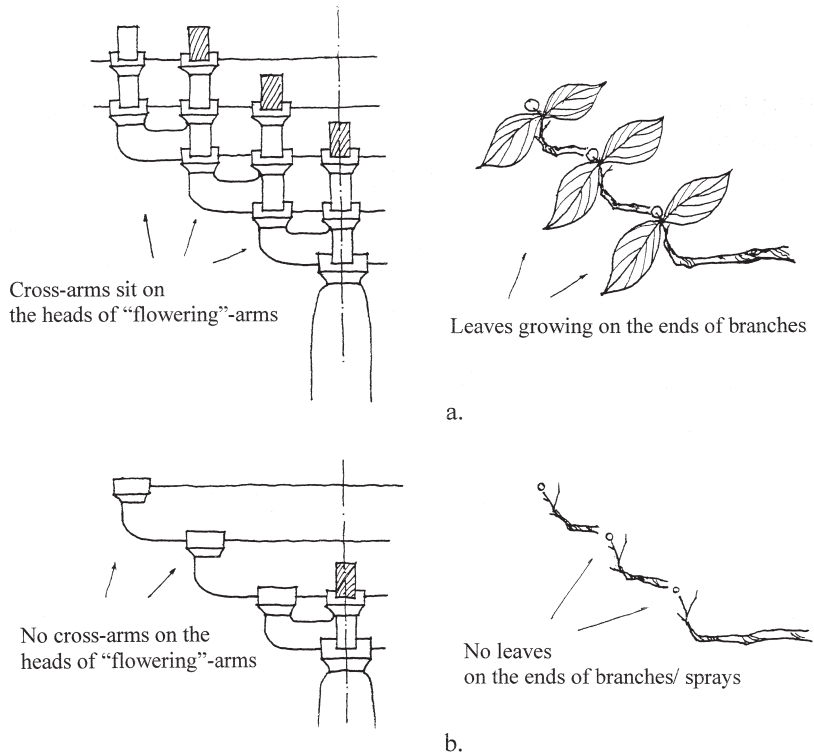


FIGURE 4.13. Cross arms likened to leaves growing on "branches": (a) "rotating leaves" (cross arms); (b) without "rotating leaves" (author sketch)

lyric was composed.³⁹ In the *YZFS*, the term *huazhi* is also used: “雕插及貼絡寫生華……華枝長一尺”⁴⁰ ([For] carved, inserted, and pasted lifelike flowers . . . the flower sprays are one *chi* long). In addition, a poem by Su Shi 蘇軾 (1037–1101) includes the phrase “開華樹杪”⁴¹ (flowers open at the ends of tree branches), which links *hua* 華 and *miao* 杪—the two words used to name protruding arms—in a context of blossoms. Similarly, the compound *huashao* 華梢 (the tip of a spray of flowers) used in Song poems⁴² also reflects the popularity of a contextual connection between “flower” and “the end of a branch.”

The use of *ye* for “petals” occurs as early as in the pre-Han classics⁴³ and is clearly defined in the Southern-dynasties (420–589) text *Songsbu* 宋書 (History of the [Liu] Song [420–479]): “華葉謂之英” (“Flower leaves” are called *ying* [flower petals]).⁴⁴ *Ye* for “petals” also often occurs in Tang and Song literary works. In Su E’s 蘇鶚 (*jinsbi* 886) note on lotus flowers, he describes the kind that has the most beautiful flowers: “華最秀者……華大者至百葉”⁴⁵ (Those whose flowers are most beautiful . . . can have a large

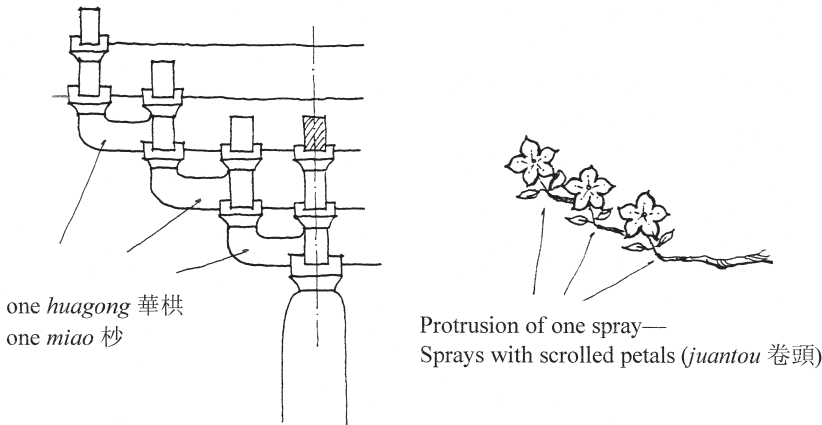


FIGURE 4.14. Protruding arms likened to flower sprays (author sketch)

flower with up to a hundred petals). Clearly, *ye* here means petals. A Su Shi poem on the herbaceous peony, for instance, includes the line “揚州近日紅千葉”⁴⁶ (Yangzhou recently [is full of] thousands of red petals). Because the character *hong* 紅 (red) modifies *qianye* 千葉 (thousands of leaves), it is clear that *ye* here represents petals. Yang Yi’s 楊億 (974–1020) oral account includes an entry for *qianye mudan* 千葉牡丹 (multipetal peonies), which records, “家園牡丹一歲中有千葉者五苞、特為繁艷”⁴⁷ (Of the peonies in [Mr. Li Fang’s 李昉 (925–996)]⁴⁸ home garden, there were five growing multipetals one year; [they were] full-blown flowers and extremely beautiful). A work by Song Qi 宋祁 (998–1061) describes *chongye Haitang* 重葉海棠 (multipetal crab apple), which is stated to be a flower with “overlapping petals” (*chongpa* 重葩): “盛則重葩……右重葉海棠 (註)……惟其盛者則重葩疊萼、可喜” (When [this kind of flower] blooms luxuriantly, [it contains] overlapping petals . . . The right item [i.e., the above item] is a multipetal crab apple [flower]. (Annotation) . . . Because a (flowering) tree of this kind growing luxuriantly is thus of overlapping petals and overlapping calyxes, it is delightful).⁴⁹

So, in the *YZFS*, when protruding arms are likened both to “flowers” (*hua*) and “branches” (*miao* or *zhi*), they could be architectural metaphors that are contextually connected: the two analogies most likely stem from the same idea—flowers or flowering trees. Jumping arms make a bracket set visually “burst into flower,” and as a result, this “flower set” as a whole can be considered as a flowering tree composed of one or a few “sprays” (“branches”) extending forward with rotated “leaves” (petals) “growing” on these “flower sprays” (figure 4.14). That is to say, the imagery of “branches”

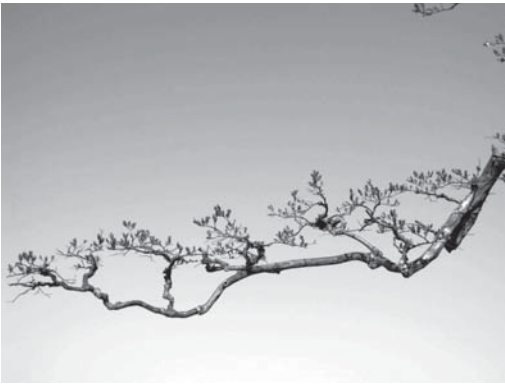


FIGURE 4.15. Flower sprays in nature (author photograph)

(*zhi*) and “leaves” (*ye*) is perhaps not confined to nonflowering tree branches and leaves, but rather apply perfectly as “flowers” to bracketing, in which *zhi* stands for flower sprays and *ye* for petals. Although the *YZFS* draws a comparison between one jumping arm (*huagong* or *miaogong*) and the dialect usage of “one branch” (*yizhi*) and between cross arms and the dialect usage of “rotated leaves” (*ye*), it gives no dialect usage such as “one tree” for measuring a bracket set. Instead, *yiduo*, “one flower” or “one cluster of flowers,” is the only term employed in the treatise for measuring a set. This suggests

that the southern dialectical usage of “branches” and “leaves” was contextually parallel to the “flower” system of bracketing constituted by the standard terms *huagong*, *miaogong*, and *duo* (see figure 4.15 for flower sprays in nature).

Were architectural “leaves” or cross arms actually considered to be like floral leaves or petals during the Song period? The evidence for such an analogy underlies other official bracketing terms in the *YZFS*. The most informative term in this aspect is *qixindou* 齊心料 (block even with center), which alternatively is termed *huaxindou* 華心料 (flower-heart block).

Qixindou is defined as “installed on top of the center of an arm” (施之于拱心之上).⁵⁰ Perhaps because this definition seems simple, previous scholarship has not paid much attention to it. However, an important annotation comes immediately after the first mention of *qixindou* in the treatise: “亦謂之華心料”⁵¹ (also called “flower-heart block”). There is a correspondence among *qixin* 齊心 (even with the center), *gongxin* 拱心 (center of an arm), and *huaxin* 華心 (flower heart, or center of a flower). The text does not specify whether the “center of an arm” is defined as the center of a protruding arm or of a cross arm. In fact, this kind of block may appear in both cases. When a *qixindou* is on the center of a protruding arm, it is actually at the center of a whole set (figure 4.16). Whether in terms of the center of a protruding arm that was likened to a spray of flowers or in terms of the center of a set that was counted as a cluster of flowers, it would make sense that a block

on the center of a protruding arm should be considered as being located at the “flower heart.” However, in such a case, this kind of block is mostly also located at the center of the wall arm (which is a cross arm) that the projecting arm intersects at the center of a whole set (see figure 4.16). Evidence from Tang-period architectural images and extant Tang and Song buildings indicates that a *qixindou* is very often put on the center of a cross arm that is supported by a protruding arm (figure 4.17; also see figure 4.7); more conspicuously, a *qixindou* is put on the center of the cross arm that is supported by the last “jumping” arm and connects the eave purlin (see figures 4.7, 4.8, and 4.17*b*). In these situations, the positions of the *qixindou* are by no means the centers of any protruding arms. The *YZFS* illustrations of the mortises of brackets also have captions that explain the cases of the *qixindou* used on cross arms (figure 4.18).⁵² In addition, in the *YZFS* illustrations of the color-painting system, bracket sets are

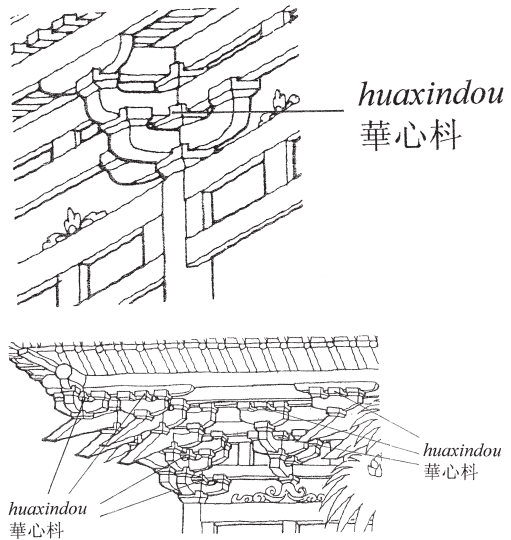


FIGURE 4.16. Tang-period examples of bracketing: (top) early-Tang mural in Cave No. 321 at Dunhuang; (above) mural on the southern wall of Cave No. 172 at Dunhuang (after Xiao Mo, *Dunhuang jianzhu yanjiu*, 225, 229; added arrows indicate the *qixindou* or *huaxindou*)

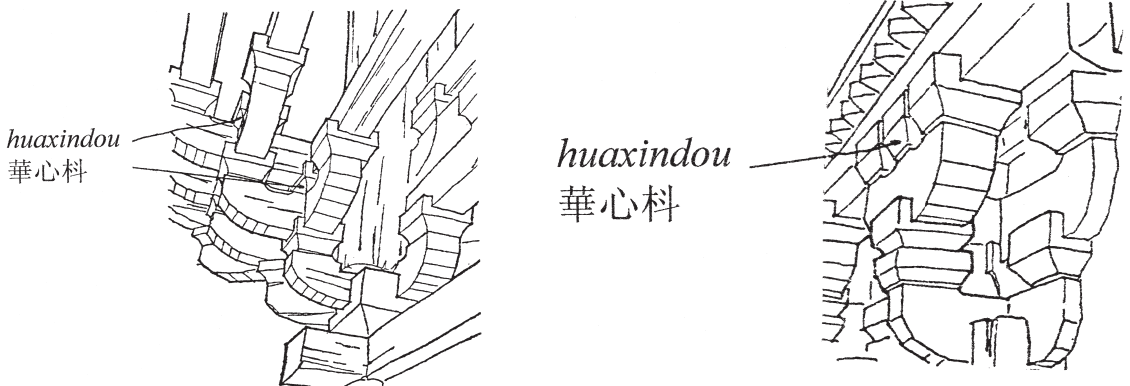


FIGURE 4.17. Song-period examples of bracketing: (left) Revolving Sutra Hall of the Longxing Monastery at Zhengding, Hebei; (right) pagoda of the Yunyan Monastery at Huqiu in Suzhou (after Xu Bo’an and Guo Daiheng, “Song ‘Yingzao fashi’ shuyi huishi,” 17, 43; added arrows indicate the *qixindou* or *huaxindou*)

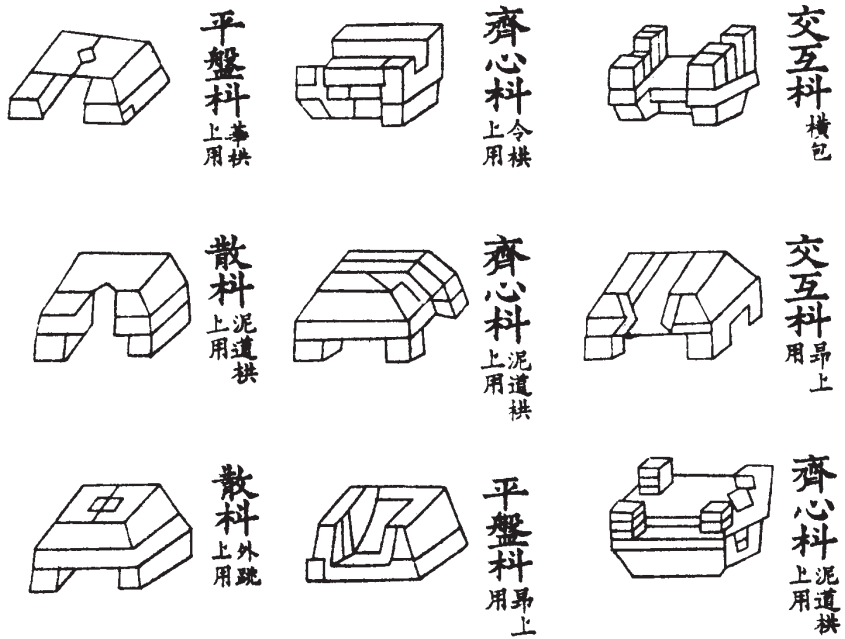


FIGURE 4.18. YZFS illustration of mortises in brackets (*juan* 30:16b): the *qixindou* (shown in the centers of top and middle lines and in the right of last line) have captions indicating they are to be used on cross arms (mud-line arms and *ling* arms)

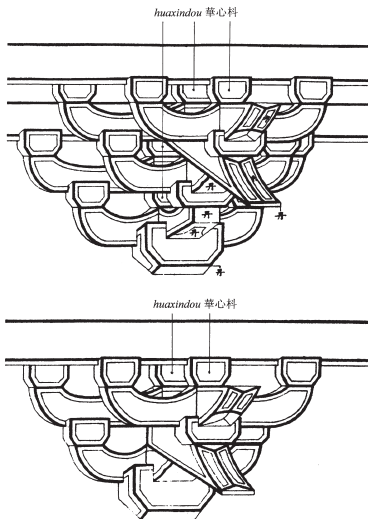


FIGURE 4.19. YZFS illustration of color-painting styles for brackets (*juan* 34:19a), with a *huaxindou* at the center of the cross arms (added arrows indicate the *huaxindou*)

clearly depicted as having a *qixindou* at the center of cross arms (figure 4.19). Thus, the *huaxin*, or “flower heart,” of the *huaxindou* is not defined as the center of a *huagong* (flower arm) only; instead, it also, and more often, refers to the centers of all cross arms (figure 4.20). That is, corresponding to their counterpart, “flower arms,” all cross arms were likened to flower petals growing on flower sprays.

The term *huaxin* in connection with *qixindou* was rather common in reference to flowers, as often seen in Chinese poetry. I offer in the following a few examples of the occurrence of *huaxin* in Tang and Song poems on flowers.

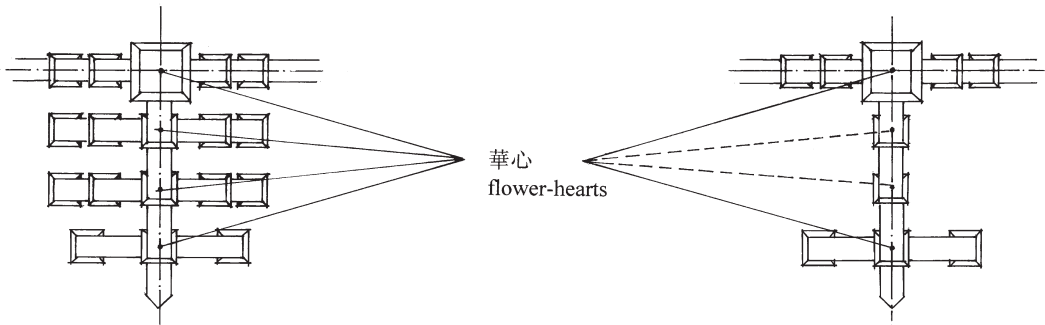


FIGURE 4.20. Sketch of bracketing “flower hearts”: cross arms likened to petals (author sketch)

TABLE 3. *Huaxin* in Tang and Song Poems

Author	Title of poem or lyric	Line including <i>huaxin</i>
Li Shimin 李世民 (599–649), Emperor Taizong 太 宗 of the Tang	“Fu de li” 賦得李 (Composition of acquired plums)	“鶯啼密葉外、蝶戲脆華心” ¹ (Orioles warble outside the dense leaves / butterflies playing in the center of the delicate flower)
Wang Wei 王維 (701–761)	“Hong mudan” 紅牡丹 (Red peony)	“華心愁欲斷” ² (The flower heart anxious as if it is going to be broken)
Su Shi 蘇軾 (1037–1101)	“Mohua” 墨華 (Ink flowers)	“華心超墨暈、春色散毫端” ³ (The flower heart stands out from the faint hue of the ink / spring scenes are diffused from the tip of the brush)
Fan Chengda 范成大 (1126–1193)	“Mufurong” 木芙蓉 (Cotton rose [<i>hibiscus</i> <i>mutibilis</i>])	“華心應似華心酸” ⁴ (Flower hearts seem alike in feeling sad)
Zhu Shuzhen 朱淑真 (fl. 1080–1131)	“Muxi” 木犀 (Sweet-scented osmanthus)	“人與華心各自香” ⁵ (I and the flower heart [possess] particular fragrances)
Shi Dazhu 史達祖 (fl. 1195)	“Dongfeng diyi zhi: Lichun” 東風第一枝：立春 (First branch in the east wind: The beginning of spring)	“華心夢醒” ⁶ (The flower heart awakened from dream)

Notes

1. Li Fang et al., *Wenyuan yinghua*, juan 326, “Shi” 詩 (Poems), 176, “Huamu” 華木 (Flowering trees), 6, v. 2: 1691.
2. See Si Dai et al., *Yonghua shixuan*, 217.
3. Cited in Chen Fuhua, *Gudai Hanyu cidian*, 1975, entry for *yun* 暈.
4. Si Dai et al., *Yonghua shixuan*, 434.
5. *Ibid.*, 397.
6. Wen Ruxian, *Cixuan*, 403.

Literati Perceptions of Brackets: The Fulcrum 樞 of a Bracket Set Resembling the “Base of the Flower’s Ovary” 華房之蒂

Song craftsmen were not alone in perceiving bracketing as “flowers,” “branches,” “leaves,” and “petals.” Literary texts reveal that contemporary literati also conceived bracket sets as flowers. The second-century character dictionary *Shuowen jiezi* includes explanations of some architectural terms, one of which is *lu* 樞, the capital block in bracketing: “樞、柱上柎也”⁵³ (*Lu* [cap block] is a *fu* on top of a column).

Although in various texts from the Han and Three-Kingdoms to the Tang periods, the term *lu* is used also to represent generically all bearing blocks, including those small ones sitting on the two ends of a bracket arm,⁵⁴ this *Shuowen jiezi* definition—probably the earliest gloss of *lu*—does not define it as the small blocks on a bracket arm. Rather, with the words “*zhu shang*” 柱上 (on top of a column), *lu* here is glossed as an element or a structure installed directly on top of a column—most likely the cap block, or at least the structure made up of the cap block and supported by a column (apparently, such a structure would be the bracket set sitting on the cap block). The *YZFS* quotes this *Shuowen jiezi* gloss as one of the traditional texts on *dou* 斗 (blocks) in its terminology sections and clearly terms a cap block *ludou* 樞料 (*lu* block, cap block).⁵⁵ In fact, the meaning of the term *lu* tended to refer more specifically to “capital blocks” during the post-Tang period and became an official and common term for “capital blocks” from the Northern Song period at the latest.

The *Shuowen jiezi*’s gloss of *lu* as a *fu* on top of a column is preserved in major works on Chinese characters and classics from the Han to Song periods. These works include the third-century dictionary *Zilin* 字林 (Forest of characters),⁵⁶ the sixth-century dictionary *Yupian*,⁵⁷ the important commentary of the Sui-Tang period on the classics *Jingdian shiwen* 經典釋文 (Explanations of the meanings of the classics),⁵⁸ the Southern Tang etymological work *Shuowen xizhuan* 說文系傳 (A systematic commentary on the *Shuowen [jiezi]*),⁵⁹ and the official Northern Song dictionary *Leipian* 類篇 (Conforming to [the standard of] the *Yupian*).⁶⁰ What was a *fu* 柎? The *Shuowen jiezi* text does not explain it directly in this gloss, and neither does the *YZFS*. However, in the tenth century, Xu Kai wrote a commentary on this *Shuowen jiezi* gloss in his *Shuowen xizhuan*, which reads as follows:

今謂草木枝端華房之蒂為柎、此櫨象之、即今之科栱也。⁶¹

Nowadays the base of a flower ovary at the ends of branches of vegetation is called *fu*, and the *lu* [cap block] resembles it; [which is] namely the bracketing of today.

Fu, as Xu Kai explains, is the base of a flower ovary (*huafang zhi di* 華房之蒂), that is, the bottom of a flower. In fact, the word *fu* in reference to a flower ovary occurred in Chinese classics as early as the pre-Qin period.⁶² Some important texts of the third to sixth centuries defined *fu* either as a southeastern dialect term for a flower ovary (*zifang* 子房, i.e., *huafang* 華房), as the calyx under flower petals (*hua xia e* 華下萼), or as the base of the calyx (*hua'e zu* 華萼足).⁶³ These definitions were also preserved in Northern Song official character and rhyming books.⁶⁴ In terms of botanical structure, the calyx or the base of the calyx represents a position identical to that of a flower ovary. Either as a flower ovary, or as a calyx, or as their base, *fu* refers to the bottom of a flower: it supports the corolla on the central base of a flower and links all the upper parts of a flower to the flower stalk (figure 4.21*a*).

As the capital block, *lu* is the bottommost element of a bracket set: in other words, it is the element supporting a whole set. Looking at the structure of a flower and the bracketing structure of a set, we notice the following striking similarities between the flower ovary and the cap block: (1) the form of the cap block is wider in the upper part and narrower in the lower part,⁶⁵ similar to that of a flower ovary, in which the bottom part connecting to the flower stalk is narrower than the upper part immediately supporting the flower petals; (2) the large capital block is located in a position corresponding exactly to the base of a flower—it supports all the elements of the “bracket flower.” Regardless of how the protruding arms or cross arms were likened to “extended flower sprays” or “rotating floral leaves or petals,” these are all situated on the capital block. It must have been because the physical and functional features of the *lu* block resemble the base of a flower to such a great extent that the second-century explanation of *lu* as *fu* on top of a column made perfect sense to Xu Kai (figure 4.21*b*). Since the *lu* block was perceived as the base of a flower, the bracket set sitting on the *lu* block was certainly perceived as a flower in its entirety. Perhaps this imagery of the capital block as the base of a flower extends even to the column supporting it: since the “ovary” is said to be “on the ends of branches” (枝端華房之蒂), and architecturally the *lu* block is an “ovary” located “on top of a column” (柱上柎), the column under the capital block might be likened

to the flower stalk supporting the whole bracketing “flower.” Following this imagery suggests that in the eyes of ancient Chinese at least since the tenth century, the columns of a building arranged in rows and topped with increasingly complex bracket sets on each capital looked like rows of flowering trees (figure 4.22).

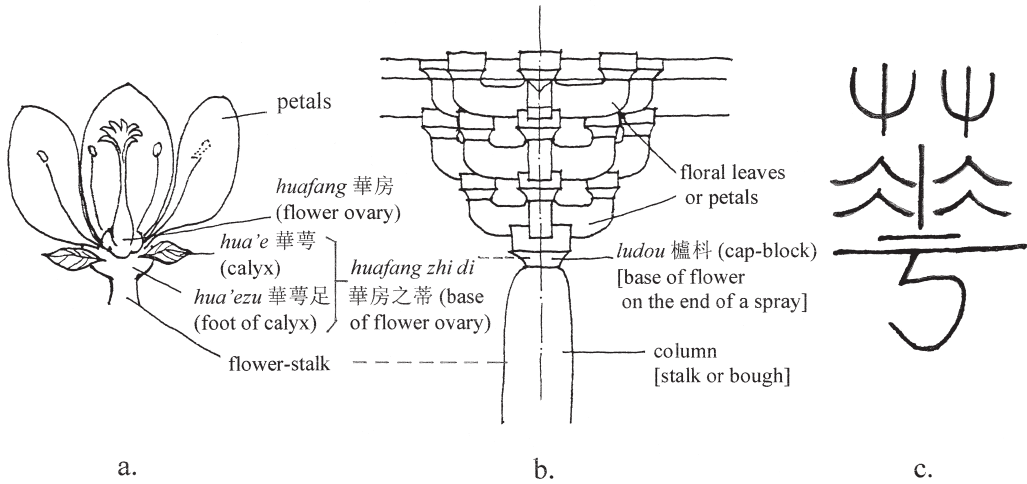


FIGURE 4.21. Sketch of bracketing likened to flowers: (a) botanical structure of a flower; (b) front view of a bracket set; (c) classical form of the Chinese character *hua* (author sketch)

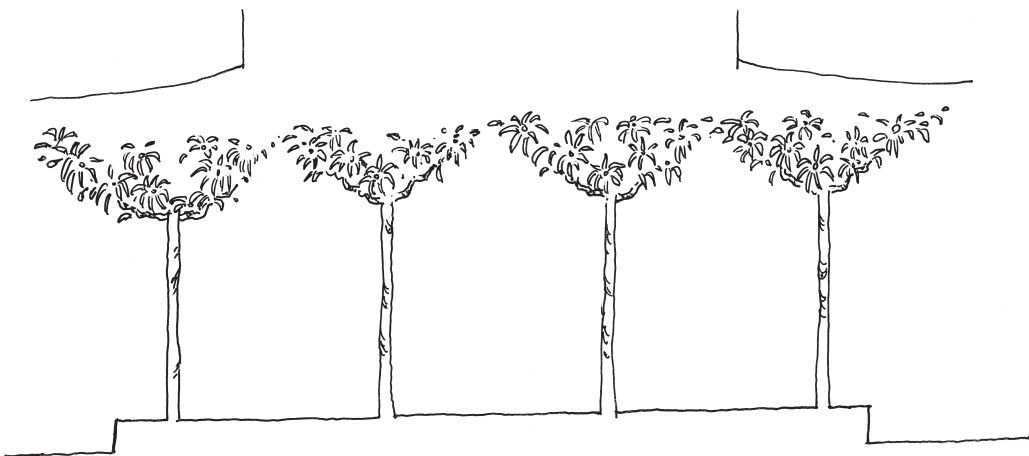


FIGURE 4.22. Sketch of bracket sets on columns likened to rows of flowering trees (author sketch)

At the end of his commentary, Xu connects the *lu* in the *Shuowen jiezi* with the *dougong*, or “bracketing,” of his time. Seemingly not a precise interpretation, this connection probably indicates that in his view, “today’s” bracketing evolved from *lu* at its earliest stage. Indeed, in the development of bracketing in Chinese architecture, the earliest bracketing, during the Western Zhou period, is in the form of a block (figure 4.23) and, during the Spring and Autumn period, it is in the form of a curved (armlike), horizontal timber (see figure 4.2). Archaeological evidence shows that a single, large capital block was one of the most popular forms of bracketing from this latter period to the Warring States period (figure 4.23). This form continued to prevail during the Han period (figure 4.23). But from the Warring States period onward, the form of bracketing developed as a combination of the large cap block and such horizontal timbers as used during the Spring and

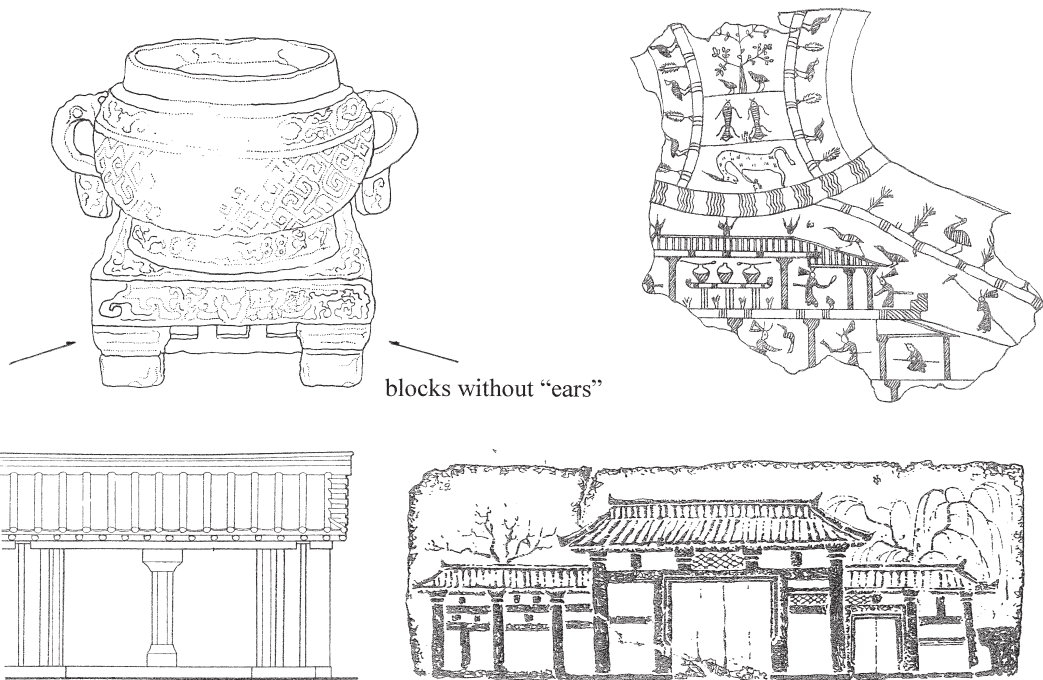


FIGURE 4.23. Big block as a popular form of bracketing from the Zhou to Han periods: (top left) Western Zhou bronze *shilinggui* (food-storage vessel) excavated at Mangshan in Luoyang (collection of Musée Guimet, Paris); (top right) architectural image on Warring States-period bronze *yi* (vessel for washing) excavated at Changzhi in Shanxi; (above left) stone sacrificial hall of Han-period tomb at Xiaotangshan in Feicheng, Shandong; (above right) pictorial brick excavated at Deyang in Sichuan (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 37, 51, 56, 73; added arrows indicate blocks without “ears”)

Autumn period, curved or square, supported by many other small blocks at the two ends of the horizontal timbers that were thereby enabled to pile up (see figures 4.3 and 4.4). Needless to say, the emergence of protruding arms in the late Han period stimulated the development of a structurally and physically more comprehensive form of bracketing from that time through the era of Xu Kai, the Five Dynasties period. It thus makes sense that a tenth-century erudite scholar like Xu Kai, who, as an etymologist studying the *Shuowen jiezi* must have been acquainted with many architectural terms in classical and contemporary literature, traced the comprehensive bracketing of his time back to its embryonic form: the large cap block.

Although the *YZFS* does not record Xu Kai's comment on *lu*,⁶⁶ Xu's perception of the cap block as a flower ovary and of the bracketing as a flower would not have been viewed as strange or preposterous. The ancient Chinese not only were intimately familiar with the botanical structure of flowers⁶⁷ but also took delight in talking about it. The classical Chinese character *hua* 華 (flower), either written in its free style and seal style or inscribed on bronzes and stone tablets, was said to have been created in a form that resembled a flower structure: flower petals and leaves in the upper segment and calyx and ovary in the lower segment (figure 4.21c).⁶⁸ The *Shijing* 詩經 (Classic of odes) produced a historically influential metaphor in which the botanical relationship between a flower and its calyx and ovary symbolized the interconnectedness between brothers.⁶⁹ This metaphor, along with the concept of "flower and calyx (ovary)," took root in the hearts of Chinese beginning at the time of the *Shijing*. It was applied in political life and imperial building practices. For example, Li Longji 李隆基, Emperor Xuanzong 玄宗 (685–762, r. 712–756) of the Tang dynasty, had specially built a Hua'e Lou 華萼樓 (Tower of Flower and Calyx; also called Hua'e Xianghui 華萼相輝 [Mutual Radiance of Flower and Calyx]) to serve as a place to stroll with the princes outside court affairs. He borrowed the metaphor of the interconnectedness of a flower and its calyx from the classics and used it to promote the ritual and patriarchal system in which younger brothers should obey their elder brother and thereby stabilize his rule. Many contemporary sources eulogize the emperor's establishment of this structure.⁷⁰

Aside from its political context, the concept of a flower and its base also spread widely among Tang and Song scholars. For example, Du Fu 杜甫 (712–770) wrote a poem titled "Huadi" 華底 (The bottom of a flower), the first line of which reads as follows: "紫萼扶千蕊"⁷¹ (Purple calyxes support thousands of petals). Zhang Jiuling's 張九齡 (678–740) poem on

plum blossoms includes the line “更憐華蒂弱、不受歲寒移”⁷² ([I] pity the flower base’s delicacy the more / [As it] won’t endure passing into the cold season). In the poem, the poet particularly characterizes the flower base (*huadi* 華蒂), the joining point of a flower with its branch, as he compares himself to a plum blossom whose graceful fragrance (metaphorically, the poet’s outstanding talent) suffers jealousy. In Guo Ruoxu’s 郭若虛 (fl. 1070–1080), *Tuhua jianwen zhi* 圖畫見聞誌 (Experiences in painting), the relationship between a flower and its calyx (“苞萼後先” [the order of appearance of buds and calyxes]) is stressed as one of the fundamental botanical facts of nature that a painter must know in depicting flowers and flowering plants.⁷³ Clearly, Song scholars and artists, like their predecessors, paid close attention to the botanical structure of a flower, in all its particular elements. Thus, during the tenth century, Xu Kai’s conclusion that the *Shuowen jiezi*’s gloss of *lu* as *fu* formulated an analogy in which the *lu* capital block corresponded to “the bottom of a flower’s ovary” was the outcome of a popular flower-ovary concept that he integrated with his intelligent observations and understanding of architecture—here, the physical features of bracketing.

More Floral Terms for Bracketing in the YZFS

Xu Kai’s commentary on the YZFS bracketing terminology thus tells us that at least around the tenth to twelfth centuries, both craftsmen and scholars alike really did conceive of the bracketing in Chinese architecture as flowers or flowering trees, branches, sprays, leaves, and petals. In addition to *huagong*, *miaogong*, *duo*, *huaxindou*, *zhi*, *ye*, and the *lu* as a *fu*, there are other floral terms for bracketing in the YZFS that fit into the “bracketing flowers” architectural metaphor of the Song period. For instance, *juantou* 卷頭 (scrolled head), another alternative term for protruding arms or “flowering arms,” most likely refers to the resemblance of protruding arms to scrolled flower petals. The *tou* 頭 in the term represents “end,” “tip,” or “head,” while *juan* 卷 means “curved” and “scrolled.” In the YZFS systems related to carving and color painting, *juan* is frequently employed to designate the scrolling shape of flowers and flower petals. As examples, it includes the lines “隨其卷舒、雕成華葉”⁷⁴ (following its scrolling 卷 and unfolding [shape], carve the petals and leaves) and “若華葉肥大、不見枝條、謂之鋪地卷成；如華葉肥大而微露枝條者、謂之枝條卷成”⁷⁵ (If petals and leaves are plump and large with no sprays visible, [the

pattern] is called “scrolled 卷 on a paved background”; if petals and leaves are large but sprays are slightly visible, [it] is called “scrolled 卷 on sprays”). Moreover, there is a specific carving style of flowers called *juanyehua* 卷葉華 (scrolled-leaf flowers). This kind of flower is characterized by petals and leaves that are turned and rolled inward, “*ye nei fanjuan*” (葉內翻卷)⁷⁶ (leaves turned inward and rolled), and as a result, its petals and leaves are scrolled at the tip or head. As a carving motif, the petals and leaves of this kind of flower are carved to make one or more “scrolls,” which are counted by *juan*, such as “one scroll” 一卷, “two scrolls” 兩卷, or “three scrolls” 三卷. As discussed, the number of scrolls on one leaf determines the class of the carved flowers.⁷⁷

Also, in the *YZFS*, the compound *juantou* 卷頭 (scrolled head) is used to specify a flower whose petals or leaves are scrolled at the tip—*juantou huicao* 卷頭蕙草 (scrolled-head fairy orchid)—and thus to distinguish this flower from flowers in other carved styles:

彫剔地 [(註) 或透突] 窪葉 [(註) 或平卷葉]
華之制有七品：一曰海石榴華、二曰牡丹華 [(註) 芍藥華、寶相華之類、卷葉或寫生者同]……五曰卷頭蕙草 [(註) 長生草及蠻雲蕙草之類同]。⁷⁸ The system of carving background-indented [(author’s annotation) or background-hollowed] concave-leaf [(annotation) or even scroll-leafed] flowers has seven classes: Number one is exotic pomegranate flower; number two is peony [(annotation) herbaceous peony, rose, and the like, (regardless of) scrolled-leaf or lifelike styles, are of the same (class)] . . . Number five is scrolled-head fairy orchid [(annotation) long-life grass and barbarian-cloud fairy orchid and the like are of the same (class)].

The term *juantou* is exactly the same word as that used for protruding arms in the *YZFS*. As we have seen, all protruding arms are referred to as *huagong*, or “flower arms,” in this treatise and are likened to flowers or flower sprays. It would thus make sense that a “flower arm” whose end is actually curved at the bottom may have looked like a “scrolled” flower petal, such that craftsmen termed it “scrolled head.”

Huatouzi 華頭子 (flower head) is a term for the strut under a downward-pointing cantilever (figure 4.24; also see figure 4.9). This strut is actually a simplified form of “flower arms,” or *huagong*, employed in instances where a regular one cannot be used because its head or most of its protruding body is “cut” by the downward-pointing head of a cantilever. Since this

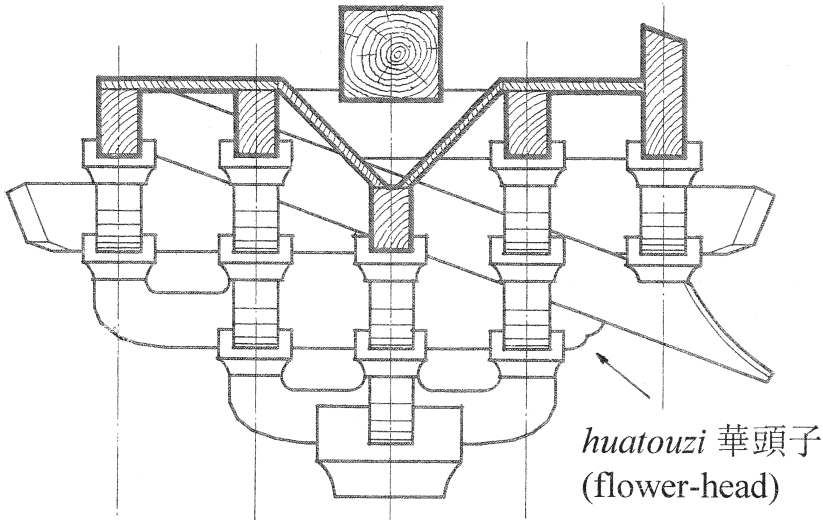


FIGURE 4.24. “Flower head” in a bracket set (after Liang Sicheng, *Yingzao fashi zhushi*, 245; arrow and labels added by author)

strut would otherwise be a “flower arm,” it is termed *huatouzi*, that is, “head of a flower.” The term *huatou* 華頭 is often found in ancient Chinese poetry; here are two Song-period examples: “華頭倒插紫荷香”⁷⁹ (The flower head droops, sending off fragrance like purple lotus) and “雨後華頭頓覺肥”⁸⁰ (After a rain, the flower heads suddenly look plump). *Huatou* is also frequently used for flowers or floral decorative elements in the *YZFS*, such as “華頭與枝條” (flower head and sprays),⁸¹ “華頭用紅、葉並用綠”⁸² (flower heads are painted red; leaves all painted green), “華頭筒瓦”⁸³ (round tiles with a flower-head [end]), or “其華頭系貼釘者、每朵一枚”⁸⁴ (For those [roof plates] whose flower heads are to be stuck with nails, use one nail on each flower).

Dinghua mohaigong 丁華抹頰栱 (mini flower-“chin”-erased arm)⁸⁵ is a small arm whose body extends to the front and the rear like a “flower arm” but is placed between the upper parts of the two arms of the inverted V-shaped strut under the topmost purlin (figure 4.25). Because it is “squeezed” on both sides, the two ends that otherwise would possess the full form of a

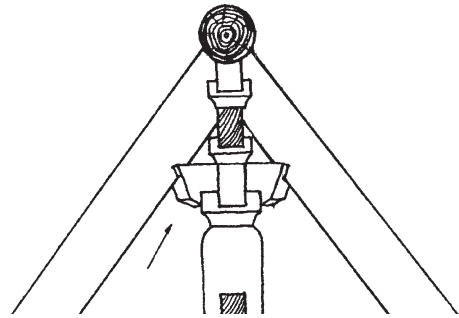


FIGURE 4.25. “Little flower chin-erased” bracket arm (redrawn based on Liang Sicheng, *Yingzao fashi zhushi*, 263; arrow added by author)

regular “flower arm” are cut off. Thus, this arm, likened to “a little flower” (*dinghua* 丁華), would look like a flower that has lost some of its outermost petals. The words *mohai* 抹頰 (literally, “chin erased”) figuratively describe the thinned contour of an open flower (or a “flower arm”). One can speculate about how a flower could be regarded as having a “chin.” A Tang verse, “華頰驕嘶上苑風”⁸⁶ ([The passing cavalry riding horses left a gust of wind, disturbing] flowers on their chins, with steeds neighing [that spread over] the air of the hunting garden), personifies flowers by referring to their delicate appearance as having “flower chins” (*huahan* 華頰). *Hái* 頰 and *hán* 頰 are written similarly, have similar pronunciations, and share the same meaning, so we can deduce that craftsmen might have considered a “flower arm” that was significantly cut at its two ends as a miniature flower whose “chin” had been cut off.

Ang 昂 (cantilever) is an impressive component of bracketing in that it is installed on a slant, with one end high and the other low. The cantilever projects from the wall plane and has all the structural functions that a “flower arm” has (see figure 4.24, also 4.7–4.9, 4.19, and 3.11). Among the five terms for downward-pointing cantilevers that are recorded in the *YZFS*,⁸⁷ *fei’ang* 飛昂 (flying cantilevers) and *ying’ang* 英昂 (flower cantilevers) were transmitted from Eastern Han and Three Kingdoms–period literature. *Fei’ang*, as further interpreted by Tang scholars, refers to the resemblance of cantilevers to the pattern of birds in flight.⁸⁸ *Ying’ang* comes from Liu Liang’s 劉梁 (fl. 147–167) *Qiju* 七舉 (a genre of rhapsody, seven refined verses exemplifying historical affairs to memorialize the emperor):⁸⁹ “Shuang fu jing ling, he chui ying ang” (雙覆井菱、荷垂英昂⁹⁰ The paired well-like coffers [decorated] with lotus flowers turn upside down/being supported by the downward-hanging “flower” cantilevers). A variant form of this *Qiju* verse is given by Li Shan in his commentary on Han rhapsodies: “Shuang yuan fu jing, ji he chui ying” (雙轅覆井、菱荷垂英⁹¹ Paired shafts [support] the well-like coffer that turns upside down / water caltrops and lotuses droop with [their] flowers). Here, *he* 荷, a polysemantic word whose meaning includes “lotus flower” and “to bear, to support,” certainly means “lotus,” and *ying* 英 represents the “flowers” of the lotus and *ji* 菱, water caltrops; the entire second half of this couplet describes the floral decorations on the ceiling. Archaeological evidence indicates that Han-period architecture certainly did include well-like coffers that were decorated with lotus flowers turned upside down (figure 4.26). Thus, in the other version of this text, which was quoted by Li Jie, *he* also could have meant “lotus”; the second verse would thus have consisted of two subject-predicate compound words,

meaning “Lotuses droop, petals rise.” In Li Jie’s view, *ying’ang* represented “cantilevers”; upon that understanding, *he* here means “bearing,” indicating the structural function of the cantilevers.⁹² Taking the variant form of the *Qiju* text into consideration, even if it was not genuine, this text most likely was intended to describe the architectural ornaments on the elements around and connected to the coffers, and these ornaments appeared to be flower shaped. So the *ying* of *ying’ang* referred to “petals” or “flowers.”

Ying as “flowers” is not only defined as such in classical dictionaries but also common in the literature of all periods, including Tang and Song poetry. Although the meaning of *ying* was extended to include “brilliant talent,” “beautiful stone,” and the like, these meanings do not relate to *ying’ang* in its architectural sense—cantilevers. Functioning similarly to protruding “flower arms,” a cantilever projecting from the wall plane or from a column and supporting and intersecting cross arms well illustrates or complements the flowerlike structure of a bracket set (figure 4.27). In the terminology sections of the *YZFS*, Li Jie sought and possibly constructed an architectural tradition deriving from the classics and early literature. Since he included this *Qiju* text as a traditional source of *ying’ang* for “cantilever,” it thus seems that the term *ying’ang* already existed for “cantilever” and had been in use in building practice for a certain period before the compilation of the *YZFS*. So we know that *ying’ang*, “flower cantilever,” was also part of the flower-based bracketing terminology so popular during the Northern Song period.

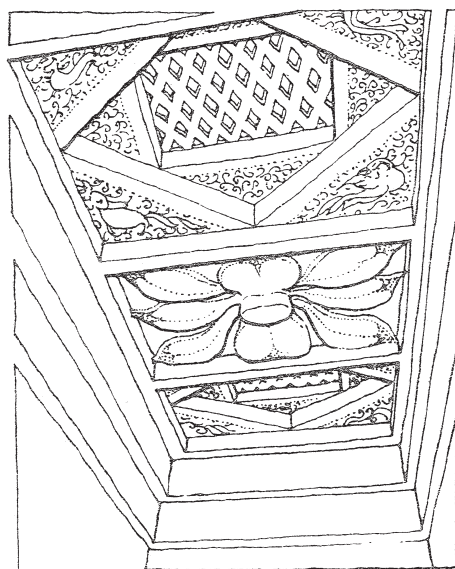


FIGURE 4.26. Coffer of stone chamber of Han-period tomb at Yi’nan in Shandong (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 76)

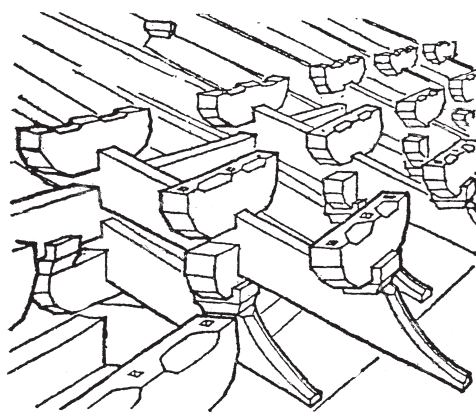


FIGURE 4.27. Sketch of cantilevers likened to flower sprays with “petals” (cross arms) (modified by author based on Xu Bo’an and Guo Daiheng, “Song ‘Yingzao fashi’ shuyu huishi,” 46)

Botanical Nomenclature for Bracketing: The Architectural Conceptualization and Its Source

Not every term for bracketing in the *YZFS* is associated with flowers or trees. Some terms are straightforward descriptions of the structural properties of elements, and even among the figurative terms, the representations are not confined to botanical imagery.⁹³ In some cases, a given element has more than one name, with each name having its own imagery, such as “flying [bird] cantilevers” and “flower cantilevers.”

Nevertheless, the variety of individual figurative terms in the bracketing terminology of the *YZFS* notwithstanding, only the botanical nomenclature constitutes a powerful and systematic architectural metaphor involving a group of terms under a coherent theme and covering all fundamental aspects of a bracket set: from protruding elements to lateral elements, from combinations of these elements to composite units. Such a coherent system of architectural imagery must have been associated with a certain architectural conceptualization held by a considerable number of people in the architectural professions. What was such a powerful conceptualization and what were its beginnings?

It is notable that some basic bracketing elements had been named in botanical terms as early as the Zhou and Han periods. The *YZFS* references some Zhou and Han texts that mention or explain bracketing terms.⁹⁴ From those bracketing terms, we see that bracket arms were called *luan* 欒 (goldenrain tree, *Koelreuteria paniculata*), cantilevers were called *jian* 欂 (firlike tree), and blocks were called *lu* 櫨 (smoke tree or sumac, *Rhus cotinus*, L.) or *jie* 節 (alternatively written 窠, the joint of newer and older stems).⁹⁵ As is clear, these terms refer to certain trees or botanical parts.

Luan as a tree clearly appears as early as in pre-Han texts.⁹⁶ A Han-period Confucian text records, “天子樹松、諸侯柏、大夫欒、士楊”⁹⁷ ([On the tumulus of] the Son of Heaven, pine trees are planted. [On the tumuli of] dukes, cypresses are planted. [On the tumuli of] aristocrats, *luan* are planted. [On the tumuli of] scholars, poplars are planted). In the *Shuowen jiezi*, it is glossed as a tree similar to the *lian* 欄(棟) tree,⁹⁸ a high-quality material for architecture.⁹⁹ Li Shizhen 李時珍 (1518–1593), in his *Bencao gangmu* 本草綱目 (Materia medica pharmacological compendium, completed 1578), tells us: “棟長甚速、三五年即可作椽”¹⁰⁰ (Chinaberry grows very rapidly, and in three to five years, [it] can then [be used to] make rafters). Modern botanical sources explain that *luan* trees belong to the botanical family Sapindaceae and that many plants of this family contain

dense grain and hard, heavy wood, which make them good materials for architecture and fine workmanship.¹⁰¹ It is also indicated that *luan* trees have a broad distribution, from the north, northwest, and northeast to the central plains and south of China.¹⁰²

The *Shuowen jiezi* glosses *jian* 櫟 only as *xie* 楔 without offering any explanation of what *xie* is.¹⁰³ While commonly understood as a “stiffener” or “wedge” in Qing-period and modern scholarship,¹⁰⁴ *xie* is also a name for a certain pinelike, thorny tree, as seen in Han and Three Kingdoms texts. For example, Zuo Si 左思 (?–306), in his “Shudu fu” 蜀都賦 (Rhapsody on the capital of Shu), writes, “其樹則有木蘭檉桂……檉榑楔樅”¹⁰⁵ ([As far as] the trees there [are concerned], there are magnolias, cinnamon trees, and laurels . . . palm trees, *ya* trees [a huge, exotic tree], *xie* [pinelike, thorny trees], and *cong* [cypresslike trees]). The Tang-period scholar Li Shan comments on this: “楔、似松、有刺也”¹⁰⁶ (*Xie* is like pine, but having thorns). *Jian* itself, as many Song-period dictionaries indicate, is a name for a firlike tree or an alternative term for fir. For instance, the scholar and artist Guo Zhongshu 郭忠恕 (fl. 837, d. 977), in his *Peixi* 佩觿 (Bodkin worn on the girdle [of young people, a metaphor for philological studies]), writes, “櫟……木、與杉同”¹⁰⁷ (*Jian* . . . [is] a tree identical to fir). In the official rhyming book *Guangyun* 廣韻 (Spreading rhymes), *jian* is glossed as the same as *shan* 杉 (fir) and *shan* 榧 (fir), the latter of which is also glossed as follows: “木名、似松” (name for a tree [that is] like the pine tree).¹⁰⁸ The *Shuowen jiezi*’s terse gloss of *jian* as *xie* may thus merely have represented the equation of *jian* with *xie*, both referring to a fir or pinelike tree. In China fir trees have been recognized as providing excellent wood for making buildings since ancient times. In his commentary on the *Erya*, Guo Pu 郭璞 (276–324) explains, “榧 (榧)、似松、生江南、可以為船及棺材、作柱埋之、不腐”¹⁰⁹ (*Shan* is like a pine tree, growing in the area south of the Yangtze River, [that] can be used for making boats and coffins. [If] made as a column and [the bottom of the column] is buried, [it] will not rot). As modern sources indicate, fir trees contain top-quality wood owing to its “perfectly straight grain and proper hardness and softness” (木理通直、堅軟得宜), and therefore, like pines and cypresses, trees in the fir genus provide good timber for building.¹¹⁰

Lu as the name of a tree is also seen in the *Shuowen jiezi*: “一曰宅櫨木、出弘農山也”¹¹¹ (Alternatively called *zhailu* [or *tuolu*] tree, [which] grows on Hongnong Mountain). Hongnong 弘農 Mountain was likely located in the central plains or middle area of China.¹¹² *Lu* as a type of tree is included in many other major Chinese dictionaries¹¹³ and often mentioned

in literature from the Han period onward. For example, Sima Xiangru's 司馬相如 (179–117 B.C.E.) "Shanglin fu" 上林賦 (A rhapsody on the Shanglin [imperial hunting park]) includes "華楓枰櫨" (birches, maples, *ping* trees [hard and white as silver], and smoke trees [sumacs]), and Zhang Heng's 張衡 (78–139) "Nandu fu" 南都賦 (Rhapsody on the Southern Capital) includes "其木則……楓、枰、櫨、櫨" ([As far as] those trees there [are concerned] . . . there are maples, *xia* trees [a fragrant tree], smoke trees, and oaks).¹¹⁴ Modern sources explain that *lu* belongs to a genus whose wood is a good material for making implements.¹¹⁵

As made clear, *luan*, *jian*, and *lu* are all trees whose wood provides good-quality material for making boats, furniture, and buildings and were probably valued as such by ancient craftsmen. The close association of these bracketing terms and botanical terms is unlikely to be accidental; rather, applying botanical nomenclature to architectural elements is likely to have been connected to a special architectural concept dating from early China. A particular architectural tradition and characteristic building methods resulted in China in this unique architectural concept. In the beginning, the

forefathers of the Chinese sheltered in caves and nested in trees, a way of life that taught them how to make use of natural resources for buildings, including trees, branches, leaf-bearing twigs, vines, and trailing plants. They used branches to build sheds above the caves and tree nests, securing and consolidating the crossing branches with vines, taking advantage of straw and dense leaves on the branches for roofing and protection from rain and snow. Later, they learned to build semisubterranean houses, erecting thick tree trunks in the center to support thatched roofs (figure 4.28). Once capable of building above-ground houses, the type of building structure was based on erecting timber posts, big and small, taken and processed from natural trees, set at regular intervals along a wattle-and-daub wall; these posts were secured with and supported purlins that were also processed from large tree trunks. This structural model established a Chinese architectural system that lasted for

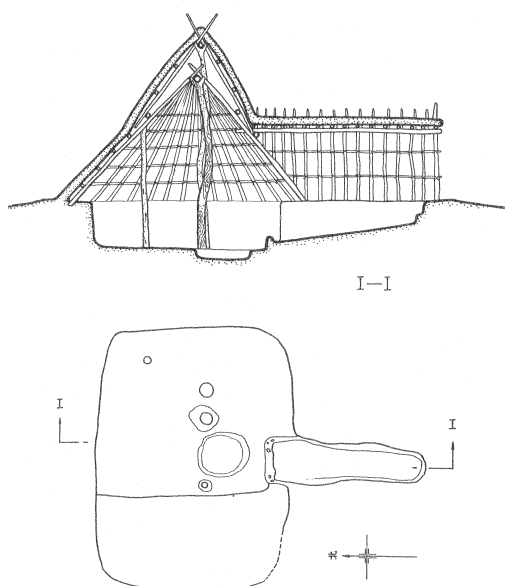


FIGURE 4.28. One of the architectural remains of Neolithic residences at Banpo, Xi'an: (top) reconstruction drawing of the transverse section; (above) plan of the excavated site (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 24)

as long as four or five thousand years: a wood-framed structure, with timber columns, beams, and purlins as the major load-bearing elements, and with wood as its major building material.

In this process of developing a building technology and methods, Chinese builders accumulated knowledge of taking building materials from natural plants and increased their skillfulness in making the most of them. One of the skills they must have had to learn was how to use smaller timber materials to increase the solidity and flexibility of a structure made up chiefly of large, thick timbers. For example, in securing those intersecting load-bearing elements, like timber posts and purlins, it was a challenge as to how to ensure these large elements—which were fashioned directly from unprocessed tree trunks and not always perfectly straight but often more or less curved—were positioned and connected properly; the strength of the whole structure could be affected significantly by a crookedly placed load-bearing timber such as a beam that was positioned higher (or lower) at one end. In such cases, the skillful use of smaller-size wood materials in between these larger wood components became crucial in solving the problems associated with bad balance and positioning. This is evident from the pictorial material found in Zhou-period bronzes and lacquerware. On the base of the Western Zhou ritual bronze *shilinggui* 矢令簋 (food-storage vessel, *gui* 簋, cast by Shiling 矢令 [an official in charge of writing imperial documents during the reign of King Zhao 昭王, the fourth king of the Zhou]) it can be seen that blocklike squares were carved on top of the posts and beneath the horizontal beams. It is noticeable that these blocks were not made in the same form as they appear in the architecture of later periods: they lack any protruding ears in their upper section (see figure 4.23), which is to say there are no openings in the square pieces (as there are in later period blocks) to permit the insertion of horizontal elements and consolidate them in the mortises. Therefore, the function of these square blocks at this point was merely to serve as a cushion between horizontal and vertical weight-bearing components: either these cubelike blocks make up for the difference in the heights of the two neighboring tree-trunk columns so that the horizontal element supported by the two columns would be positioned precisely horizontally, or, by being made slightly wider than the diameter of a column, the cubelike elements function like a simple capital and allow more space for vines to twine around them and thus bind tightly the horizontal and vertical elements.

Likewise, in the architectural image carved on the Spring and Autumn–period lacquer piece excavated in Linzi 臨淄, Shandong, a horizontally

extending curved element that looks very much like a processed tree branch is placed on top of the tree-trunk column and underneath the ridge purlin (see figure 4.2). This curved timber is positioned horizontally parallel to the purlin, which suggests that it was put there as a cushion between the intersecting horizontal and vertical load-bearing elements. This smaller, curved, long, thin timber not only made it possible to make up for the short height of the tree-trunk column when the horizontal purlin above it was designed to be raised higher, but also extended the support of the column to the upper purlin. Like the cushionlike wooden cubes, the curved, branchlike timber also facilitated a better connection and balance between major structural components and thus improved the transmission of the loads from the upper to the lower parts of the structure.

Such cushionlike wood blocks and curved, branchlike timbers are the primitive forms of bracketing construction during the transitional period from semiunderground houses to early-period timber structures. From the pre-Qin to Han periods, the form of bracketing underwent considerable development, with the integration of square blocks and long, thin arms into a whole structure, and the arms were processed in various forms, straight, angled, and curved (see figures 4.2–4.4). Many of the curved arms were constructed with marked curvature, some with even swelling curves, and these curved arms appeared in both the south and north (figures 4.29–

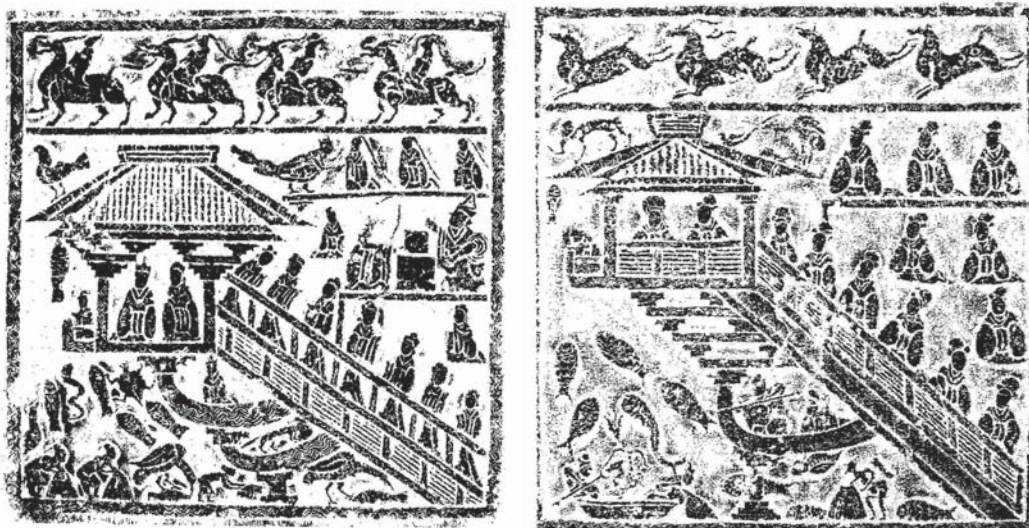


FIGURE 4.29. Two images of curved brackets on pictorial stones excavated at Liangchengshan (or Liangchengzhen) in Shandong (after Chang Renxia, *Zhongguo meishu quanji*, 30–31)

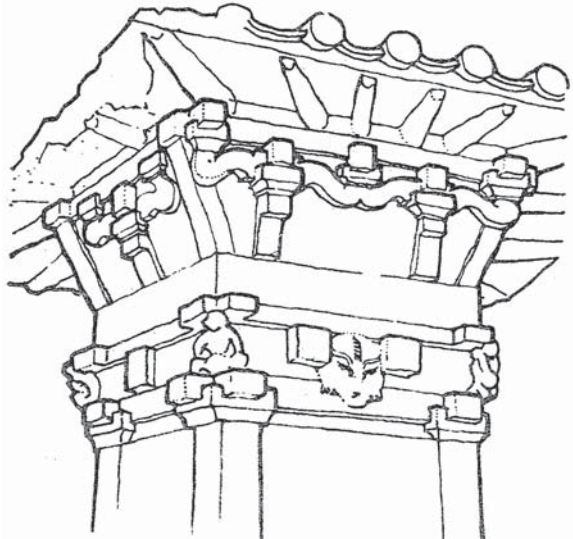
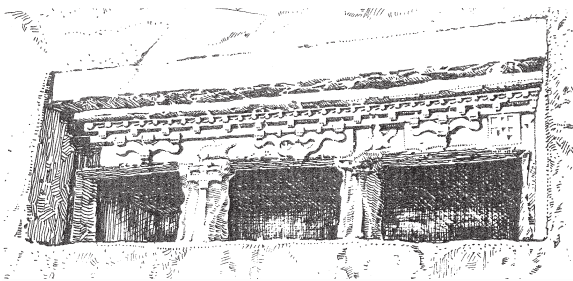
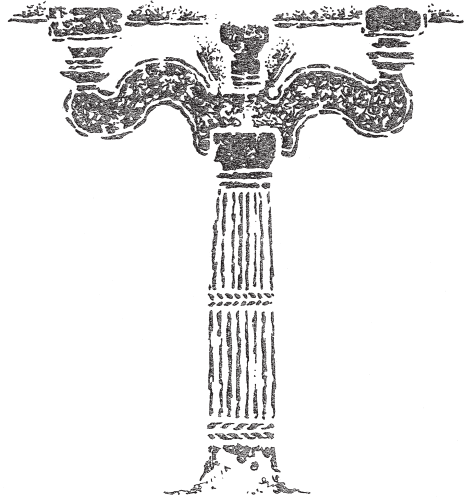
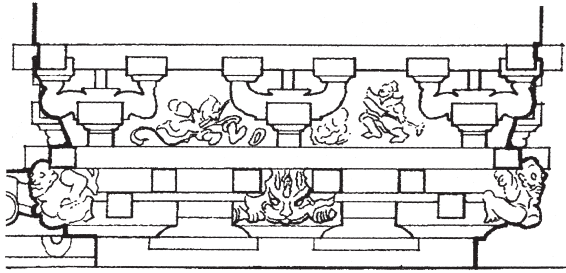


FIGURE 4.30. Curved brackets represented in Han-period architectural remains in Sichuan: (*top left*) masonry watchtower from the tomb of Gao Yi at Ya'an; (*top right*) image from Han-period tomb at Shiziwan; (*middle*) late-Han cliff tomb at Huangsanxi in Yibin; (*above left*) masonry watchtower at Quxian (after Liu Dunzhen, *Zhongguo gudai jianzhushi*, 57, 75, 77, 97); (*above right*) masonry watchtower of Pingyang Fujun (author photograph)

4.30). Such swelling, curved arms can be seen even as late as the Jin (265–420) period. Modern scholarship has suggested that Han and Jin-period craftsmen employed naturally curved tree limbs or branches as bracket arms, as the material record in both the south and north indicates.¹¹⁶ Although we have to admit that those swelling, curved arms as seen in the Han and Jin-period masonry architectural remains and images may not be feasible structurally, the exaggerated depictions of those swelling, curved arms, which indeed resemble the forms of tree branches, very likely represented either a conceptualized earlier-period architectural tradition or contemporary building practice, in which bracketing was very often made from naturally curved tree branches or limbs.

Han-period literary texts also indicate that early Chinese craftsmen had more than adequate knowledge of wood quality and excellent skills in properly using the natural forms in which tree trunks and limbs grow. In his rhapsody on a tree with a wonderful wood grain, Liu Sheng 劉勝 (Prince of Zhongshan [modern Tangxian 唐縣 and Dingxian 定縣, Hebei] 中山王, son of Emperor Jing of the Han 漢景帝 [r. 156–141 B.C.E.]) describes the wood quality and the varied, fantastic appearance of the limbs and branches that master craftsmen ingeniously used to make implements:

色比金而有裕、質參玉而無分、裁為用器、曲直舒卷、修竹映池、高松植巖。¹¹⁷ Its color is comparable to gold and more; its substance is indistinguishable from jade. Cut [it] to make useful implements, [making full use of its varied appearance,] curved or straight, extended or rolled, slender [like] bamboo reflected in a pond, tall [like] pines planted on a mountain peak.

The Song-period commentator Zhang Qiao 章樵 (fl. 1228–1233) annotated this passage:

枝干巨細、長短、曲直、隨所用各有所宜。¹¹⁸ The branches and stems, [in their] being thick or thin, long or short, curved or straight, all are properly used to make proper implements.

As Zhang indicates, craftsmen were very good at taking advantage of the natural shape of branches to make implements. So too must builders have been in making architectural elements. They must have been skillful in fashioning timber structures by making proper use of the physical attributes of timber.

It is thus easy to understand that people in early China could have employed naturally curved tree branches to make bracketing on the top of

columns. As early texts show, people understood that particular naturally occurring shapes and sizes of trees were useful for particular architectural features. Moreover, they must also have understood that certain trees had particular material properties suited to particular architectural elements. Therefore, when needing smaller timbers to make tree-trunk columns, beams, and purlins properly connected and positioned, they must have had the intelligence to make use of the natural forms of trunks, limbs, stems, and branches and take advantage of particular material properties. For a wooden block positioned at the point where the upper and lower tree-trunk structural elements were joined, they could simply have cut and used the joint of a limb and the trunk. Such joints met the need for being wider than the diameter of a column, so as to allow vines to be twined around it. It would then make sense that pre-Qin craftsmen named the square wooden blocks *jie* 節, literally, the joint of a limb and the trunk.

Considering the vital functional demands of bracketing, appropriate material properties with both solidity and flexibility are especially necessary for each of its members. As discussed, *luan*, *jian*, and *lu* trees provided high-quality wood suitable for implements and buildings. Either at the very first stage of bracketing (pre-Qin period) or some time not long thereafter (Qin and early Han), these tree timbers were selected as the preferred material (or among the preferred materials) deemed most appropriate for the fundamental bracketing components: arms, cantilevers, and cap blocks. It is also possible that when a new bracketing element initially emerged, it was made from any generic tree branches or limbs, but that during an exploratory period of creating a stronger bracketing construction, the craftsmen soon appreciated the proper hardness, solidity, and flexibility of *luan*, *jian*, and *lu* wood and began using it as the preferred type for bracketing. There may also have been a regional factor involved. Perhaps when a new bracketing element (say, the arm) was first used by the craftsmen of a certain region, a specific tree timber (the *luan* tree in the case of arms) was used that was not only of high quality but also more readily available in that region. The local craftsmen may have named this element after the given tree. Later, when the technical method involving such an element became popular in other areas as well, its term, taken originally from the specific source tree, was received popularly as well. This same term was subsequently transmitted to later periods, whether or not the specific tree was still the source for making the given element.

Moreover, *luan*, *jian*, and *lu* trees have their own characteristic material properties that would make them suitable for different bracketing elements, which ancient Chinese craftsmen must have learned through experience. For

example, compared with *luan* and *lu*, the *jian* tree is particularly advantageous for its perfectly straight grain and its proper hardness and softness, which may account for why *jian* trees were chosen to make cantilevers rather than arms or blocks. A cantilever is positioned considerably higher at one end and lower at the other and extends straight downward, intersecting with almost all other bracketing elements that are positioned horizontally. From the point of view of material mechanics, a wood with perfectly straight grain offers considerable assurance that each part of the wood will bear the load evenly; therefore, *jian* timber would have been the best available material for making cantilevers in early China.

From the Han period, Chinese architecture became increasingly complex, but the architectural tradition of taking building materials from plants found in nature and the origins of ancient architecture in caves and tree nests remained an important basis persisting into later dynasties.¹¹⁹ In addition, Chinese architects continued the tradition of building with a wood-frame structure. Within this tradition, the concept that architectural elements, such as bracketing, originated from, and were fashioned from, natural tree branches and limbs, was also perpetuated.

In Han and Tang-period literature, the perception of bracketing as trees and branches is reflected incidentally. During the Three Kingdoms period, He Yan 何晏 (190–249), in his “Jingfudian fu” 景福殿賦 (Rhapsody on the Hall of Great Blessings), writes, “欒栱夭矯而交結” (Bracket arms, bending and extending [like branches], intertwine).¹²⁰ The original meaning of *yaojiao* 夭矯 refers to the appearance of crooked tree branches, which is extended to the appearance of projection and continuous extension.¹²¹ Sima Xiangru, in his “Shanglin fu,” writes, “夭矯枝格、偃蹇杪顛”¹²² ([The monkeys were playing on] the long, consecutively extending branches, and [they were at] the tall, curved treetops). Thus, He Yan, in his rhapsody, describes intercrossing brackets as being like layers of branches. Likewise, Wang Yanshou 王延壽 (ca. 124–ca. 148), a Han-period writer, in his “Lu Lingguangdian fu” 魯靈光殿賦 (Rhapsody on the Hall of Numinous Brilliance in Lu) describes the structure of the Hall of Numinous Brilliance, including the following observations:

於是詳察其棟宇、觀其結構、規矩應天、上憲觜陬(媿)……飛梁偃蹇以虹、揭蘧蘧而騰湊。層櫨磔危以岌峩、曲榀要紹而環句。芝栴攢羅以戢翬、枝掌杈枒而斜據。傍夭矯以橫出、互黜糾而搏負。 And then, [we] carefully examine the building/view its [manner of] construction/The design

corresponds to the heavens/[the structure] being modeled on [the manner of the] Zizou [constellation] in the heavens/. . . Flying beams, arched and arced, pointing like rainbows/raised aloft, great and grand, soar and gather/Layered bearing blocks are precipitously piled, precariously positioned/curved bracket arms, bent and bowed, are concatenated/Painted dwarf posts are thickly arrayed, closely clustered/bracing struts, like bifurcating branches, lean at angles/Laterally twisting and turning [like branches], [these timber elements] jut sideways/conjoined and connected [like a forest], braced and trussed together.¹²³

The Tang-period commentator Lü Xiang 呂向 (fl. 718) explained that both *yaojiao* and *youjiu* 黝糾 in this rhapsody mean the “appearance of trees linking and intertwining” (天蟠、黝糾、林木相連繞兒).¹²⁴ In the eyes of the writer, those intercrossing timber elements on the beams were like trees and branches curving and extending. Since the layered blocks and bracket arms were described as between those flying beams and intersecting diagonal braces and dwarf posts, it is very likely that they were also considered to be part of those crisscrossing “trees and branches.” The writer claims that the building was constructed according to a principle corresponding to the method of construction in heaven. In the rhapsody, Zizou 觜陬 (or Ziju 觜嫩, Juzi 嫩觜) refers to one of the twenty-eight constellations said to be in charge of architectural construction in the celestial sphere. In his commentary on this rhapsody, Li Zhouhan 李周翰 (dates unknown; one of the five officials who commented on the *Wenxuan* in 718) explains, “觜陬、星、主架屋、故此結構之始法之、是應天也”¹²⁵ (Zizou is a constellation in charge of building construction. Therefore, from the beginning, this structure modeled itself on Zizou’s building method; in that way, [this structure] corresponds to [the principle of] the heavens). Thus, those intercrossed timber elements, which were built very much like or were perceived as being made in the form of natural trees and branches, must have been considered as part of the method corresponding to the heavens or to the norms of nature.

Similarly, in his rhapsody on the Hall of Great Blessings, He Yan also praises the skillfulness of craftsmen in building the hall according to a principle that corresponded to the natural form of heaven and the earth; He Yan describes the mass of building components by comparing them to tree branches and leaves:

惟工匠之多端、固萬變之不窮……讎天地以開基、並列宿而作製。製無細而不協於規景、作無微而不違於水臬。故其增構如積、植木如林、區連域絕、葉比枝分。Consider the carpenters' multiple skills/truly, ten thousand transformations could not exhaust them all/. . . In accord with heaven and earth, [they] lay the foundation/following the constellations, [they] build and construct/In construction, there is nothing so fine it does not accord with the shadow's measurement/In building, there is nothing so minute it fails to follow the level or gnomon/Thus, its rising tiers seem piled one upon another/with standing timbers like those of a forest/Joined into sections, cut off into regions/ matted like leaves, splayed like branches.¹²⁶

The last line of this text is annotated by Lü Xiang as follows:

植木、以材木相插、如林之多。區：院；域：牆也。言院皆相連、牆為隔絕、如葉相比、如枝相分。¹²⁷ *Zhimu* [planting trees] represent those timbers that intercross [one another], as many as a forest. *Qu* is courtyards; *yu* is walls. It says that the courtyards are all connected, and the walls serve as partitions, [the way the buildings] are connected is like leaves, [the way they] are articulated is like branches.

In He Yan's eyes, gifted craftsmen built those massive timber structures by following a principle in accord with nature, and those structures looked like trees in a forest; the way the structures connected to one another looked identical to the form of tree branches and foliage. All these texts reveal the existence of a concept of nature in early-period Chinese architectural practice: in such a concept, the timber structure as a whole, consisting of large, load-bearing components and bracketing, was perceived as natural trees and branches and was thus a creation of nature.

Several centuries after the Han period, the writer Chen Zi'ang 陳子昂 (fl. ca. 690–704), in his record of architecture in a monastery, writes, “櫺栢森鬱以宏合”¹²⁸ (Blocks and bracket arms are dense and exuberant [like trees], showing magnificence). The word *senyu* 森鬱 here is a term that almost always indicates a lush growth of vegetation. Chen's employment of this word to describe bracketing is a continuation of the pre-Qin and Han-period perception of bracketing as tree branches.

Admittedly, the literary descriptions of architecture in the Han rhapsodies also include many other types of imagery, such as comparing

flying beams to rainbows, suspended floating posts to stars,¹²⁹ and so on. These analogies are all nature oriented, reflecting the same general theme: architecture as a part of nature. The imagery likening building components, including bracketing, to natural trees and branches in Han and Tang-period literature relating to architecture probably had a deeper basis in historical and traditional architectural practice than most other types of imagery. Such imagery bears a powerful historical imprint: the ancestors built their buildings with natural trees and then developed a timber-oriented architectural system. Throughout long architectural practice, Chinese builders maintained that architectural tradition and the use of timber materials in construction. The concept of natural trees and branches in Chinese architecture must have been implanted in the minds of builders. While it is regrettable that to date there is no technical treatise on architecture extant from the pre-Song period, we can nevertheless see from the employment of botanical terms in the naming of bracketing that such a concept must have affected Chinese architects and builders very powerfully.

Conclusion

As Chinese timber construction developed from the Han down to the Song, bracketing reached an unprecedentedly high level, structurally more comprehensive and physically more robust. The complexity of bracketing created an extraordinarily intriguing appearance that provoked the rich imaginations of skilled craftsmen and observing scholars. As a consequence, at the end of the Five Dynasties and the beginning of the Northern Song, the perception of bracketing as flowers and flowering trees emerged. At the same time, the system of “branches protruding front and back and leaves growing left and right” or “transverse branches (sprays) and lateral leaves (petals)” emerged in southern China and came to prevail in other areas, including the central plains.

As has been stressed above, this systematic architectural metaphor involved a set of terms under a coherent theme: flowers and flowering trees. All the basic elements of a bracket set are perfectly covered in this system: (a) principal protruding elements, including projecting arms and cantilevers, are likened to flowers, flower sprays, or branches; (b) lateral elements—all cross arms are likened to leaves and petals growing on the “branches” or “sprays” (protruding arms or cantilevers); (c) basic combining methods of these bracketing elements are compared to extending branches and rotating

leaves at the tips of branches; (d) each composite unit of these elements is considered as a cluster of flowers; (e) all small blocks positioned in the middle of a bracket arm are considered as growing in the heart of a flower or petals; (f) the cap block under a whole set is considered as resembling the ovary of a flower. Such vivid architectural metaphors must have played an important role in the professional communication, teaching, and learning of architectural technologies and building practices in China of the tenth to twelfth centuries. Underlying this perception of bracketing as flowers, sprays, branches, leaves, and petals must have been a widespread concept of architecture rooted itself in nature. The flower-and-tree-based terminology for bracketing as reflected in the *YZFS* reflects a distinctive architectural culture and profound architectural conceptualization in medieval China, which also demonstrates one of the many reasons the *YZFS* should be seen as more than a mere technical manual.

The *Yingzao Fashi* Architectural Terminology (II)

The Interplay of Literature, Arts, and Craftsmanship

It is important to note that the architectural metaphorical system for bracketing in the *YZFS*—likening it to flowers and flowering trees—was well documented in contemporary literary texts and that the architectural conceptualization associated with it was shared by craftsmen and literati in China from the tenth to twelfth centuries. Our concern here is how craftsmen and scholars reached such an identical perception of particular architectural structures. Was there an interaction between professionals and the literati in the domain of architecture? Did these two social groups share architectural knowledge or vocabulary as well? Did they cooperate in the making and transmission of technical knowledge?

Taking a closer look at the architectural terminology in the *YZFS*, it can be seen that a large number of refined, literary words are mixed with popular, vernacular language. In contemplating who was responsible for the employment of literary language in the nomenclature of architecture, the question of the level of literacy among craftsmen and the degree to which the literati knew architecture must be addressed. This will help in understanding the distinct roles that people of different social status played in the knowledge field of architecture in premodern China. In the following cases of technical terms in the *YZFS*, let us look at how literary and artistic practices affected Song craftsmanship, and how the learned and the “unlearned” contributed to the practical and theoretical realms of premodern Chinese architecture.

The Case of *Linggong* 令拱 (Shorter Arms) and *Mangong* 慢拱 (Longer Arms)

What Are *Ling* and *Man*?

In the *YZFS*, bracket arms are classified into five basic types: first, *huagong*, namely, protruding arms; and the others are four basic types of cross arms, which are introduced in the following order: *nidaogong* 泥道拱 (literally, “mud-line arms”), *guazigong* 瓜子拱 (literally, “melon-seed arms”), *linggong* 令拱, and *mangong* 慢拱. A *nidaogong* sits directly in the opening of the cap block and thus is the lowest cross arm installed in the center of a bracket set. A *guazigong* is the first layer of cross arms installed on the end of a protruding arm when the protruding arm supports two layers of cross arms. This distinction is important because *guazigong* would otherwise be replaced by *linggong* (further discussed below). A *mangong* is mounted on top of the *guazigong* or the *nidaogong* and forms a second layer of cross arms. Modern scholarship explains *linggong* as a cross arm installed on the uppermost protruding arm of a bracket set.¹ This explanation is based on the discussion in the *YZFS* on the manufacture of bracket arms under the major carpentry system, but the text also defines a *linggong* as being installed “under the joining point of two neighboring purlins inside a hall” (屋內榑縫之下)²—in such a case, the *linggong* is not on top of any protruding arm but mostly installed on top of a block that is supported by a short post. When a *linggong* is placed on the uppermost protruding arm, it is also under the joining point of two connected eave purlins.

In fact, throughout the *YZFS*, the *linggong* is seen to be the most versatile bracket arm. A *linggong* can actually be installed on any projecting arm, from the first “jump” to the last, replacing the two layers of cross arms constituted by the *guazigong* and the *mangong*. In addition, it can be used in the center of a set, replacing the *nidaogong*. When a bracket set is designed as a “double-layer cross-arm construction” (*chonggongzao* 重拱造), the two layers of cross arms installed on top of each protruding arm (except for the uppermost one, which accommodates a *linggong*) are made up of the *guazigong* on the bottom and the *mangong* on top. However, when a set is designed as a “single-level cross-arm construction” (*dangongzao* 單拱造), which includes only one layer of cross arm on top of a protruding arm, the *linggong* is the only kind of cross arm used. This principle is mentioned in the *YZFS* discussion on work limits for bracketing:

如單拱造者、不用慢拱、其瓜子拱並改作令拱。³ If [a bracket set is] of single-level cross-arm construction, *mangong* are not used, and all *guazigong* are replaced by *linggong*.

Such a principle is consistent with the discussion in the *YZFS* on the building methods related to the *guazigong*, which clearly states that a *guazigong* is employed under the following conditions: first, a bracket set must be at least a five *puzuo*—consisting of more than two protruding arms (or cantilevers), and second, the protruding arms on which a *guazigong* sits must support a double layer of cross arms:

[瓜子拱]施之於跳頭。若五鋪作以上重拱造、即於令拱內泥道拱外用之。(註)四鋪作以下不用。⁴ [*Guazigong*] are installed at the ends of protruding arms. If [a set is] more than five *puzuo* and of a double-layer cross-arm construction, then the *guazigong* is used in between the *linggong* and the *nidaogong* [i.e., installed on each protruding arm except for the uppermost one]. (Author's annotation) [If a set is] four *puzuo* or even more inferior, *guazigong* are not used.

According to the annotation, *guazigong* are not used when a set contains only one protruding arm (or cantilever) because this protruding arm is the “uppermost jump” (termed *shangtiao* 上跳 in the *YZFS*)⁵ and must have a *linggong* on it according to the building standard being established in the *YZFS*; or, when a set is of an even simpler construction, such as the *doukoutiao* 料口跳 (“jump” from the mouth of the cap block), the protruding arm connects the eave purlins directly. Moreover, in the *YZFS* discussion on *nidaogong*, we see the following principle:

若料口跳及鋪作全用單拱造者、只用令拱。⁶ If [a set is] *doukoutiao* and a whole set is of a single-level cross-arm construction [for all protruding arms], only *linggong* are used.

Thus, a *linggong* will even substitute for the *nidaogong* in the center of a set in the case of a *doukoutiao* and a set where protruding arms support only a single cross arm on each level.

From these stipulations in the *YZFS*, it appears important to use the *linggong* to substitute for other types of cross arms in various situations of bracketing. Why is this necessary? Why must the two layers of cross arms—*guazigong* and *mangong*—be replaced by *linggong* when a set is of a single-layer cross-arm construction? When *mangong* are not used, why cannot

guazigong remain as a single-level cross arm? Why does the *nidaogong* even have to be changed into a *linggong* when a set is of a single-layer cross-arm construction? Theoretically, when a protruding arm supports a single-level cross arm, this cross arm can be any type of arm. However, we must keep in mind the different sizes of each of these arms as specified in the *YZFS*: a *nidaogong* and a *guazigong* are of the same length (sixty-two *fen* 分), both shorter than a *linggong* (seventy-two *fen*), and a *mangong* is the longest (ninety-two *fen*).⁷ Since *linggong* and *mangong* support purlins or tie beams that connect neighboring bracket sets, they are given a relatively greater length. While a *nidaogong* can be put under a tie beam in the center of a set, it mostly works together with a *mangong* as a double-layer cross-arm support to the tie beam (泥道重栱上施素方).⁸ A *guazigong* is never meant to be put directly under a tie beam or purlin. In addition, looking at the entasis of these arms at their two ends, all but *linggong* are shaped in a four-segment type of entasis (每頭以四瓣卷殺), while *linggong* are fashioned in a five-segment type of entasis (五瓣卷殺).⁹

We can see that in the *YZFS*, the combination of a sixty-two-*fen* *guazigong* or *nidaogong* at the bottom and a ninety-two-*fen* *mangong* at the top is considered as the proper form of double-layered cross arms, in terms of the proportion between these arms and the overall appearance of a set. When such a combination of cross arms is maintained in a set of double-layer cross-arm construction, a sixty-two-*fen* *nidaogong*—as long as a *guazigong*, and both are shaped in a similar entasis—is installed in the center of a set, while a seventy-two-*fen*, five-segment-entasis *linggong*—a bit longer than a *guazigong* but shorter than a *mangong*—sits on the uppermost protruding arm and functions as a support to the joining point of two neighboring eave purlins. Visually, the former gives a sense of harmoniousness and consistency, while the latter creates a sense of slight variation and enriches the contour of a whole set. When a set is of a single-level cross-arm construction and thus contains no ninety-two-*fen* *mangong*, the proper proportion and overall appearance of a whole set would be significantly changed if the short *guazigong* arms were at the ends of protruding arms and directly supporting the tie beams, potentially making a whole set look narrower and thinner. Such a great change in the general proportion of bracketing must have been considered a problem in Song building practice, apart from the fact that the size of a *guazigong* would not give as strong support to the tie beams as a *mangong* or a *linggong* does. That is why, in a single-layer cross-arm construction, all the sixty-two-*fen* *guazigong* must be replaced by the seventy-two-*fen*

linggong. A set having *linggong* on each protruding arm makes the general style of bracketing relatively identical to that of a double-layer cross-arm construction. The substitution of other types of cross arms by a *linggong* in the *YZFS* reflects a meticulously aesthetic concern in the design of architectural elements and, in this case, a principle of making use of the different lengths (and shapes) of bracketing elements to create a satisfying proportion and general contour of bracket sets.

In the *YZFS*, a *linggong* has the alternative name *dangong* 單栱 (single arm), and a *mangong* is alternatively termed *shengong* 腎栱 (literally, “kidney arms”).¹⁰ We are dealing with specific terms for individual bracket arms, and we have seen there is a diversity of bracketing nomenclature in the *YZFS*. It was necessary for craftsmen to name each element according to its specific structural or formal properties, and frequently an element had more than one property by which craftsmen identified it. It is also quite possible that various terms for a single element emerged at different times or during various stages in the development of building technologies. In addition, these terms could have arisen in different regions before their widespread transmission. At any rate, each term must have a specific meaning that represents the structural property of the corresponding building element that was so termed.

The terms *nidaogong* and *guazigong* describe straightforward physical features of these two arms: the former is identified by its position at the “mud line” (泥道), the mud wall starting from the architrave,¹¹ and the latter by its small, delicate form resembling a small, oval-shaped “melon seed” (瓜子).¹² Likewise, the terms *dangong* and *shengong* describe structural characteristics or physical forms of their corresponding elements. Indeed, one of the unique aspects of a *linggong* is that it is always used alone (as a “single”), without exception. No other cross arms possess such a structural characteristic. As mentioned, a *mangong* had to be installed on top of a shorter arm, either a *guazigong* or a *nidaogong*. That must have been why craftsmen at some point created the name *dangong* for a *linggong*. The term *shengong* appears to describe the kidney shape of the long and slightly curved *mangong*. To modern observers, other arms might also resemble the shape of a kidney, but in the eyes of Song craftsmen, the *mangong* resembled it most (figure 5.1). This was most likely because of the fact that this arm was relatively long and thus the flat portion of its body was longer while its two ends were curved.

But what are the *ling* 令 of *linggong* and the *man* 慢 of *mangong*? These words cannot be explained by their common meanings in classical

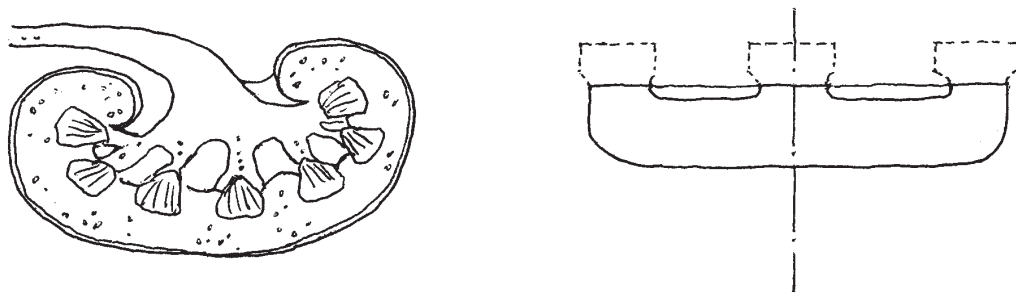


FIGURE 5.1. A *shengong* resembling a kidney (author drawing)

and early-period dictionaries, that is, *ling* as “order”¹³ and *man* as “slow” or “lazy,”¹⁴ because they would not make sense architecturally. There could have been no point for a *linggong* to be considered by Song professionals as a bracket arm that “dominated,” “commanded,” “ordered,” or “led” (令) other bracketing elements. This arm has no control over other components, and thus it would not have been named in the sense of “issuing orders.” Another meaning of *ling* is “season” (as in *shiling* 時令 [season]), but it makes no sense that craftsmen or scholars would have associated this arm with the four seasons or considered it to be a “seasonal” element. Likewise, none of the meanings of *man* that we find in pre-Song and even early Northern Song dictionaries—including “easy,” “idle,” or “arrogant”¹⁵—leads us to a plausible interpretation of the term *mangong*. In the *YZFS*, the character *man* is used in three other cases: *junman* 峻慢 (steep and gentle), which describes the slopes of a roof;¹⁶ *mandao* 慢道 (gentle path, gentle gradient), a term that describes gradients of stairs;¹⁷ and *manshui* 慢水 (slow river), a term designating a sluggish flow.¹⁸ In the first two instances, *man* stands for “gentle” (gradients). While this meaning would explain *mangong* as “gentle arms,” it is still awkward because “gentle” is appropriate for modifying an architectural element that possesses a slope, like a roof or stairs, but bracket arms are generally installed horizontally. *Ling* and *man* must thus be special terms used outside their common meanings.

The Differentiation of Lengths by *Ling* and *Man* and Song Lyric-Poem Practice

My research indicates that the term *mangong* must be explained in close association with the term *linggong*. I propose that the *man* of *mangong* and the *ling* of *linggong* are words modifying the length of the respective arms. I

also propose that they are associated with the popularity of *ci* 詞 (song lyric) poetry during the Northern Song period.

As mentioned, the different lengths of bracket arms are an important matter in the *YZFS* discourse on architectural design. In particular, the length of the *linggong* is critical since it is why this kind of arm is designated for substitution of other types of arms that are shorter or longer than it. The two short arms, *nidaogong* and *guazigong*, cannot be differentiated from each other by their equal length, so they are named instead according to their most striking structural position (“mud line”) or appearance (“melon seed”) (figure 5.2). Thus, naming cross arms in terms of length would have become a matter for the *mangong* and the *linggong* only: a very long arm and a medium-length arm (figure 5.3). The connection between the words *man* and *ling* in the context of length occurred in Chinese literature only during the Tang and Song dynasties.

Ci, a genre of poetry written in fixed numbers of lines and words based on music, originated during the mid-Tang period and reached its zenith during the Song dynasty. According to the length and rhythm of the tunes to which the *ci* is set, these lyrics are classified into two main types: *ling* 令 and *man* 慢. A *lingci* 令詞 is commonly based on a short melody and thus contains a relatively small number of words, whereas a *manci* 慢詞 is associated with a longer melody and, consequently, includes more words. A typical *lingci* contains less than fifty-eight words, and a normal *manci* includes some one hundred words.¹⁹ It was common to identify a *ci* work specifically by adding the word *ling* or *man* to the names of the tune (*cipai* 詞牌) to which the words were set. Examples of such *cipai* include *cailian ling* 采蓮令 (short tune of “Picking Lotus Flowers”), *yiconghua ling* 一叢華令 (short tune of “A Clump of Flowers”), *liangzhou ling* 涼州令 (short tune of “The Prefecture of Liang”), *yingshanhong man* 映山紅慢 (long tune of “Azalea”), *wangnanyun man* 望南雲慢 (long tune of “Looking at Clouds Flying to the South”), *shaonianyou man* 少年游慢 (long tune of “A Young Person on a Tour”), and so on.

In particular, during the Song period, there were many *ci* poems that shared the same popular name of a tune but were distinguished from one another by their length and the corresponding rhythms of the tunes: *ling* and *man*. For example, the shorter and longer tunes of “Changxiangsi” 長相思 (Having been languishing with lovesickness for long) were named *changxiangsi ling* 長相思令 and *changxiangsi man* 長相思慢, respectively. Other examples include *caisangzi ling* 采桑子令 (short tune of “Picking

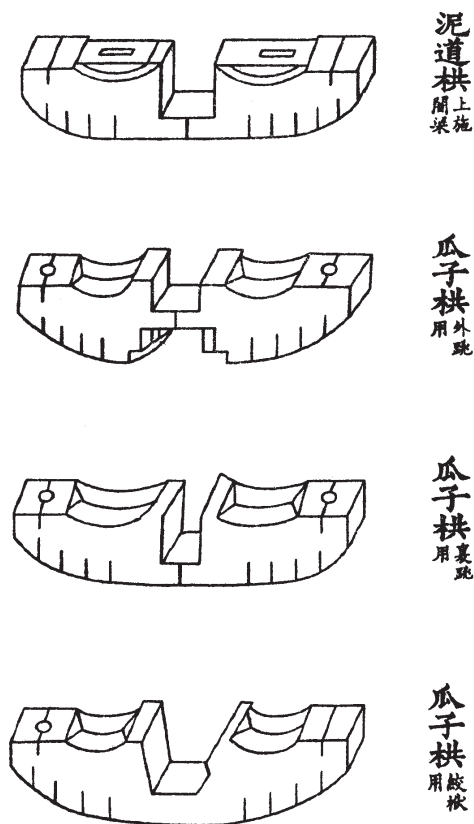


FIGURE 5.2. Same-length mud-line arm (top) and “melon-seed arms” (bottom three images) (YZFS, *juan* 30:11b, illustrating mortises of mud-line arms and “melon-seed arms”; note scribal error of the word *anliang* 闌梁 in caption of mud-line arm, which should be *anzhi* 闌槩, stiffener on an arm to form a full-size modular arm)

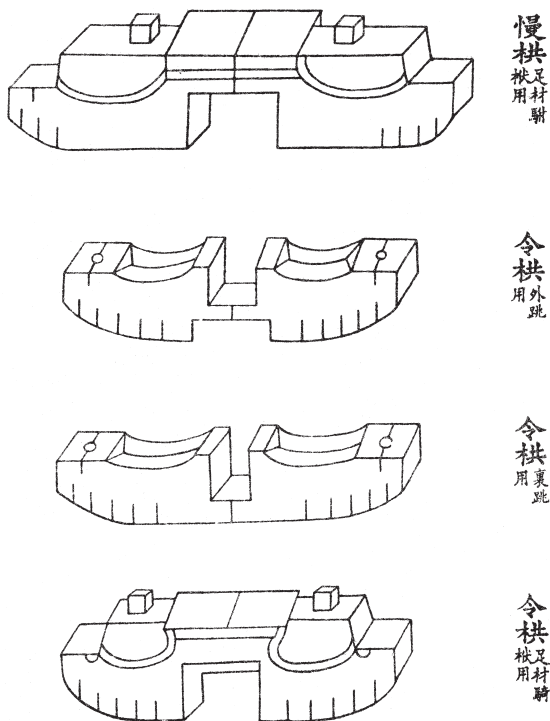


FIGURE 5.3. YZFS illustration of mortises of *mangong* (top) and *linggong* (bottom three images), featuring a full-size modular timber (top and bottom images) (*juan* 30:12b; note scribal error of the word *fu* 駢 in caption of top image, which should be *qi* 駢 [sit on]—*qifu yong* 駢用 [used for sitting on a beam], as seen in caption of bottom image); note lengths of *mangong* and *linggong*

Mulberries”) and *caisangzi man* 采桑子慢 (long tune of “Picking Mulberries”), *yuzhonghua ling* 雨中華令 (short tune of “The Flower in the Rain”) and *yuzhonghua man* 雨中華慢 (long tune of “The Flower in the Rain”), *mulanhua (ling)* 木蘭華(令) (short tune [sometimes *ling* was added by later scholars] of “Blossoms of Lily Magnolia”) and *mulanhua man* 木蘭華慢 (long tune of “Blossoms of Lily Magnolia”), *huaxindong (ling)* 華心動(令) (short tune of “Flower-Heart Waving”) and *huaxindong man* 華心動慢 (long tune of “Flower-Heart Waving”), *langtaosha ling* 浪淘沙(令) (short tune of “Waves Washing Sand”) and *langtaosha man* 浪淘沙慢 (long

tune of “Waves Washing Sand”), *tasuoxing (ling)* 踏莎行(令) (short tune of “Walk along Nut Grass”) and *tasuoxing man* 踏莎行慢 (long tune of “Walk along Nut Grass”), and so on.

The following are two examples of *ci* composed to the shorter and longer tunes of *mulanhua*, and our interest here is their lengths:

First, a fifty-six-word *mulanhua (ling)* 木蘭華(令) by Yan Shu 晏殊 (991–1055):

燕鴻過後鶯歸去、細算浮生千萬緒。長於春夢幾多時、散似
秋雲無覓處。聞琴解佩神仙侶、挽斷羅衣留不住。勸君莫作
獨醒人、爛醉華間應有數。²⁰

Now a one-hundred-one-word *mulanhua man* 木蘭華慢 by Liu Yong 柳永 (987?–1053):

拆桐華爛漫、乍疏雨、洗清明。正艷杏燒林、緗桃繡野、芳景
如屏。傾城。盡尋勝去、驟雕鞍紺幃出郊坰。風暖繁弦翠管、
萬家競奏新聲。盈盈。斗草踏青。人艷冶、遞逢迎。向路旁
往往、遺簪墜珥、珠翠縱橫。歡情。對佳麗地、信金疊聲竭玉
山傾。拼卻明朝永日、畫堂一枕春醒。²¹

Here, Liu specifically identifies his *mulanhua* poem as a long tune (*man*) work composed to an extended rhythm of a previous, short *mulanhua* tune like Yan's work.

Modern sources on *ci* poems indicate that during the Tang and Five Dynasties periods, the *lingci*, also termed *xiao lingci* (小令詞, small *lingci*) was the dominant type of *ci*.²² During the Northern Song period, *ci* poems took on a new aspect, in which both *lingci* and *manci* were significantly developed and both very popular.²³ Although long *ci* tunes had already been written in the High Tang period, it was only from the mid-Northern Song period that *manci* began to flourish. Although the exact date of the use of the word *man* in long-melody tunes is not clear, it seems that the designation did not appear in any *ci* tune titles during the Tang and Five Dynasties periods.

In all likelihood, the architectural terms *linggong* and *mangong* recorded in the *YZFS* did not exist before the Tang period. Moreover, they most likely did not occur during the Tang and Five Dynasties periods, either. They were the products of a prosperous cultural setting around the tenth to twelfth centuries. The art of *ci* flourished so greatly during the Song period that people of all social ranks were involved in their creation, appreciation, and performance. Craftsmen and builders would not have been exceptions.

Whether or not they composed *ci* themselves, they must have been familiar with, or imperceptibly influenced by, the common practice of identifying *ci* poems by their lengths, often using the words *ling* and *man*. Therefore, when the need arose for identifying bracket arms by their lengths, the words *ling* and *man* would easily have come to mind. I argue this further by investigating literati knowledge of architecture.

Naming Particular Building Elements Using Literary Terminology: Scholars or Craftsmen?

One might assume that scholars alone were responsible for the employment of literary terms in the naming of architectural elements. I believe, however, the reality was not that simple, and the contemporary written sources do not support such a simple assumption. I argue that, at least during the Song period, craftsmen themselves were able to devise appropriate architectural terms both from their vernacular languages and from their literary vocabulary. Especially in the case of *linggong* and *mangong*, it was the Song craftsmen themselves who borrowed the specific literary terms for classifying two major types of *ci* poems in their naming of the particular architectural elements.

We must ask if scholars were generally involved in the naming of technical elements, a question that relates to how much scholars actually knew about architecture in ancient times. Certainly, scholars were skilled at composing literary works and *ci* poems, and many of them wrote about architecture throughout history. Despite beautiful styles of writing, we see that their works often lack specific knowledge of architecture, especially its technical aspects. We also find that their general understanding of architecture sometimes is not accurate. Take Du Mu's 杜牧 (803–ca. 853) *Epanggong fu* 阿房宮賦 (Rhapsody on the Epang Palace) as an example.²⁴ This work contains finely written literary descriptions of the general appearance of the biggest palace compound in history, allegedly built by the First Emperor of the Qin. While the architectural descriptions are elegant, including such phrases as “廊腰縵迴、檐牙高啄” (long corridors wind around the palace / the high tile ends on the eaves are arrayed like gritting teeth), the author describes the structural features of the buildings in the following terms: “fu dong zhi zhu, jia liang zhi chuan” 負棟之柱、架梁之椽 (the columns that support purlins / the rafters that support beams). In this usage, the relationship between beams and rafters is mistaken—structurally, rafters are never positioned under beams to support them, on the contrary, the beams support the rafters.

So learned society was not necessarily as knowledgeable of architecture as craftsmen, at least not all of them. Scholars may have had some aesthetic preferences and compelling ideas about the artistic design of buildings, but when complicated building technologies and complex structural components were involved, most of them probably lacked adequate building knowledge. A Northern Song source may suggest how much knowledge of architecture Song scholars generally possessed. The material is found in Guo Ruoxu's 郭若虛 (fl. 1070–1080) *Tuhua jianwen zhi* 圖畫見聞誌 (Experiences in painting).

In his general discussion of the models to be followed, Guo specifically states that a good painter must have essential knowledge of the subjects of his artistic work; one such subject is architecture. Guo stresses that each subject “has its own terminology, forms, and arrangements, all of which must be clearly understood; in no particular is a lapse permissible” (具有名體、處所、必須融會、闕一不可).²⁵ However, in offering examples of those essential architectural elements and terms for painters working on architectural subjects, Guo makes many errors in terminology. In Alexander Soper's view, some technical phrases must seldom have emerged in the written language during Guo's time, and therefore Guo transcribed many technical terms by using phonetic equivalents of the terms.²⁶ A question to be kept in mind here is, from whom did Guo hear those technical terms he was transcribing? Let us first take a look at those transcribed terms. They at least include *shuzhu* 熟柱, *anzhi* 暗制, *hupofang* 琥珀枋, *pushui* 撲水, *bofeng* 膊風, *huafei* 化廢, and *danggou* 當鉤. They are “phonetic equivalents” for *shuzhu* 蜀柱 (dwarf posts on beams or used in railings), *anzhi* 闇槩 (filling timbers between two layers of bracket arms), *pupaifang* or *pupofang* 普拍枋 (a timber element set flat like a sill across the tops of the columns in the wall plane), *boshui* 搏水 (“water catcher”: ends of the purlins protruding beyond the gable wall),²⁷ *bofeng* 搏風 (barge boards), *huafei* 華廢 (ornamental tile heads running up each side of the gable), and *danggou* 當溝 (flat tiles set vertically at the base of the ridge),²⁸ respectively. In addition, Soper suspected that Guo's *fangjing* 方莖 was a phonetic equivalent for *fangheng* 方桁 (timbers of standard cross-section dimensions) of the *YZFS*.²⁹

From these mistaken terms, we see clearly that even Guo was not certain about the exact terms for some architectural elements,³⁰ or unsure of the accurate meanings of their terms. The word *shu* 熟 (ripe) in Guo's *shuzhu* does not make any sense in reference to the particular element, which is a very short post sitting on beams and supporting purlins (sometimes also

used in railings). The word *shu* 蜀, from the accurate term *shuzhu* 蜀柱 recorded in the *YZFS*, describes the fairly small size or low height of this element, just as its alternative term, *zburuzhu* 侏儒柱 (dwarf posts), in the *YZFS* suggests.³¹ The word *hua* 化 (turn, melt) in Guo's *huafei* is clearly an error for the *hua* 華 (flower, ornamental) of the *YZFS* term *huafei* 華廢, which describes the ornamental heads of the tiles on the side of the roof.

Comparing Guo's term *anzhi* 暗制 and the *YZFS* term *anzhi* 闇槩, we see more clearly that Guo did not understand how a technical term as difficult as *zhi* was understood by craftsmen. The *zhi* 槩 is defined as a secondary modular timber in the *YZFS*. It is of a standard cross-section dimension: six *fen* 分 (small unit of a module, one-tenth the width of a *cai* module)³² high and four *fen* wide, as compared with the fifteen-*fen* high and ten-*fen* wide dimension of the larger *cai* module. In the *YZFS* modular system, this smaller-unit module is used in combination with the *cai* module. As the *YZFS* states, a *zhi*-dimension timber can be added to the top of a *cai*-dimension timber, forming a "full-size module" (材上加槩者謂之足材),³² as compared with a "single-size module" (單材) made up of a *cai* alone. When a *zhi*-dimension timber is added to the top of a bracket arm, it is called *anzhi*, as is clearly defined in the *YZFS*: "施之栱眼內兩料之間者、謂之闇槩"³³ (A *zhi*-dimension timber that is inserted into the space between the two blocks on a bracket arm is called *anzhi*). This element is also illustrated in the *YZFS* (figures 5.4, 5.5; also see figure 5.3, *top* and *bottom* images; also see figure 5.2, the *YZFS* caption for the "mud-line arm," *shang shi anzhi* 上施闇槩 [installing an *anzhi* at the top]), although the captions of the transmitted images contain a transcription error in the *zhi* of *anzhi*, which was incorrectly copied as *liang* 梁 (beams). As we see, the term *anzhi* refers to the filling timbers between two layers of elements of a "single-size modular" dimension, which, in most cases, are two layers of bracket arms in a single-size standard cross-section.

Apparently, it was not scholars like Guo who created the specific terms for those architectural elements. A famous connoisseur of painting and calligraphy and a commentator on the history and theories of painting, Guo was an erudite scholar. We cannot conclude that no other Song scholars knew more about building matters than Guo did, but in the case of complex technical matters (structures and related terms), the majority of them probably did not understand particular architectural procedures and building technologies as adequately as craftsmen did. Although scholars like Guo indeed made efforts to transcribe particular architectural terms as best they could and as accurately as they were able, they made mistakes simply because they were

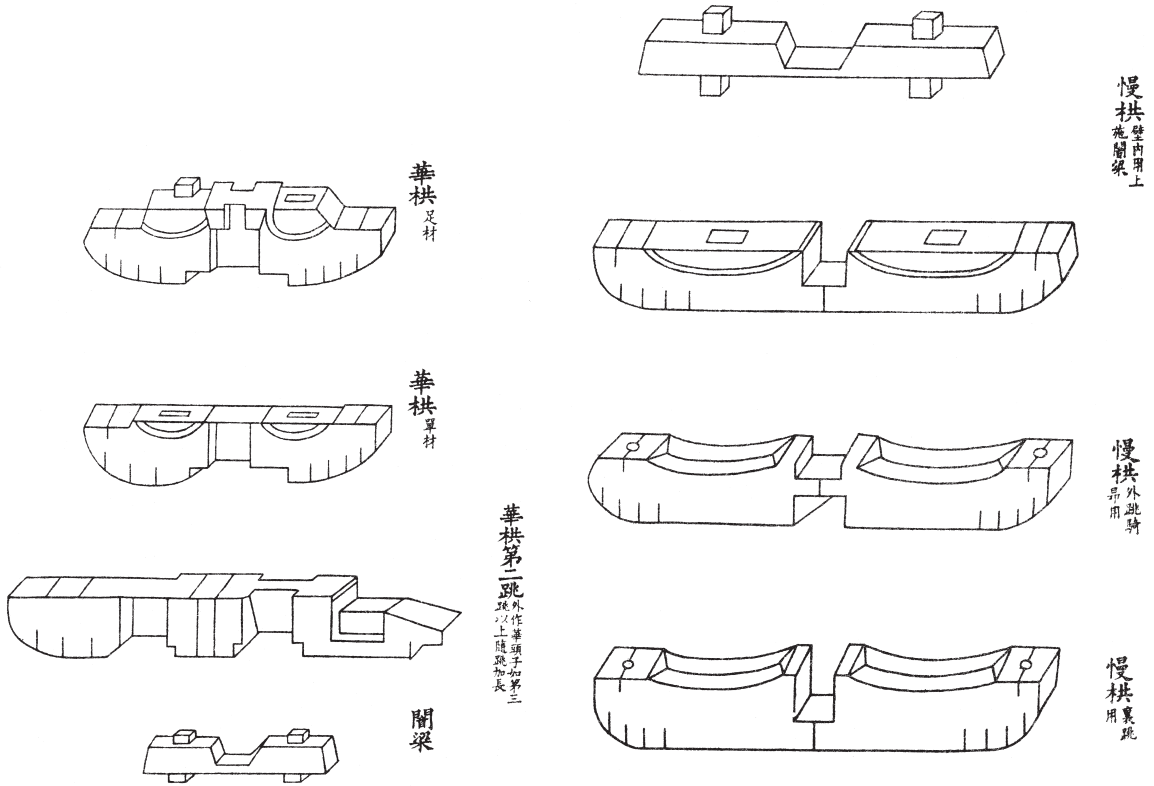


FIGURE 5.4. YZFS illustration of mortises of *huagong*, specifically showing an *anishi* stiffener (or filling timber) at the bottom (*juan* 30:11a; note scribal error of label *anliang* 闇梁, which should be *anzhi* 闇架)

FIGURE 5.5. *Anzhi* as illustrated in the YZFS (*juan* 30:12a) (the *anzhi* is shown at the top, and the caption of the top *mangong* includes “上施闇架” [*anzhi* to be installed on the top]; note scribal error of *anliang* 闇梁, which should be *anzhi* 闇架)

not professional builders and because they were not—at least not always—the source of those rather complicated, very technical terms.

Craftsmen, however, not only were professionally skilled, but, in a culturally brilliant society like Song China, they also could be literate. During the Song period, not only scholars but also emperors, officials, and commoners enjoyed singing and, more important, composing *ci* poems.³⁴ In the Song period, folk *ci* poems were also popular and frequently transmitted from cities to rural areas.³⁵ The invention of printing during the Northern Song period must have stimulated the transmission of poems and literature as well as other written information, and it made mass literacy possible. *Ci* poems were composed for singing, and singing and listening to *ci* poems was almost a routine practice in everyday life. Craftsmen must have taken

part in the popular practice of *ci* poetry during the Northern Song period. They surely were able to apply their knowledge of the difference between *lingci* and *manci* in formulating architectural nomenclature.

The Cases of *Wuyun* 吳雲 (*Wu-Style Clouds*), *Caoyun* 曹雲 (*Cao-Style Clouds*), *Wudian* 吳殿 (*Wu-Style Halls*), and *Caodian* 曹殿 (*Cao-Style Halls*)

Most of the decorative patterns or motifs in use are illustrated in the *YZFS*, although the transmitted images available to us do not necessarily always help understand Song-period decorative patterns precisely. However, the two kinds of cloud patterns classified in the *YZFS*, *wuyun* 吳雲 (*wu*-style clouds) and *caoyun* 曹雲 (*cao*-style clouds), are not explained and illustrated at all in the *YZFS*. These two terms bring to mind two other *YZFS* terms containing the words *wu* 吳 and *cao* 曹, namely, *wudian* 吳殿 (*wu*-style halls) and *caodian* 曹殿 (*cao*-style halls). As the *YZFS* states, *wudian* was a “popular” (俗) term for *si'e diange* 四阿殿閣 (four-slope tower-type halls), the highest rank of any hall with a single layer of eaves, which was also popularly called *wujidian* 五脊殿 (five-ridge halls).³⁶ *Caodian* is an alternative term for a hall of the type *shaliangtou zao* 廈兩頭造 (construction having a gable roof at the top and a hip roof at the bottom, which therefore contains nine ridges), the second-highest rank of any hall with single-layer eaves. The *YZFS* includes an annotation about this construction: “Jin yi yong cizhi wei diange zhe, su weizhi caodian, you yue handian, yi yue jiujiudian” 今亦用此製為殿閣者、俗謂之曹殿、又曰漢殿、亦曰九脊殿³⁷ (Nowadays, those tower-type halls that are also built according to this construction method are popularly called *caojian* [*cao* halls], and also called *handian* 漢殿 [Han halls] or *jiujidian* 九脊殿 [nine-ridge halls]). So the term *caodian* was a contemporary (今) popular name for halls of a nine-ridge construction during the Northern Song period, as was the “popular” term *wudian*. In fact, in his *Tuhua jianwen zhi* Guo Ruoxu also mentions *handian* and *wudian* as part of the essential architectural knowledge for painters.³⁸ Although *caodian* is not included in this account, there is no doubt that *wudian* and *handian* as well as *caodian* were all practical architectural terms during the Northern Song period. The *Tuhua jianwen zhi* was completed around 1080, about twenty years before the completion of the *YZFS*. Now the question is what *wu* and *cao* meant in the terms *wu* halls, *cao* halls, *wu* clouds, and *cao* clouds, and what cultural implications these terms bore.

What Are *Wu* and *Cao*: Aesthetic Harmony in Arts and Architecture

It has been suggested that *wu* in *wu* halls and *cao* in *cao* halls refer to the names of two great painters of pre-Song periods: Wu Daozi 吳道子 (ca. 689–759) of the Tang and Cao Zhongda 曹仲達 of the Northern Qi (550–577),³⁹ but there is no detailed discussion as to why *wu* and *cao* in the two architectural terms must derive from the names of these two artists. The artistic styles and techniques of Wu and Cao were indeed extremely influential upon Song art. In the *Tuhua jianwen zhi*, Guo Ruoxu presents a special discussion on the styles of Cao and Wu in which he clearly states that Song artists referred to the styles of these two greatest painters as *cao* and *wu*:

曹吳二體、學者所宗。按唐張彥遠《歷代名畫記》稱：“北齊曹仲達者、本曹國人、最推工畫梵像。”是為曹。謂唐吳道子曰吳。⁴⁰ The two styles of Cao and Wu are followed by [art] students [today]. According to the *Lidai minghuaji* [Record of celebrated paintings of all times, 847] by Zhang Yanyuan [815–907] of the Tang, [it] says: “Cao Zhongda of the Northern Qi was by origin a native of the realm of Cao. All acknowledged his supremacy in painting icons of Indian [type].” Here is our *cao*, while our *wu* is Wu Daozi of the Tang.

Following this statement, Guo specifically discusses the significant difference between the styles of Cao and Wu:

吳之筆其勢圓轉而衣服飄帶、曹之筆其體稠疊而衣服緊窄、故后輩稱之曰：“吳帶當風、曹衣出水。” Wu’s brush gave an effect of smooth curving, and his robes billowed upward. Cao’s brush was a style using close-set parallels, and his robes were clinging and tight. It was for this reason that later men held that Wu’s girdles were caught by the wind, while Cao’s garments were just out of the water.⁴¹

The styles of the two painters featured in this account are important for understanding the connection between the artistic styles of Wu and Cao and the forms of roofs as well as the decorative forms of cloud motifs in the *YZFS*. Wu’s style is characterized by smooth curving (圓轉) and elegantly waving (飄) lines and contours. Cao’s style is characterized by dense lines (稠疊) and clinging, tight (緊窄) contours—the costumes that he painted look as if water could be wrung from them. In addition, Guo comments on Wu’s brush style as “落筆雄勁” (the fall of his brush is gallant and strong).⁴²

It is important that Guo points out that there had been no such abridged terms *cao* and *wu* to represent the two distinct styles of art before the Tang period. In his discussion, Guo counters various opinions about what *cao* and *wu* represent in other accounts, refuting the claim that *cao* and *wu* refer to figures from the Three Kingdoms and Southern Dynasties periods. He emphasizes that those artists did not gain great reputations and that their theories were “never widely accepted” but had been forgotten with the passage of time. He then concludes,

至如仲達見北齊之朝、距唐不遠、道子顯開元之后、繪像仍存。證近代之師承、合當時之體範。況唐室已上、未立曹吳。
As for Cao Zhongda, he made his appearance in the Northern Qi dynasty, not long before the Tang. [Wu] Daozi's fame dates from the Kaiyuan era (713–742), and figures painted by him are still extant, so that there is [visible] proof that the school traditions of recent times have been in agreement with the modes and standards of that age. Moreover, prior to the house of Tang, no contrast between *cao* and *wu* styles existed.⁴³

Accordingly, the terms *cao* and *wu* as designations of the two characteristic artistic forms originated only during the Northern Song period. In an annotation to his discussion of the styles of Cao and Wu, Guo states that “the contrast between the style of Cao and that of Wu is a basic one for sculpture as well” (彫塑鑄像亦本曹吳).⁴⁴ In addition to Wu's style, which was extremely popular, Wu's use of colors in painting was also distinctive. According to Guo's comments, Wu's handling of colors was “simple and light” (傳彩簡淡),⁴⁵ and from Wu's time to Guo's time, painters, and also sculptors, who handled colors in the simple, “thoughtless” manner (輕拂丹青) of Wu were known as *wuzhuang* 吳裝 (*wu*-style decorators).⁴⁶

Thus, *cao* and *wu* were two abridged terms commonly recognized by Song artists (painters, sculptors, and others) as designating the representative styles of Cao Zhongda and Wu Daozi. In a sense, architectural craftsmen and designers were among those artists whose work must have been influenced by the famous styles of Cao and Wu. In a nine-ridge hall, the main ridge and the four gable ridges are on top of the four hip ridges, making a total of nine slopes on the roof. The four gable ridges discontinue at the end of the gable roof, and the four lower ridges start from this position but extend in entirely different directions from those where the top four ridges extend. To Song artists or craftsmen, these elements together must have created a combined visual effect of a relatively “tight,” “narrow,” and “line-changing”

roof contour (figures 5.6, 5.7; see also figure 3.8). The roof of a five-ridge hall, in contrast, consists of only four hip ridges creating four simple slopes. These ridges extend directly from the two ends of the main ridge, which creates a “gallant,” “free-flowing,” “strong,” and “vigorous” roof contour. A roof of such a contour is distinctly different from the “broken-line” contour of a nine-ridge hall (figure 5.8). It is very likely that these pronounced differences between the forms of these two kinds of roofs induced Song craftsmen to “popularly” connect them with the styles of Cao and Wu, respectively, and to therefore name these roof forms *cao* halls and *wu* halls, respectively.

We can thus see that the arts of painting, sculpture, and architecture during the Northern Song period were in aesthetic harmony. Artists of all professions widely accepted and followed the principles developed from the styles of Cao and Wu, a legacy of the Tang and earlier-period tradition. Having seen the



FIGURE 5.6. *Cao*-style halls of tenth to eleventh centuries: (top) main hall (964) of the Hualin Monastery in Fuzhou; (above) Moni Hall (1052) of the Longxing Monastery, Zhengding (author photographs)



FIGURE 5.7. *Cao*-style hall as seen from the Dragon Pavilion (rebuilt during the Ming period) of the Shrine for the God of the Ji River, in Jiyuan, Henan (author photograph)



FIGURE 5.8. *Wu*-style hall: Sanqing Hall, Yongle Daoist Monastery (13th–14th c.) (after Steinhardt, *Chinese Architecture*, 236, fig. 6.32)

impact of the Cao and Wu styles upon Song architectural terminology for the forms of roofs, it certainly would make sense that artists of wall painting and architectural color painting (painting timber elements in color and with various motifs) also applied the principles of the contrasting styles of Wu and Cao in their work. The two terms *wuyun* and *caoyun* in the *YZFS* reflect this widely evidenced artistic principle. Beyond polychrome painting as discussed in the *YZFS*, these two terms might also have been used widely in Song artistic practice, such as painting, wherever cloud motifs were concerned.

The Forms of *Cao*-Style Clouds and of *Wu*-Style Clouds

Based on the discussion of the styles of Cao and Wu, we can deduce that the form of *wuyun* clouds would be more associated with gallant, strong, free-flowing lines of clouds than that of *caoyun*, and *wuyun* would be more associated with the simple and light use of color. According to the characteristics of the style associated with Cao, we can consider *caoyun* clouds as possessing dense lines, more ornamental details, and a narrow, tight contour. With regard to color, a *caoyun* cloud would be embellished with heavier pigments than that of *wuyun*. In Guo's description of Wu's handling of color, he stresses that those pigments applied heavily (設色重) in some paintings by Wu were never applied by Wu himself but by later artists.⁴⁷ As Cao's style and methods were opposite to those of Wu in many ways, we can deduce that a *caoyun* cloud might be depicted with heavy pigments in addition to careful, delicate, dense lines. In the extant *YZFS* illustrations, most of the authentic *wu*-style clouds and *cao*-style clouds must have been lost in the copying of later periods. But the floating clouds depicted in the fourth leaf of *juan 34* of the *YZFS* probably belong to one style, somewhat like *wu*-style clouds (figure 5.9). In the material record, the rising clouds

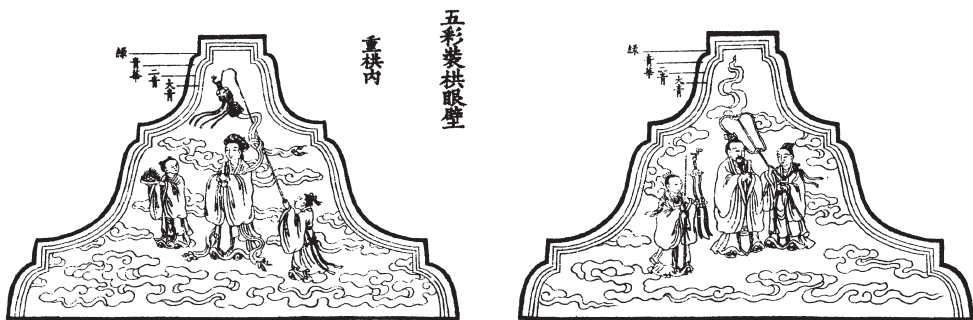


FIGURE 5.9. *YZFS* illustrations of color-painting styles used on the filling board between bracket sets: (left) *juan 34:4b*; (right) *juan 34:4a*

depicted in the wall painting of the tomb for Empress Li 李后 (d. 977) of Emperor Taizong (r. 976–997) of the Song represent a different style (figure 5.10).⁴⁸ The rising clouds contain more small clusters next to one another and a more winding tail than the floating clouds in the extant *YZFS* images. The same style of clouds—somewhat like *cao*-style clouds—is also seen in the pictorial stone column base at the tomb of Empress Cao 曹后 in Emperor Renzong's Yongzhao Mausoleum 永昭陵 (figure 5.11).⁴⁹

The *YZFS* presents an annotation on the *caoyun*: “蕙草雲、蠻雲之類同”⁵⁰ (*hui* grasslike clouds, *man* [barbarian tribes in the south] clouds, and the like belong to this category). The “*hui* grasslike clouds” and “barbarian clouds” are also mentioned in the *YZFS* discussion of decorative motifs in wood carving, in which these two kinds of clouds and *huyun* 胡雲 (barbarian clouds) are considered to be of the same type.⁵¹ Obviously, the *caoyun* style is associated in the *YZFS* with a barbarian style. As Guo Ruoxu states, Cao Zhongda was a native of the realm of Cao. Modern sources explain that the realm of Cao was in the western regions 西域 (including modern Xinjiang and parts of central Asia).⁵² *Cao*-style clouds may thus have been flavored with a central Asian style, or at least associated more with that style than was a *wu*-style cloud.⁵³

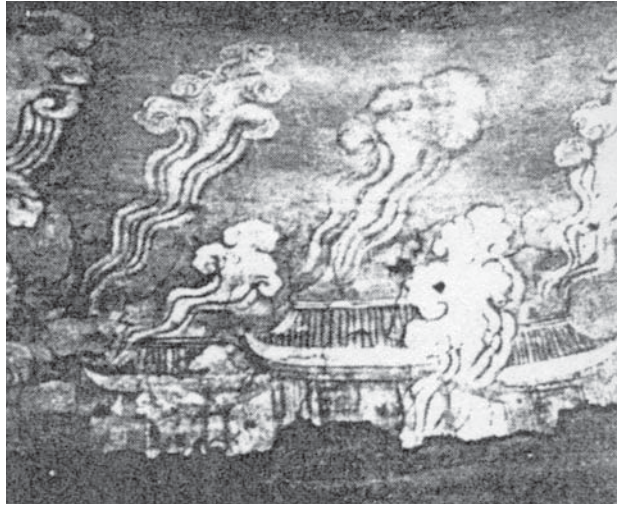


FIGURE 5.10. Rising clouds and palaces depicted in wall painting of the tomb for Empress Li of Emperor Taizong (after Guo Husheng, “Henan Gongxian Songling diaocha,” plate 10, no. 8)

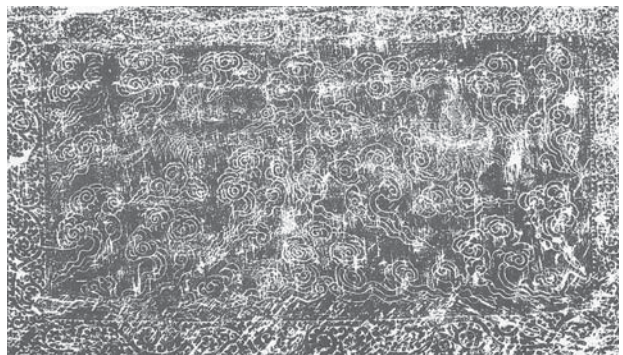


FIGURE 5.11. Rising clouds depicted on north side of pictorial stone column base in the tomb of Empress Cao in Emperor Renzong's Yongzhao Mausoleum (after Henansheng Wenwu Kaogu Yanjiusuo, *Bei Song huangling*, 164)

Between Learned Society and Craftsmen: Working toward a Shared Architectural Vocabulary and Knowledge

While Song craftsmen were more or less literate and able to name particular building elements using literary words, it is not true that scholars contributed nothing to architectural knowledge. As shown by the example I related, scholars like Guo Ruoxu were transcribing technical architectural terms that were seldom available in written language. Although they did not understand particular architectural procedures as adequately as craftsmen did, they were nonetheless greatly concerned about architecture, were willing to learn difficult technical nomenclature, and regarded such terms and the corresponding building elements as essential knowledge of the field of architecture. Whether they heard those technical terms from their colleagues or from craftsmen directly, they were recording and sharing the technical terms craftsmen were using in practice. They wrote down the architectural knowledge as they acquired it, mostly orally, and that written knowledge of architecture, despite mistaken transcriptions, in turn significantly facilitated the transmission of this knowledge and increased the opportunities for communication between learned society and craftsmen.

The manner of such communication must have been more complex than one group simply learning everything from another. It would not have been a simple matter of scholars being capable of contributing only aesthetic theories and never engaging in practical aspects of building. Likewise, it would be simplistic to assume that craftsmen were responsible for all practical building methods and technical terminology without consulting members of learned society.

From historical records, it can be seen that there were certain occasions when craftsmen indeed received advice from knowledgeable artists and scholars regarding how to design buildings properly. For example, as recorded in the Northern Song monk Wenying's 文瑩 (fl. eleventh century) jottings *Yuhu qinghua* 玉壺清話 ([Contemporary] stories excerpted from corpora at Yuhu, 1078), when the tenth-century master craftsman Yu Hao 喻皓 was building the wood-framed pagoda at the Kaibao Monastery (開寶寺) in the capital of Bianliang under orders from Emperor Taizong, he consulted Guo Zhongshu 郭忠恕 (fl. 837, d. 977), a scholar-official and artist gifted in ruler-lined painting (*jiehua* 界畫), and modified his design after listening to Guo's criticism:

將建開寶寺塔、浙匠喻皓料一十三層、郭以所造小樣末底一級折而算之、至上層、余一尺五寸、殺收不得。謂皓曰：宜審之。皓因數夕不寐、以尺較之、果如其言。黎明叩其門、長跪以謝。⁵⁴ When the pagoda of the Kaibao Monastery was about to be constructed, the craftsman from Zhe, Yu Hao, designed a thirteen-story [pagoda]. Guo measured the miniature model [Yu had made], calculating from its bottommost story, and at its top, [only] one foot and five inches remain, [which] made it impossible to have [reasonable] entasis treatments [for structural elements at the appropriate position] and [to reasonably] assemble [structural components of the framework]. Guo told Hao: “You should examine it carefully.” Hao therefore did not sleep for several nights, rectifying his design by careful measurement, and sure enough it was as Guo had said. At daybreak he knocked on Guo’s door, kneeling for a long time to thank [Guo].

Guo Zhongshu was an erudite scholar and an expert in philology; one of his influential works was the *Peixi* 佩觿 (Bodkin worn on the girdle [of young people, a metaphor for philological studies]). On the occasion in question, the mistake that Guo found in Yu’s design related to the measurement of each story of the pagoda and the ratios between them. The advice was crucial and indeed the matter was so important that it caused Yu to work through several sleepless nights in order to correct the mistake. Although it is not clear whether the discussion between Guo and Yu involved particular structural elements and technical terms, Guo’s knowledge of architectural technology was good enough to instruct Yu, a nationally known highly skilled craftsman who nonetheless likely was occasionally careless despite having already designed magnificent structures by that time.

Historical texts also offer indications that Song scholars engaged in the construction practice, some intelligently and creatively designing timber structures. For instance, during the Jingding 景定 period (1260–1264) of the Southern Song, a group of scholars in Huzhou 湖州 (in modern Zhejiang) sponsored and had built the Wenchang 文昌 (God of Literary Prosperity) Shrine with the aid of some officials:

文昌廟……宋景定辛酉、蜀人牟子才率吳蜀士夫創建、以祀梓潼之神。吏部郎中程端昇等咸助成之。⁵⁵ The Wenchang Shrine . . . in the year of Xinyou [1261] of the Jingding period of the Song, Mo Zicai [牟子才] from the Shu region led some scholars from the Wu and Shu regions in order to enshrine the

God of Literary Prosperity. The senior secretary of the Board of the Civil Office Cheng Duansheng [程端昇] and others all helped in the completion of the construction.

Similarly, during the Northern Song period, the scholar Su Shunqin 蘇舜欽 (1008–1048) patronized the construction of the Canglang Pavilion 滄浪亭 in Suzhou, where he resided for several years after he suffered a setback in his political career. In particular, Su Shi 蘇軾 (1036–1101), the great Northern Song statesman and brilliant writer, painter, and calligrapher, claimed in his writings that in 1091 he designed and built—most likely with the aid of construction laborers—a special, movable wood-framed pavilion while he served as the procurator of Ying Prefecture 潁州 (modern Fuyang 阜陽, Anhui):

維古潁城、因潁為隍……我欲即之、為館為堂。近水而構、夏潦所襄。遠水而築、邈焉相望。乃作斯亭、筵楹欒梁。鑿枘交設、合散靡常。赤油仰承、青幄四張。我所欲往、一夫可將。與水升降、除地布床……無脛而趨、無翼而翔。⁵⁶ Old Ying City relies on the Ying River as its city moat . . . I intend to get close to it [the river], make a pavilion or a hall. Building near the river, heavy rains in summer can be drained off [from the hall]. Constructing at a distance from the river, [I can] gaze far afield. [I] then made this pavilion, with bamboo-mat columns and *luan* 欒 [goldenrain tree] beams. Mortises and tenons are installed [on all elements] to connect [them], all able to be disassembled and assembled freely. Roofed by a red tarpaulin, its four sides are covered with blue curtains. If I want to go somewhere, all [disassembling, moving, and rebuilding it] can be done with one person's strength. It goes up and down as the river does, [and I] prepare the ground and set up beds . . . [It] walks without legs, flying without wings.

For the convenience of viewing beautiful natural scenery wherever he found it near the Ying River, he made his Zesheng 擇勝 (selecting scenic spots) Pavilion. This unusual, movable structure is described as having timber columns and beams (筵楹欒梁) connected to one another by mortises and tenons, all capable of being freely disassembled and reassembled (鑿枘交設、合散靡常) by means of the strength of a “single person” (一夫可將). We do not know exactly what this pavilion may have looked like, and it is most likely an exaggeration to claim the pavilion could be moved by one

person. Nevertheless, we must admit that Su fully understood the principle of a wood-framed structure and how to put its components together by taking advantage of mortises and tenons (*sunmao* 榫卯). Such a movable timber structure is rare in the history of Chinese architecture. We seldom come across historical materials describing such a wood-framed, movable structure as Su's. Su was a genius in literature and the arts, and so too seemingly in the domain of architecture. He was remarkably creative in his idea of designing such a movable timber structure. He applied his knowledge of architecture in practice, using this knowledge for pleasure. Able to be managed by one person's strength, such a pavilion would not have been as sophisticated as a building with a complex structural system and an imposing appearance, rather, it was roofed in red tarpaulin and its four sides were covered with blue curtains (赤油仰承、青幄四張). Nevertheless, Su's professional knowledge of architectural components and construction is undeniable. How, then, did he come to know about architecture and construction?

As brilliant as Su was, we could attribute his knowledge of architecture to broad reading and diligent study of all available written sources. However, practice must have been a prerequisite for his skillfulness in constructing mortised timber structures. Yet in the course of gaining experience in architecture, he might have interacted with and been assisted by other people—either lower-level men working with him who were talented in architecture or a group of craftsmen. Historical records indeed indicate that Su was actively engaged in several construction projects for flood control in his official career as the procurator for the prefectures of Xuzhou 徐州, Hangzhou 杭州, and Yingzhou 潁州. For instance, when Xuzhou was in danger of flooding, Su supervised the low-level officials and joined them in the fight against the flood, constructing and consolidating dams. Later, Su proposed to the court his idea of constructing a timber-plank bank (木岸) around the city walls to prevent flooding. The court approved his design of the plank embankment as a barrier to overflowing water.⁵⁷ Su's rich experience of construction and working with local skilled professionals must have aided his acquisition of knowledge of building technology.

At the same time, the talented Su nonetheless showed respect for the important role of craftsmen in construction. In the following note, Su states the necessity of seeking the professional advice from master craftsmen before building a house:

夫富人之營宮室也、必先料其資材之豐約、以製宮室之大小。然後擇工之良者而用一人焉。必告之曰：“吾將為屋若干、度用材幾何？役夫幾人？幾日而成？土石竹葦、吾于何取之？”其工之良者必告之曰：“某所有木、某所有石、用財、役夫若干。”主人率以聽焉。及期而成。既成而不失當、則規矩之先定也。⁵⁸ Whenever rich people build their residences, [they] always first consider the amounts and limits of their money and materials so as to decide how big their residences can be. After that, [they] choose from among the most skillful craftsmen and hire one of them. [They] always tell the craftsman: “I am going to make several houses. How much material would you estimate to be needed? How much labor? How many days [will it need] to complete the construction? As for clay, stones, bamboo, and reeds, where should I obtain them?” The most skillful must tell them: “[It needs] this much timber, this amount of stones, this amount of money, and this amount of labor.” The master usually follows it [the craftsman’s advice]. The construction is completed in time. It is completed and nothing is improper, which is because rules have been made in advance.

Su reflects upon an important aspect of general building practice in Song times: when the rich were in need of professional consultation about building, they normally turned to craftsmen directly, instead of scholars. This suggests that in the eyes of most people craftsmen were more authoritative in terms of actual construction matters than literati. Su also recognizes craftsmen’s advice as very necessary to guarantee houses are built properly.

Song accounts indeed suggest a general advancement in the social status of craftsmen during the Song dynasty. An account in Shen Kuo’s 沈括 (1031–1095) *Mengxi bitan* 夢溪筆談 (Brush talks at the Dream Creek, 1086–1093) points to this gradual yet significant social change:

郭進有才略。於城北治第。既成、聚族人賓客落之。下至土木之工皆與。乃設諸工之席於東廡、群子之席於西廡。人或曰：“諸子安可與工徒齒？”進指諸工曰：“此造宅者”、指諸子曰：“此賣宅者、固宜坐造宅者下也。”⁵⁹ Guo Jin had talent and great sagacity. He built his residence in the north of the city. When it had been built, he gathered his family members and guests for the ceremony celebrating the

completion of construction. All [from those of high social class] down to those craftsmen and builders attended. [Guo Jin] then set up seats for all the craftsmen in the eastern corridor, [setting up] seats for all the notables in the western corridor. Someone said, “How can all the notables and craftsmen sit side by side?” Jin pointed at all the craftsmen, saying, “These are those who construct houses.” [He] pointed at all the notables, saying, “These are those who trade houses and should thus sit lower in position than those constructing houses.”

Although it is not clear whether Guo Jin 郭進 was a scholar—most likely he was—how he positioned the “notables” (likely including rich and educated people or local celebrities) and craftsmen at the ceremony is so important for us in attempting to discern social changes in the Song dynasty. The craftsmen were positioned at the left, traditionally for those of higher social ranks, while the celebrities or educated people were seated at the right, traditionally for those of relatively lower social levels. Yet someone challenged this arrangement, but Guo Jin, a man of “sagacity”—implying the writer Shen Kuo’s attitude toward Guo’s behavior—offered a straightforward explanation. In Guo’s eyes, craftsmen deserve greater respect, a higher social status, and better treatment. Most likely, Shen Kuo would have shared Guo’s opinion. If Guo Jin in this account indeed was a scholar, an intellectual like him must have kept rather close contact with various craftsmen. We can assume that in the process of constructing his residence, there must have been an active cooperation between him, his family, his peers, and those professionals. Such cooperation would have stimulated a considerable degree of mutual understanding and consultation, thus promoting a significant interaction between practical and theoretical knowledge of architecture.

It thus makes sense that Song scholars like Guo Zhongshu, Guo Ruoxu, and Su Shi were intimately involved with architectural knowledge. Like Guo Jin, they acknowledged and could appreciate the work of craftsmen. We are reminded of the great enthusiasm of many known scholars—Yang Yi, Ouyang Xiu, Li Gefei, Shen Kuo—for the master craftsman Yu Hao’s technical skill and the *Mujing*. Willing to communicate with craftsmen, they offered direct advice to craftsmen and acquired essential architectural knowledge as they studied texts and listened to the words of craftsmen. Again, those like Guo Ruoxu tried to grasp and spread the technical terms that craftsmen were using in practice, and in so doing, they promoted a

shared knowledge of architecture among learned society and professionals. This attitude toward technical architectural knowledge was shared by other scholars, such as Shen Kuo, who excerpted in his writings specific aspects of building technology from Yu Hao's *Mujing*. Scholarly writing on craftsmen, architectural terminology, and general building knowledge must have profoundly influenced the literati's general perception of craftsmen and the architectural profession in Song times. The Song dynasty witnessed a great change in traditional theories of painting in which the *jiehua* 界畫 paintings of architectural subjects were promoted as one of the most important genres of painting. In the imperial catalogue of paintings *Xuanhe huapu* 宣和畫譜 (A book of model paintings compiled during the Xuanhe [宣和] era [1119–1125]), for instance, the *wumu* 屋木 genre, namely the *jiehua*, is ranked third. The official promotion of the rank of *jiehua* in painting theory reveals one aspect of a greater degree of acknowledgement of the architectural profession in Song society. This must also have stimulated a greater desire to gain more essential knowledge of architecture among artists and in learned society in general. More and more men of letters must have given attention to the architectural profession and paid more interest to building technology than in previous times.

The *YZFS* is just such a product of the social change regarding the value of craftsmen and architecture. It provides a model for an active communication between scholars and craftsmen. Although Li Jie claims that he *compelled* (*le* 勒) craftsmen to explain building methods item by item (并勒人匠逐一講說),⁶⁰ he actually showed respect for the craftsmen's specialized knowledge of building technology just as Guo Ruoxu, Ouyang Xiu, or Shen Kuo had done. He recorded the architectural methods and technical terminology as the craftsmen instructed, and after examining them, he presented this practical knowledge in the form of a national building standard. In addition, based on the textual tradition in architecture, he presented legitimized architectural examples and terminology contained in literary sources. By doing so, he—like his peer Guo Ruoxu—also endeavored to promote shared building knowledge and a shared architectural vocabulary among different social groups. As a consequence, the *YZFS* text presents a mixture of popular or even vulgar, simple, oral language and refined, elegant, sophisticated, written language. As I have argued, Song craftsmen were more or less literate and may have been responsible for some elegant literary terms as well, as in the cases of *linggong*, *mangong*, *wuyun*, and *caoyun*. In general, many traditional, literary terms that Li Jie clearly indicated he found in the classics and early literature were added as standard terms to the

architectural vocabulary of the *YZFS*, which complemented contemporary popular-language-based professional terminology. A few examples of such terms include *juetou* 爵頭 (literally, “tip of a *jue* ritual bronze,” or “head of a sparrow”), an element on top of a bracket set, *yangma* 陽馬 (corner beams), *fei’ang* 飛昂 (flying cantilevers), and *ying’ang* 英昂 (flowering cantilevers), the source of which was evidently earlier-period literature.⁶¹ The Song equivalents of these terms are *shuatou* 耍頭 (playing head) or *husun tou* 胡孫(獼猴)頭 (macaque head), *jiaoliang* 角梁 (corner beam), and *xia’ang* 下昂 (downward cantilever) or *shang’ang* 上昂 (upward cantilever), respectively. Both these literary terms and many popular-language-based terms became legitimized architectural nomenclature after Li Jie recognized them and put them into the *YZFS*. They were widely accepted by society, shared among officials, scholars, and craftsmen alike.

The cooperation between scholars and craftsmen was more conspicuous during the late imperial period, when more and more scholars engaged in architectural design. Some scholars began criticizing craftsmen for being too rigid. Others claimed they could do a better job than craftsmen in terms of design. Some even claimed that they indeed instructed craftsmen as to what to do. It appears that during the Ming and Qing periods, scholars more strongly felt that it was their social obligation to serve as advisors to craftsmen in the matter of architecture.

The late-Ming scholar Ji Cheng 計成 (b. 1582, courtesy name Wupi 無否), who claimed to be good at painting since childhood and who became known from his designs of gardens, summarized his theories of garden design in his *Yuanye* 園冶 (The craft of gardens), the first treatise on the art of landscape architecture in Chinese history. In this well-illustrated technical, scholarly treatise, Ji Cheng not only deals with the designs of landscape architecture and its elements, including pavilions, fences, balustrades, ornamental paving, the forms of doors and windows, but, more important, also summarizes practical principles of garden siting and effective methods of creating artistic landscape settings. This indicates Ming scholars’ keen interest in and knowledge of practical methods of architecture.

In the work, Ji Cheng criticizes craftsmen for being overly rigid and lacking a spirit of creativity; he thus makes clear the importance of scholars’ involvement in the design of gardens and architecture. He writes,

世之興造、專主鳩匠、獨不聞三分匠七分主人之諺乎。非主人也、能主之人也……若匠惟雕鏤是巧、排架是精、一梁一柱、定不可移、俗以“無竅之人”呼之、其確也……第園

築之主、猶須什九、而用匠什一。Generally in construction, responsibility is given to a team of craftsmen. But do they simply not know the proverb that three-tenths of the work is the workmen's and seven-tenths [of it] is that of the "master"? [By "master" here I] do not mean the owner of the property, but the man who is capable [of mastering the work] . . . If a workman merely carves skillfully, or sets up the framework of a building competently, with every single beam and pillar absolutely firm and immovable, it is quite correct to call him by the popular expression "a mere mechanic" . . . The master in charge of constructing a garden residence should really account for nine-tenths of the work, and the workmen he employs for one-tenth.⁶²

Ji Cheng emphasizes the importance of having a capable "master" in charge of the construction of the buildings and gardens. As an experienced designer of gardens, he claims that scholars like himself were entitled to the creative work of garden design and construction. In his view, in construction craftsmen are needed for three-tenths of the work, while the role of the intelligent garden designer (a scholar like himself) is seven-tenths of it; if in building a garden, the role of the genius (scholar) designer is even larger, responsible for nine-tenths of the work, only one-tenth of it is left to the craftsmen.

Another Ming scholar, Zheng Yuanxun 鄭元勛 (1598–1645), who commented on Ji's book, shared Ji's attitude, pointing out the shortcomings of craftsmen and emphasizing the extremely important role that scholars needed to play in garden and building practice. He wrote, "工人能守、不能創、拘牽繩墨" (Workmen can follow instructions but are not creative, having only to stick to their plumb lines and ink marks). He praises Ji Cheng's gift in innovation: "此計無否之變化、從心不從法、為不可及、而更能指揮運斤。使頑者巧、滯者通、尤足快也" (This Ji Wupi [Ji Cheng] has changed all that: he goes by the concept, not by a fixed set of rules, something that most people cannot achieve. Thus he is even better at directing operations successfully, so that the stubborn becomes flexible and the blocked flows freely. This is really something to be glad about).⁶³ What Zheng stresses about the superiority of scholars like Ji Cheng over craftsmen is related to a spirit of originality, a capability of innovation. Zheng calls on all those wishing to build country retreats and gardens to seek Ji Cheng's advice: "宇內不少名流韻士、小築卧游、何可不問途無否?" (There are many distinguished connoisseurs in the world who wish to build country retreats and gardens and enjoy roaming

freely in a small space. How can it be not asking Wupi's advice?). Among such "distinguished connoisseurs" who wanted to build small gardens and artificial hills and took great pleasure in living in such retreats, there must have been many scholars. If scholars and the wealthy building such gardens indeed received Ji Cheng's advice on garden design, they would likely have applied this knowledge in their supervision of the construction of gardens while working together with craftsmen. This would have promoted effective transmission of knowledge among both literati and craftsmen. Zheng expected Ji Cheng's treatise on gardens to be of the same value as the "Kaogongji": "今日之國能、即他日之規矩、安知不與《考工記》并為膾炙乎?" (Today's genius of national status will become a standard for later generations to emulate. Who can say that this book [*Yuanye*] will not become an object of praise in the mouths of all, rivaling even the "Kaogongji"?).

According to Zheng's foreword to the *Yuanye*, he himself knew a little about garden design and construction, but Ji Cheng's talent was superior: "予自負少解結構、質之無否、愧如拙雞" (I can claim to know a little about garden design and construction myself, but beside Wupi, I feel as clumsy as a cuckoo [that cannot even build its own nest]). As modest as Zheng was, we thus know that not only scholars like Ji Cheng, who personally engaged in architectural practice, but scholars like Zheng, who did not possess much experience, also felt the need to offer specific knowledge of garden and building design to both craftsmen and learned society. Originality was the key issue for Ming and Qing scholars engaged in construction and eager to instruct their peers and those they employed—craftsmen.

The early Qing scholar Li Yu 李漁 (1611–1680) in his *Xianqing ouji* 閑情偶記 (Occasional remarks jotted down while at leisure, 1671) sums up his theories on the art of landscape architecture. As he claims, the top priority among his ideas for creating gardens is originality: "創造園亭、因地制宜、不拘成見、一榱一桷、必令出自己裁" (In creating and building gardens and pavilions, I have a design that best suits the concrete circumstances of the site. Without confining myself to fixed rules, I let every single rafter be made after my own creation). He claims that he invented many new methods (新制) that no one else had ever seen (新制人所未見),⁶⁴ and he illustrated those methods as much as he could. He indeed created many unique practical methods, including *huoyan* 活檐 (flexible eaves), *douli* 斗笠 (bamboo hat) shaped ceiling, and *bianmian* 便面 (fan-shaped lattice) windows. More important, whenever he created a new building method, he instructed his craftsmen to do as he designed. For example, regarding his

creative design of a bamboo-hat-shaped ceiling, he wrote: “予為新制……但令工匠畫定尺寸、旋而去之” (I made a new method . . . simply asking craftsmen to mark the designed measurements, cut the timber, and make it accordingly).

While Li Yu was proud of his ability for original designs, he also had the courage to make a self-criticism. In the following passage, Li claims that he often designed window lattices and “taught craftsmen orally and let them make them” (口授工匠使為之); at the same time, he sometimes found that designs similar to his were already in use, which made him aware that he might have had too high an opinion of himself:

予往往自制窗欄之格、口授工匠使為之、以為極新極異矣。而偶至一處、見其已設者、先得我心之同然、因自笑為遼東白豕。獨房舍之制不然、求為同心甚少。門窗之物、新制既多、予不復贅、恐又蹈白豕轍也。惟約略言之、以補時人之偶缺。⁶⁵ I often design lattices for windows and railings myself, and have instructed craftsmen orally and let them make them. They [craftsmen] thought my designs very new and very different. Sometimes I would happen to go to a place and find the window lattices used there had the same concept as mine. I then laughed at myself for having too high an opinion of myself. But the methods for buildings and houses are different. I have seldom found something used was of the same concept as mine. For things like doors and windows, since there are many new methods out there, I will not repeat unnecessarily, because I am afraid of having a high opinion of myself again. For these, I will make only brief mention, so as to complement what happens to be missing in the world.

It is important to note that some of Li's new designs were similar to what was already in use. Li noticed this and so decided to record only those he did not find in contemporary building practice. There are two points worthy of mention: Scholars like Li Yu endeavored to “complement what happened to be missing in the world” (以補時人之偶缺) and to make a unique contribution to architectural knowledge. Although some scholars were talented in garden and building design, some modestly acknowledged that their “new” designs were actually already in evidence in the built environment. While they continued to feel strongly the need to teach craftsmen, they also examined their ideas against popular practice, which mostly involved the work done by craftsmen. On the other hand, they strove

to invent new building methods, and their designs were indeed accepted by craftsmen and others, who “thought [these designs] very new and very different” (以為極新極異矣). Thus the architectural knowledge created by scholars like Li Yu became an important part of the practical building system.

In addition, the Ming scholar Wen Zhenheng 文震亨 (1585–1645) offered many valuable garden and landscape design ideas in his *Zhangwu zhi* 長物志 (Record of superfluous things, 1621).⁶⁶ The Qing-period scholar Li Dou 李斗 (fl. Qianlong 乾隆 [1736–1795] era) in his note on the building practices of Yangzhou 揚州, the *Gongduan yingzao lu* 工段營造錄 (Record of the procedures of architectural construction, 1797),⁶⁷ recorded practical building methods and an extensive list of architectural terms. All these indicate Ming and Qing scholars’ increasing concern about building and construction practices.

As we have seen, Ming-Qing scholars not only became more actively involved in the writing and promulgation of theories on architecture but also created their own building methods and new terms. One might ask if such activities were widely put into practice during this period. According to the historical materials that have been unearthed, it is very likely. Certainly, we must note that scholars felt the need to engage in the practical knowledge of the field and claimed they exerted a significant advisory influence on craftsmen. And that their designs and aesthetic ideas were in cases similar to what was already in practice must mean their designs and ideas were not conceived as strange or exotic and thus did not meet much difficulty in being accepted and used by craftsmen. Thus, scholars enjoyed guiding craftsmen and society, and craftsmen and learned society in turn accepted the advice and designs of experienced scholars and incorporated their methods into building practice.

It should be clear that there was indeed ongoing cooperation between scholars and craftsmen at certain times in premodern China. The two social groups began working toward a shared vocabulary and knowledge beginning in the Song period. In general, scholars studied the textual tradition in architecture and identified useful architectural terms in the literary records, and those terms were introduced into contemporary building practice. Craftsmen developed complex techniques and scholars learned about them orally and transcribed them; such knowledge significantly complemented the literati’s insufficient knowledge of architecture. Sometimes craftsmen consulted with scholars about architectural designs, and scholars at times offered direct advice to craftsmen. Sometimes scholars indeed invented some

new practical architectural knowledge and instructed craftsmen to follow their designs, and these new building methods and architectural terms were accepted and shared by craftsmen and their colleagues. We can probably say that scholars and craftsmen were two interactive forces in the domain of building knowledge. Each side had its own advantages in the field. The communication and cooperation between these two social forces uniquely yet significantly contributed to practical and theoretical architectural knowledge, an essential aspect of Chinese civilization. Such a splendid and intriguing interaction became greater and greater during the late imperial period, but the increased scholarly interest in architecture and the increased interaction that it brought about started in the most culturally brilliant and artistically prosperous of times—the Song dynasty. The active interplay of architecture and literature was richly, sophisticatedly represented in and behind the technical relevance of the *YZFS*, a text reflecting the engagement of learned and “unlearned” culture in Song China.

Conclusion

The powerful metaphorical system formed by the bracketing terminology in the *YZFS*—bracket sets likened to clusters of flowers and bracket elements likened to flowers, petals, branches, and leaves—and the marks that literature and the arts left on both bracketing terms and other architectural names indicate just a few of the many aspects of how Song architectural methods and technical features recorded in the *YZFS* were connected with contemporary literature and culture. These aspects reflect the engagement of learned and “unlearned” culture in Song times, suggesting an interplay of the two social groups—learned society and architectural professionals—in premodern China. These cultural connotations demonstrate why the *YZFS* should be seen as more than a mere technical manual. It presents a fusion of the practical and literary traditions. Probably no other text reflects such rich cultural factors affecting Song craftsmen’s architectural design and construction as does this imperial building manual.

Examining the relationship between technology and culture, this research has attempted to open a new mode of understanding architecture and its distinctive culture in imperial China—technical nomenclature encounters culture. Technical terminology can be coherently systematic, bearing a certain culture-bound meaning. To uncover such cultural implications, we must study carefully how given terms make sense in relation to actual technical (in this case, architectural) procedures. More important, we must question whether such culture-bound systematic terminology is

related to any distinctive imagery or cultural concepts that reflect the specific intellectual and social phenomena of the relevant historical times.

Through this research, we are able to know that many distinctive cultural factors were embedded in Chinese building technology. This embedding is a key to understanding how the practical and the theoretical realms interacted and how Chinese culture shaped its material surroundings and developed its intellectual ideal—in short, how it built its specific architecture of knowledge. The abundant cultural implications of the architectural terminology of the *YZFS*—and the text as a whole—add to the value of the *YZFS* as a unique literary work and as a source for traditional and contemporary building culture and beyond, a reference for the distinctive Song social system pertinent to construction practices. If we read a Chinese building manual and any technical sources with such values in mind, we will obtain from their technical relevance more than just an understanding of the technical methods.

Previous Scholarship on the *YZFS*

Modern scholarship on the *YZFS* emerged in the 1920s. The scholarship then and down to the 1930s focused on a general understanding of the historical background, transmission, and some technical contents of the *YZFS*. Naitō Torajirō 内藤虎次郎 (better known as Naitō Konan 内藤湖南, 1866–1934) offered one of the earliest brief reviews of this compilation.¹ Paul Demiéville also reviewed the text and introduced this imperial Chinese architectural treatise to the West.² At that time, little Western scholarship on Chinese architectural methods was available. Treating both the bibliographical data and the technical methods of the *YZFS*, Demiéville submitted the world's first scholarly study of a part of the *YZFS*. He was not capable of discussing the major carpentry system, which he evaluated as the most important part of the *YZFS*. However, he suggested that the difficult terms in these chapters could be understood if one sought assistance from builders and craftsmen with the aid of the illustrations in the *YZFS*. The approach that he suggested was one of the very ways in which, years later, Liang Sicheng and his colleagues—representing the vanguard of Chinese architectural studies in China—endeavored to understand the imperial Qing building manual *Gongcheng zuofa* and the *YZFS*.

Tao Xiang 陶湘 (1871–1940) and Kan Duo 闕鐸 (1875–after 1925), in the colophons of the 1925 edition of the *YZFS*, offered the earliest two scholarly studies of the transmission and authorship of the *YZFS* in twentieth-century China.³ In 1929, Itō Seizō 伊藤清造 studied the

stonework and carving techniques in the *YZFS*.⁴ He identified the main elements of stone balustrades described in the *YZFS* and indicated each term in the corresponding *YZFS* illustrations (in *juan* 29, 11a–b). He made a mistake in indicating the *yingxiang* 櫻項 (vase-shaped supports under the main railing, decorated with clouds on the top) on the single-support balustrade (單鉤闌), which are actually *cuoxiang* 撮項 (hatchetlike supports under the main railing). But all other elements were identified correctly. This was probably the first identification of these Song-period architectural elements, which are not indicated in the *YZFS* illustrations. With the aid of the Japanese system of stone carving, Itō also offered a preliminary study of the six steps of the carving process and the four carving methods of the *YZFS*.⁵ He suggested that the *haishiliubua* (exotic pomegranate flowers), one of the most popular carving motifs during the Song period, might have been a flower transmitted far from the south of China.⁶ Although Itō's suggestion was debatable, he was one of the earliest scholars to study the origins of the decorative motifs in the *YZFS*. In 1930, Walter Perceval Yetts (1878–1957) recovered eighteen folios of the *YZFS* illustrations of the color-painting system from the fragments of a manuscript copy of the *Yongle dadian* dated to 1567, found in England. He identified that these pictures resembled the original Song style more than any other images in all existing copies of the *YZFS*.⁷

From the 1940s to the 1960s, comprehensive studies of the *YZFS* building technology began to be produced. During 1939 to 1943, Takeshima Takuichi's 竹島卓一 (1901–1992) commentary notes on the technical methods of the *YZFS* appeared in Japanese journals, which prompted critical reviews by Japanese scholars.⁸ On the basis of his previous publications, he completed a three-volume monograph on the *YZFS* in 1970, which demonstrated that he was one of the most important contributors to the field.⁹ The work treated all building systems in the *YZFS*, which was unprecedented. In particular, his work on the minor carpentry system was probably the earliest comprehensive study of that *YZFS* section in the world. Takeshima also stressed that the origin of the architectural methods in the *YZFS* during the pre-*YZFS* period would be the most important subject to determine its place in Chinese architectural history.¹⁰

Liang Sicheng and Takeshima were born in the same year and were studying the same subject almost at the same time. Nevertheless, it was unlikely that they had any scholarly communication. In the 1940s, in an English manuscript on Chinese architectural history, Liang introduced the building methods of the *YZFS*, including those of wood-framed construction,

modules, and bracketing.¹¹ This was probably the first comprehensive study in modern scholarship on the architectural methods of the major carpentry system of the *YZFS*, which profoundly augmented modern scholars' knowledge of Chinese timber architecture. About twenty years later Liang completed his commentary on the *YZFS*, in which he further reconstructed its major carpentry system and interpreted many difficult technical terms and methods. This work positioned him as a leading scholar of *YZFS* building technology.¹² Liang's extensive reconstructed images of beam structures and bracketing are regarded as "the most important drawings" of the *YZFS* by a modern scholar.¹³ Liang's complete scholarship on the *YZFS* was published in 2001, which, however, did not include a comprehensive study of all the building systems of this treatise.¹⁴

Since the 1970s, modern scholarship has continued to explore the text and its building methods in further detail. Else Glahn is another Western scholar who stimulated great Western interest in the *YZFS* during the 1970s to 1980s.¹⁵ Chen Mingda 陳明達 (1914–1997), in his two-volume monograph on the major carpentry system,¹⁶ presented detailed discussion and tabulations of the modular system and clarified the architectural design methods that were only vaguely articulated in the *YZFS*. Some scholars consider Chen's research to be complementary to Liang's in terms of his proposition of design methods, despite some partial guesswork. In a coauthored article, Chen also studied the achievements of Song architecture in terms of mechanics as reflected in the treatise.¹⁷ Xu Bo'an 徐伯安 (d. 2002) and Guo Daiheng 郭黛姮, former assistants to Liang, wrote several articles during the 1980s on the major carpentry system and on carving techniques in the section on stonework.¹⁸ They also provided a concise and useful glossary of the terms in the sections on moats and fortifications, stonework, and major carpentry.¹⁹ Pan Guxi 潘穀西 (b. 1928) was likely the first to suggest that the architectural standards in the *YZFS* should be associated more with southern technology than with northern.²⁰ Guo Qinghua offered the first English monograph on the *YZFS* and a full English translation of the two chapters on the major carpentry system, although there are many instances where the translation needs to be revised.²¹ Tanaka Tan 田中淡 offered a Japanese translation with commentary of the preface, the "Kanxiang," and the "Zongshi" of the *YZFS*.²² In general, modern scholarship defines and recognizes the *YZFS* as a work of a "strictly technical nature."²³ Most scholars have engaged in studies of the structural systems and building technologies of the *YZFS*, and their research has focused mainly on the major carpentry system.

Notes

1. Naitō, “*Eizō hōshiki no shin’in bon.*” Naitō compared the modern republished edition of the *YZFS* (1919 and 1920 editions) with a manuscript copy of the *Siku quanshu* (All works in the Four Collections; the catalogue of the imperial Qing library, completed 1790) edition that he and other Japanese scholars copied in 1905. Naitō concluded that the text in the 1920 edition possessed fewer errors, while the *Siku quanshu* edition had better illustrations. He thought that the drawings in the *Siku quanshu* edition resembled the original Song style. Nevertheless, the drawings in the *Siku quanshu* edition were later known to less accurately resemble the Song style.
2. Demiéville, “Che-yin Song Li Ming-tchong *Ying tsao fa che.*”
3. This edition publishes the tomb epitaph of Li Jie, the author of the *YZFS*, which was found in a Southern Song account. As the chief editor of this edition, Tao offered a survey of the transmission of the text and a comparison of various editions; Kan Duo offered a complementary biography of Li Jie. See Kan Duo, “Li Jie buzhuān”; Tao Xiang, “Fashi shiyu.”
4. Itō Seizō, “*Eizō hōshiki to Kōtei sabō*” 營造法式と工程做法 (The *YZFS* and the *Construction Methods*), in Itō, *Shina no kenchiku*, 53–67.
5. Itō Seizō, “*Sōdai no ishiku*” 宋代の石工 (The stonework of the Song dynasty), in *Shina no kenchiku*, 168–172.
6. *Ibid.*, 171.
7. See Yetts, “Note on the ‘*Ying Tsao Fa Shih.*’” In addition, Yetts made Li Jie’s biography and the bibliographical studies of the *YZFS* by Tao and Kan available to the West; see his “Writings on Chinese Architecture.”
8. Takeshima published seventeen articles on the *YZFS* in *Kenchiku-shi* 建築史 (Architectural history) during 1939–1944. See, for example, “Shina kenchiku ni okeru hashira no nobi to uchikorobi”; “*Sōdai ni okeru hōi no kettei to mizumori hō.*” Critical reviews of Takeshima’s scholarship on the *YZFS* appeared during 1940–1943 in *Kenchiku zasshi* 建築雑誌 (Journal of architecture). The writers included Yamamoto Shōho 山本章甫, Ōta Hirotarō 太田博太郎, Murata Jirō 村田治郎, and, more actively, Suda Atsuo 須田敦夫.
9. Takeshima, *Eizō hōshiki no kenkyū*. This work earned a Monbushō (Ministry of Culture) award.
10. Takeshima, “*Eizō hōshiki no kachi.*”
11. This manuscript was posthumously published in 1984; see Liang Ssu-ch’eng, *Pictorial History of Chinese Architecture*.
12. Liang Sicheng, *Yingzao fashi zhushi*, v. 1. As a posthumous work, it reflects the scholarship completed before Liang’s death in 1972. According to Lin Zhu 林洙, Liang had completed his writing of this work by 1966; see Lin Zhu, *Kunhuo de dajiang*, 80.
13. See Glahn, “On the Transmission of the *Ying-tSao Fa-shih.*” 265.
14. Liang Sicheng, *Liang Sicheng quanji*, v. 7. This volume republished Liang’s *Yingzao fashi zhushi* and his commentaries on the other building systems of the *YZFS*. In these commentaries, Liang’s explanations of these building methods are terse. In some cases, such as the sections on the niches for Buddhist and Daoist images, wall sutras, and revolving sutra libraries, he does not explain the contents at all.
15. See Glahn, “On the Transmission of the *Ying-tSao Fa-shih.*”; “Some Chou and Han Architectural Terms”; “Chinese Building Standards in the 12th Century”; “Unfolding the Chinese Building Standards.”
16. Chen Mingda, *Yingzao fashi damuzuo yanjiu*.
17. Du Gongchen and Chen Mingda, “Cong ‘*Yingzao fashi*’ kan Bei Song de lixue chengjiu.”
18. Xu Bo’an and Guo Daiheng, “Diaobi zhi mei, qili qianqiu.”

19. Xu Bo'an and Guo Daiheng, "Song 'Yingzao fashi' shuyu huishi."
20. See Pan Guxi, "Yingzao fashi chutan." See also Pan Guxi and He Jianzhong, *Yingzao fashi jiedu*.
21. Guo Qinghua, *Structure of Chinese Timber Architecture*.
22. Tanaka, "Eizō hōshiki jijo kanshō sōshaku bubun kōho yakuchū (jō)."
23. For example, see Ruitenbeek, *Carpentry and Building in Late Imperial China*, 25.

Appendix 2

ARCHITECTURAL TYPES GLOSSED IN THE *ERYA* AND IN THE *SHIMING*

Terms for buildings (including two for cities)	“Shigong” (<i>Erya</i>)	“Shigongshi” (<i>Shiming</i>)
<i>Gong</i> 宮 (hall, palace, residence, or chamber)	×	×
<i>Shi</i> 室 (hall, especially chamber, also residence, palace)	×	×
<i>Jia</i> 家 (inside a hall, chamber)	×	
<i>Zhai</i> 宅 (residence “at a geomantically auspicious site”) ¹		×
<i>She</i> 舍 (house, cottage)		×
<i>Yu</i> 宇 (covered building)		×
<i>Wu</i> 屋 (hall, house, building)		×
<i>Dian</i> 殿 (magnificent hall, especially palace hall)		×
<i>Bi</i> 陛 (stairs to high terrace leading to imperial palace hall)		×
<i>Jiashi</i> 夾室 (side room inside a chamber)		×
<i>Tang</i> 堂 (hall)		×
<i>Fang</i> 房 (side room outside a chamber)		×
<i>Tai</i> 臺 (high terrace)	×	×
<i>Xie</i> 榭 (open hall on a high terrace)	×	
<i>Guan</i> 觀 or <i>que</i> 闕 (watchtower near the front gate of a palace)	×	×
<i>Lu</i> 櫓 (uncovered, overhanging watchtower)		×
<i>Shu</i> 塾 (palace gatehouse)	×	
<i>Miao</i> 廟 (shrine)	×	×
<i>Qin</i> 寢 (soul-sleeping chamber)	×	×
<i>Lou</i> 樓 (tower)	×	×
<i>Cheng</i> 城 (city)		×
<i>Guo</i> 郭 (outer city)		×

ARCHITECTURAL TYPES GLOSSED IN THE *ERYA* AND IN THE *SHIMING* (continued)

Terms for buildings (including two for cities)	“Shigong” (<i>Erya</i>)	“Shigongshi” (<i>Shiming</i>)
<i>Si</i> 寺 (government office)		x
<i>Ting</i> 廷 (yard)		x
<i>Yu</i> 獄, <i>lao</i> 牢, <i>yuantu</i> 圜土 (literally, “round earthen walls”), <i>lingyu</i> 囹圄 (jail)		x
<i>Ting</i> 亭 (pavilion)		x
<i>Zhuan</i> 傳 (posthouse or inn)		x
<i>Wa</i> 瓦 (public gathering place)		x
<i>Gi</i> 茨 (thatched cottage)		x
<i>Lu</i> 廬 (hut, thatched cottage)		x
<i>Pu</i> 蒲 or <i>an</i> 菴 (round thatched cottage)		x
<i>Wu</i> 廡 (large house) ²		x
<i>Di</i> 隄, <i>liang</i> 梁 (bridge)	x	
<i>Shijiang</i> ³ 石杠, <i>ji</i> 倚 (stone bridge)	x	
<i>Shi</i> 埽 (fowl pen)	x	
<i>Jing</i> 井 (well)		x
<i>Cang</i> 倉 (storehouse)		x
<i>Ku</i> 庫 (warehouse)		x
<i>Jiu</i> 廄 (stable)		x
<i>Lin</i> 廩 (granary)		x
<i>Qun</i> 囷 (round barn)		x
<i>Yu</i> 庾 (uncovered barn)		x
<i>Dun</i> 囷 (reed barn)		x
<i>Chui</i> 圖 (round thatched barn)		x
<i>Ce</i> 廁 (outhouse)		x

Note: *x* indicates inclusion.

1. Liu Xi, *Shiming*, *juan* 5, “Shigongshi,” 84: “宅、擇也。擇吉處而營之也。” (*Zhai* is “to choose”; choosing an auspicious place to construct it [the residence]). Therefore, *zhai* denotes both normal residences and those for dead people, i.e., tombs, as is seen in pre-Qin classics.
2. *Ibid.*, 89: “大屋曰廡。廡、幪也。幪、覆也。並糞人謂之庠。庠、雅也。雅、正也。屋之正大者也” (A large house is called *wu*. *Wu* means *hu*; *hu* is to cover [a large space]. Sanitation servants called it *ya*. *Ya* means *ya* [for elegance]; *ya* [for elegance] is “upright,” which means a large, square house). The explanation of *wu* suggests that *wu* in the pre-Qin period represented only a large hall, which is different from the meaning “corridors,” the meaning from the late Han.
3. “杠” is pronounced “jiang”; see Lu Deming, *Jingdian shiwen*, *juan* 29, “*Erya yinyi*,” part 1, “Shigong,” 1630.

Appendix 3

STRUCTURAL ELEMENTS GLOSSED IN THE *ERYA* AND IN THE *SHIMING*

Structural elements of a wood-framed building whose terms are glossed	Corresponding terms in the “Shigong” of the <i>Erya</i>	Corresponding terms in the “Shigongshi” of the <i>Shiming</i>
beam	<i>mangliu</i> 宋廂, <i>liang</i> 梁	<i>liang</i> 梁
column	<i>ying</i> 楹	<i>zhu</i> 柱, <i>ying</i> 楹, <i>qing</i> 輕
dwarf post on beam	<i>zhuo</i> 柁	<i>zhuonou</i> 榑櫛 (literally, “short tree like a dwarf” [<i>zburu</i> 侏儒])
square timber on capital	<i>bian</i> 闌, <i>ji</i> 枅	
large timber (used as supporting element under eave or beam), bracket arm	<i>gong</i> 拱	<i>luan</i> 欂
block on capital	<i>er</i> 栴, <i>jie</i> 欂	<i>lu</i> 櫨
blocks at two ends of an arm		<i>dou</i> 斗
purlin	<i>dong</i> 棟, <i>fu</i> 桴	<i>yin</i> 檼, <i>wang</i> 望, <i>dong</i> 棟
rafter	<i>jue</i> 桷, <i>cui</i> 榑	<i>jue</i> 桷, <i>chuan</i> 椽, <i>cui</i> 榑
rafter reaching eave	<i>yue</i> 閱	
rafter not reaching eave	<i>jiao</i> 交	
eave	<i>di</i> 檐, <i>yan</i> 檐	<i>yan</i> 簷, <i>yan</i> 檐
eave-connecting board		<i>lü</i> 椳, <i>man</i> 椳
lintel	<i>mei</i> 楣, <i>liang</i> 梁	<i>mei</i> 楣
slanted brace resting on beam and supporting purlin		<i>wu</i> 梧
reed or bamboo mat for roofing	<i>yao</i> 筵	<i>ze</i> 箝
ridge		<i>wuji</i> 屋脊, <i>meng</i> 甍
wall	<i>qiang</i> 牆, <i>yong</i> 墉	<i>bi</i> 壁, <i>qiang</i> 牆, <i>luan</i> 垣 (short wall); <i>yong</i> 墉 (tall wall, city wall)

ENTRIES ON ARCHITECTURE IN THE *TAIPING YULAN* (IN ORDER OF APPEARANCE)

Groupings of the ninety entries	Individual entries
Palaces and residences, from imperial halls to private and ordinary houses (group A, sixteen entries)	<i>gong</i> 宮 (palace), <i>shi</i> 室 (palace), <i>dian</i> 殿 (hall), <i>tang</i> 堂 (residential hall, with <i>tanghuang</i> 堂皇 [underground chamber] included), <i>lou</i> 樓 (tower), <i>tai</i> 臺 (high terrace), <i>que</i> 闕 (watchtower), <i>guan</i> 觀 (watchtower), <i>zhai</i> 宅 (residence), <i>di</i> 第 (mansion), <i>di</i> 邸 (residence of a high official), <i>wu</i> 屋 (house), <i>jia</i> 家 (inside of a hall), <i>she</i> 舍 (house, cottage), <i>lu</i> 廬 (hut, with <i>tusu</i> 屠蘇 [flat hut] included), <i>an</i> 庵 (round hut)
Gates, doors, and small gatelike buildings in palaces and residences (group B, eleven entries)	<i>men</i> 門 (gates and doors), <i>hu</i> 戶 (door leaves), <i>shu</i> 樞 (door pivot), <i>guan</i> 關 (door bars), <i>yue</i> 鑰 (door locks), <i>wei</i> 闈 (small side gate in a palace), <i>gui</i> 闈 (small gate with round top and square bottom), <i>be</i> 閣 (small gate or chamber in a palace), <i>ge</i> 閣 (small pavilion), <i>yi</i> 移 (small room connected to a pavilion), <i>ta</i> 闈 (gate or small chamber in a palace)
Other types of chambers and elements of a palace or residential compound (group C, twelve entries)	<i>tingshi</i> 廳事 (small hall of government office), <i>zhai</i> 齋 (study), <i>fang</i> 房 (side room of a large chamber), <i>ting</i> 庭 (courtyard), <i>jie</i> 階 (stairs), <i>bi</i> 陛 (stairs of imperial palace), <i>chi</i> 墀 (vacant space on the stairs of a hall), <i>xu</i> 序 (side chamber or partition), <i>lang</i> 廊 (corridor), <i>shu</i> 塾 (side room of a gate), <i>tan</i> 壇 (altar), <i>ping</i> 屏 (screen and screening wall)
Classical terms for space related to doors (group D, two entries)	<i>yi</i> 屜 (space between a door and a window), <i>zhu</i> 宁 (space between door and screen inside a hall)
Secondary buildings in residences (group E, four entries)	<i>chu</i> 廚 (kitchen), <i>jiao</i> 窖 (storage cellar), <i>dou</i> 竇 (tunnel), <i>ce</i> 廁 (outhouse)
Structural components, architectural elements, and decorations (group F, fifteen entries)	<i>qiangbi</i> 牆壁 (wall), <i>zhu</i> 柱 (column), <i>liang</i> 梁 (beam), <i>dong</i> 棟 (purlin), <i>chuang</i> 窗 (window), <i>jian</i> 檻 (railing), <i>chuan</i> 椽 (rafter), <i>yan</i> 檐 (eave), <i>zhuo</i> 柂 (short post on beam), <i>jie</i> 榘 (block), <i>ji</i> 枅 (bracket), <i>pushou</i> 鋪首 (door knocker), <i>zaojing</i> 藻井 (coffer), <i>chiwei</i> 鴟尾 (owl-headed fish tail [tile decoration]), <i>zhichu</i> 質礎 (footing)

ENTRIES ON ARCHITECTURE IN THE *TAIPING YULAN* (IN ORDER OF APPEARANCE)
(*continued*)

Groupings of the ninety entries	Individual entries
Classical terms for the four corners of the inside of a chamber (group G, four entries)	<i>ao</i> 奧 (southwestern corner), <i>wulou</i> 屋漏 (northwestern corner), <i>yi</i> 窻 (northeastern corner), <i>tu</i> 突 (southeastern corner)
Building materials (group H, two entries)	<i>zhuan</i> 磚 (brick), <i>wa</i> 瓦 (tile)
Wells and storehouses (group I, six entries)	<i>jing</i> 井 (well), <i>cang</i> 倉 (storehouse), <i>gun</i> 囤 (round barn), <i>yu</i> 庖 (uncovered barn), <i>fukucang</i> 府庫藏 (government storehouse for weapons and documents), <i>jiu</i> 廄 (stable, including imperial stable)
Cities and public buildings (group J, six entries)	<i>shi</i> 市 (market), <i>cheng</i> 城 (city, with <i>guo</i> 郭 [outer city], <i>hao</i> 壕 [moat], and <i>lu</i> 櫓 [watchtowers on the city walls] included), <i>guanyi</i> 館驛 (guesthouse, post), <i>chuan</i> (or <i>zhuan</i>) <i>she</i> 傳舍 (posthouse), <i>ting</i> 亭 (post; also pavilion), <i>nilü</i> 逆旅 (inn)
Roads and streets (group K, six entries)	<i>daolu</i> 道路 (road), <i>chidao</i> 馳道 (road for the imperial carriage), <i>tu</i> 塗 (road between halls), <i>qianmo</i> 阡陌 (crisscrossed footpaths between fields), <i>jie</i> 街 (street), <i>xiang</i> 巷 (lane)
Gardens (group L, two entries)	<i>yuanyou</i> 苑囿 (imperial hunting park, imperial garden), <i>yuanyu</i> 園圃 (garden, plantation, orchard)
Fences and folds (group M, three entries)	<i>juan</i> 圈 (fold), <i>lao</i> 牢 (pen, jail), <i>fanli</i> 藩籬 (hedge)
Ornamental columns in imperial architectural compounds (group N, one entry)	<i>huabiao</i> 華表 (ornamental columns erected in front of palaces or tombs)

QUOTATIONS OF CLASSICAL TEXTS FOR GONG IN THE ERYA SHU,
THE YZFS, AND THE TAIPING YULAN

Traditional texts on <i>gong</i> and <i>shi</i> quoted in the “Shigong” of the <i>Erya shu</i> ¹ (number before text indicates order of appearance; total seven)	Traditional texts quoted in the entry for <i>gong</i> in the YZFS (no entry for <i>shi</i> ; in order of appearance; total eleven) ²	Similar or identical texts on <i>gong</i> and <i>shi</i> in the <i>Taiping yulan</i> ³
(1) <i>Yi[jing]</i> , “Xici” section: 《易·繫辭》云：上古穴居而野處、後世聖人易之以宮室。上棟下宇、以待風雨。蓋取諸大壯。	(1) <i>Yi[jing]</i> , “Xici” section: 《易·繫辭》：上古穴居而野處、後世聖人易之以宮室。上棟下宇、以待風雨。	(8) <i>Yi[jing]</i> , “Xici” section: 《易〔繫辭〕》曰：上古穴居而野處、後世聖人易之以宮室。上棟下宇、以待風雨。蓋取諸大壯。
(6) <i>Shi[jing]</i> : 《詩》云：作於楚宮。又曰：入此室處。	(2) <i>Shi[jing]</i> : 《詩》：作於楚宮。揆之以日、作於楚室。	(6) <i>Mao Shi</i> (Mao Heng commentary on the <i>Shijing</i>): 《毛詩》曰：定之方中、作為楚宮。揆之以日、作為楚室。(with another entry from the <i>Mao Shi</i> following)
(7) <i>Liji</i> : 《禮記》曰：由士命以上、父子皆異宮。 <i>Liji</i> , “Sangfu” section: 又《喪服傳》：繼父為其妻前夫之子筑宮廟。	(3) <i>Li[ji]</i> : 《禮〔記〕》：儒一畝之宮、環堵之室。	(5) <i>Da Dai [Li]ji</i> : 《大戴〔禮〕記》曰：周時德澤和洽、高茂大、以為宮柱、名為蒿宮。[11]〔《禮記》〕又曰：儒有一畝之宮、環堵之室。
(4) Guo Pu’s commentary on the <i>Erya</i> glossing <i>gong</i> as <i>shi</i> (宮謂之室、室謂之宮)：郭云：“皆所以通古今之異語、明同、實而兩名。”	(4) <i>Erya</i> , “Shigong” section, with Guo Pu’s commentary: 《爾雅》：宮謂之室、室謂之宮。(Guo’s commentary):皆所以通古今之異語、明同、實而兩名。〕室有東西廂曰廟……。	(3) <i>Erya</i> : 《爾雅》曰：宮謂之室、室謂之宮。

QUOTATIONS OF CLASSICAL TEXTS FOR *GONG* IN THE *ERYA SHU*,
THE *YZFS*, AND THE *TAIPING YULAN* (*continued*)

Traditional texts on <i>gong</i> and <i>shi</i> quoted in the “Shigong” of the <i>Erya shu</i> (number before text indicates order of appearance; total seven)	Traditional texts quoted in the entry for <i>gong</i> in the <i>YZFS</i> (no entry for <i>shi</i> ; in order of appearance; total eleven)	Similar or identical texts on <i>gong</i> and <i>shi</i> in the <i>Taiping yulan</i>
	(5) <i>Mozi</i> 墨子 (text omitted)	
(2) <i>Baihutong</i> (General comprehension of the Five Classics compiled at the White Tiger Hall; also known as the <i>Baihu tongyi</i>): 《白虎通》云：黃帝作宮室。	(6) <i>Baihu tongyi</i> : 《白虎通義》：黃帝作宮〔室〕。	
(3) <i>Shiben</i> : 《世本》曰：禹作宮室。	(7) <i>Shiben</i> : 《世本》：禹作宮〔室〕。	(1) <i>Shiben</i> : 《世本》曰：堯使禹作宮。
	(8) <i>Shuowen [jiezi]</i> : 說文曰：宅、宅也。	[1] 說文曰：室、實也。(second entry under <i>zhai</i> [dwelling]) 說文曰：宅、人所託也。
(5) <i>Shiming</i> : 《釋名》云：宮、穹也。言屋見於垣上、穹、崇然也。室、實也。言人物實滿於其中也。	(9) <i>Shiming</i> : 《釋名》：宮、穹也。〔言〕屋見於垣上、穹、崇然也。室、實也。言人物實滿〔於〕其中也。	(2) <i>Shiming</i> : 《釋名》：宮、穹也。〔言〕屋見垣上穹隆也。
	(10) <i>Fengsu tongyi</i> 風俗通義 (Comprehensive meanings of customs; also known as <i>Fengsutong</i>): 自古宮室一也。漢來尊者以為號下、乃避之也。	[60] <i>Fengsutong</i> : ... 由是言之、宮室一也。秦以、尊者以為常號、乃避之耳。室也、實……
	(11) <i>Yixun</i> 義訓 (Explanation of meanings [of words]) (text omitted)	

Notes

- For all the following texts quoted in the *Erya shu* shown in the table, see Guo Pu, *Erya zhushu*, *juan* 5, section on “Shigong,” 1a.
- For all the texts quoted in the *YZFS* shown in this table, see Li Jie, *Yingzao fashi*, *juan* 1, “Zongshi,” part 1, 1b–2b.
- The numbers in parentheses indicate the order of appearance under the entry *gong*, while the numbers in brackets indicate the order of appearance under the entry *shi*.

Appendix 6

ARCHITECTURAL TERMS IN THE TERMINOLOGY SECTION OF THE YZFS AS COMPARED WITH THE TAIPING YULAN AND THE YIWEN LEIJU

Groupings	Terms treated in the “Zong-shi” section of the YZFS	Entries not in the <i>Taiping yulan</i> (indicated by <i>x</i>)	Entries not in the <i>Yiwen leiju</i> (indicated by <i>x</i>)
Major architectural types	<i>gong</i> (palace)		
	<i>que</i> (watchtower)		
	<i>dian</i> (hall with <i>tang</i> attached)		
	<i>lou</i> (tower)		
	<i>ting</i> (pavilion)		x
	<i>taixie</i> 臺榭 (high terrace and pavilion on terrace)	(<i>tai</i>)	(<i>tai</i>)
System of moats	<i>cheng</i> 城 (city)		x
	<i>qiang</i> (wall)	(<i>qiangbi</i>)	x
System of stonework	<i>zhuchu</i> 柱礎 (base of column)	(<i>zhichu</i> 質礎)	x
Fundamental building technologies for any construction	<i>dingping</i> 定平 (determining level)	x	x
	<i>quzheng</i> 取正 (determining directions and correct position)	x	x
	<i>cai</i> 材 (module for timber structure)	x	x

**ARCHITECTURAL TERMS IN THE TERMINOLOGY SECTION OF THE YZFS AS COMPARED
WITH THE *TAIPING YULAN* AND THE *YIWEN LEIJU* (*continued*)**

Groupings	Terms treated in the “Zong-shi” section of the <i>YZFS</i>	Entries not in the <i>Taiping yulan</i> (indicated by <i>x</i>)	Entries not in the <i>Yiwen leiju</i> (indicated by <i>x</i>)
Bracketing elements and related substructure	<i>gong</i> (bracket arm)	(<i>ji</i>)	x
	<i>fei'ang</i> 飛昂 (flying cantilever)	x	x
	<i>juetou</i> 爵頭 (protruding timber element on top of bracket set)	x	x
	<i>dou</i> 斗 (block)	(<i>jie</i>)	x
	<i>puzuo</i> 鋪作 (bracket set)	x	x
	<i>pingzuo</i> 平坐 (balcony substructure)	x	x
Weight-bearing and related structural elements	<i>liang</i> (beam)		x
	<i>zhu</i> (column)		x
	<i>yangma</i> 陽馬 (corner beam)	x	x
	<i>zhuruzhu</i> 侏儒柱 (dwarf post)	x	x
	<i>xiezhuzhu</i> 斜柱 (diagonal brace)	x	x
Structural elements and technologies related to roofs and eaves	<i>dong</i> 棟 (purlin)		x
	<i>liangji</i> 兩際 (two side ends of a roof)	x	x
	<i>bofeng</i> 搏風 (board at the side of a roof)	x	x
	<i>fu</i> 柎 (cushion timber)	x	x
	<i>chuan</i> 椽 (rafter)		x
	<i>yan</i> 檐 (eave)		x
	<i>juzhe</i> 舉折 (raise and break [method for roof curvature])	x	x
System of minor carpentry: doors, windows, and related elements	<i>men</i> (doors and gates)		x
	<i>wutoumen</i> 烏頭門 (<i>wutou</i> gate)	x	x
	<i>huabiao</i> 華表 (ornamental columns erected in front of palaces or tombs)		x
	<i>chuang</i> (window)		x
Minor carpentry: ceilings	<i>pingqi</i> 平棊 (ceiling)	x	x
	<i>doubazaojing</i> 闢八藻井 (coffer with octagon motif)	(<i>zaojing</i>)	x

**ARCHITECTURAL TERMS IN THE TERMINOLOGY SECTION OF THE YZFS AS COMPARED
WITH THE TAIPING YULAN AND THE YIWEN LEIJU (continued)**

Groupings	Terms treated in the “Zong-shi” section of the YZFS	Entries not in the <i>Taiping yulan</i> (indicated by <i>x</i>)	Entries not in the <i>Yiwen leiju</i> (indicated by <i>x</i>)
Minor carpentry: railings	<i>goulan</i> 鉤欄 (railing)	x	x
Minor carpentry: fences, screens, and the like	<i>juma chazi</i> 拒馬杈子 (horse-obstructing palisade)	x	x
	<i>pingfeng</i> (screen)	(<i>ping</i>)	x
	<i>luli</i> 露籬 (open-air hedge)	(<i>fanli</i>)	x
Other minor carpentry elements	<i>lian zhu</i> 椽柱 (posts under beam or purlin for holding frames of doors and windows)	x	x
System of tiles	<i>chiwei</i> (owl-headed fish tail [tile decoration])		x
	<i>wa</i> (tile)		x
System of mud work	<i>tu</i> (mud)	x	x
	<i>caihua</i> 彩畫 (wall painting)	x	x
System of masonry	<i>jie</i> (stairs)		x
	<i>zhuan</i> (brick)		x
	<i>jing</i> 井 (well)		x

Appendix 7

CLASSICS AND HISTORICAL SOURCES CITED IN THE YZFS

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Yi</i> 易 ([Book of] changes)	Anonymous; early to late Western Zhou	5 <i>gong</i> 宮 (palaces and chambers); <i>yan</i> 檐 (eaves); <i>dong</i> 棟 (purlins); <i>chuan</i> 椽 (rafters); <i>men</i> 門 (gates)
<i>Kaogongji</i> 考工记 (Records of artificers) (mostly from the section on <i>jiangren</i> 匠人 [artisans], quoted as a section of the <i>Zhouguan</i> 周官); with Zheng Zhong’s 鄭眾 (Zheng Sinong 鄭司農, d. 83) commentary	Anonymous; Spring and Autumn to Warring States periods	9 (plus 4 repetitions) <i>fangyuan pingzhi</i> 方圓平直 ([how to make] a square, a circle, level, and straightness); <i>quzheng</i> 取正 (determining the directions);* <i>dingping</i> 定平 (determining level);* <i>qiang</i> 牆 (walls);* <i>juzhe</i> 舉折 (raise and break);* <i>dian</i> 殿 (palatial halls); <i>cheng</i> 城 (cities); <i>yangma</i> 陽馬 (corner diagonal beams); <i>chuang</i> 窗 (windows)
<i>Zhouli</i> 周禮 ([Rites of the Zhou], or <i>Zhouguan</i>); with Zheng Sinong’s commentary	Anonymous	7 (plus 1 repetition) <i>quzheng</i> ;* <i>juma chazi</i> 拒馬叉子 (horse-blocking palisades); <i>que</i> 闕 (watchtowers); <i>cai</i> 材 (timber module); <i>pingfeng</i> 屏風 (screens); <i>tu</i> 塗 (mud); <i>caihua</i> 彩畫 (color painting)
<i>Yili</i> 儀禮 (Rites and ceremonies); with Guo Pu’s 郭璞 (276–324?) commentary	Anonymous	3 <i>dong</i> 棟 (purlins); <i>bofeng</i> 搏風 (wind-protecting roof boards); <i>yan</i>
<i>Li</i> 禮 or <i>Liji</i> 禮記 ¹ (Record of rites)	Anonymous	8 <i>gong</i> (palaces and chambers); <i>que</i> ; <i>dian</i> ; <i>taixie</i> 臺榭 (pavilions on high terraces); <i>cheng</i> ; <i>zhu</i> 柱 (columns); <i>yan</i> ; <i>pingfeng</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE YZFS (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Shangshu</i> 尚書 (Book of documents); including the <i>Zhoushu</i> 周書 (Zhou documents)	Anonymous	3 (plus 1 repetition) <i>qiang</i> ; [*] <i>tu</i> ; <i>jing</i> 井 (wells)
<i>Chunqiu Zuoshizhuan</i> 春秋左氏傳 (Zuo’s commentaries on the <i>Spring and Autumn Annals</i>)	Zuoqiu Ming 左丘明 (fifth century B.C.E.)	4 (plus 1 repetition) <i>qiang</i> ; [*] <i>cheng</i> ; <i>chuan</i> ; <i>men</i>
[<i>Chunqiu</i>] <i>Gongyang zhuan</i> 春秋公羊傳 (Gongyang’s commentaries on the <i>Spring and Autumn Annals</i> ; oral accounts attributed to Gongyang Gao 公羊高 [Warring States period])	Recorded in written form by Gongyang Shou 公羊壽 (fl. 156–143 B.C.E.) and Mr. Huwu 胡毋 (also known as Humu 胡毋; fl. 156–143 B.C.E.)	2 <i>cheng</i> ; <i>men</i>
<i>Shi[jing]</i> 詩(經) ([Book of] odes)	Anonymous	9 (plus 2 repetitions) <i>quzhen</i> ; [*] <i>qiang</i> ; [*] <i>gong</i> (palaces and chambers); <i>zhu</i> ; <i>yan</i> ; <i>men</i> ; <i>wa</i> 瓦 (tiles); <i>tu</i> ; <i>zhuan</i> 磚 (bricks)
<i>Erya</i> 爾雅 (Literary exposition); with Guo Pu’s commentary	Anonymous; Warring States to early Han periods	20 (plus 1 repetition) <i>qiang</i> ; [*] <i>gong</i> (palaces and chambers); <i>que</i> ; <i>lou</i> 樓 (towers); <i>taixie</i> ; <i>gong</i> 拱 (bracket arms); <i>dou</i> 斗 (blocks); <i>liang</i> 梁 (beams); <i>yangma</i> ; <i>zhuruzhu</i> 侏儒柱 (dwarf posts); <i>dong</i> ; <i>liangji</i> 兩際 (two side ends of a roof); <i>chuan</i> ; <i>yan</i> ; <i>men</i> ; <i>chuang</i> ; <i>pingfeng</i> ; <i>tu</i> ; <i>caihua</i> ; <i>zhuan</i>
<i>Yu</i> 語 or <i>Lunyu</i> 論語 (Analects)	Kong Qiu 孔丘 (Confucius; 551–479 B.C.E.) and his disciples	3 <i>dou</i> ; <i>zhuruzhu</i> ; <i>tu</i>
<i>Mozi</i> 墨子 (Micius)	Mo Di 墨翟 (480?–400 B.C.E.)	3 <i>fangyuan pingzhi</i> ; <i>gong</i> (palaces and chambers); <i>dian</i>
<i>Han[fei]zi</i> 韓非子 (legalist texts attributed to Han Fei)	Han Fei 韓非 (third century B.C.E.)	1 <i>fangyuan pingzhi</i>
<i>Guanzi</i> 管子	Guan Zhong 管仲 (d. 645 B.C.E.)	3 (plus 2 repetitions) <i>quzhen</i> ; [*] <i>dingping</i> [*]
<i>Zhuangzi</i> 莊子	Zhuang Zhou 莊周 (ca. 369–286 B.C.E.)	1 (plus 1 repetition) <i>dingping</i> [*]
<i>Laozi</i> 老子	Lao Dan 老聃 (fl. sixth century B.C.E.)	1 <i>taixie</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE *YZFS* (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Huainanzi</i> 淮南子 (Collection of essays presented by Liu An [劉安, Prince of Huainan, ca. 179–122 B.C.E.]	Liu An 劉安; presented to the court in 139 B.C.E.	4 (plus 1 repetition) <i>qiang</i> ;* <i>lou</i> ; <i>zhuchu</i> 柱礎 (base of column); <i>yan</i>
<i>Fuzi</i> 傅子 (Collected essays of Fu Xuan 傅玄 [Western Jin period (265–316)]; Confucian thought)	Fu Xuan 傅玄	1 <i>cai</i>
<i>Litu</i> 禮圖 (Illustrations of the [Three Classics of] Rituals; pre-Qin to Han text)	Zheng Sinong’s (d. 83) commentary	1 <i>fangyuan pingzhi</i>
<i>Shangshu dazhuan</i> 尚書大傳 (Great commentary on the <i>Shangshu</i>); some with commentary by Zheng Xuan 鄭玄 (127–200) or Ma Rong 馬融 (Han period)	Attributed to Fu Sheng 伏勝 or 伏生 (Qin period); completed second century B.C.E.; later attributed to Kong Anguo 孔安國 (d. ca. 100 B.C.E.)	3 (plus 1 repetition) <i>dingping</i> ; <i>qiang</i> ;* <i>dian</i>
<i>Wujing yiyi</i> 五經異義 (Peculiar meanings of the Five Classics)	Xu Shen 許慎 (ca. 55–ca. 149)	1 <i>cheng</i>
<i>Yizhuan</i> 易傳 (Commentary on the <i>Classic of Changes</i>)	Earliest by Wang Bi 王弼 (226–249)	1 <i>jing</i>
<i>Chunqiu Zuoshizhuan yinyi</i> 春秋左氏傳音義 (Pronunciation and meaning of Zuo’s commentary on the <i>Chunqiu</i>)	Lu Deming 陸德明 (556–627)	1 <i>chuan</i>
<i>Shiyi</i> 詩義 (Meaning of the <i>Classic of Odes</i>)	Lu Deming	1 <i>men</i>
<i>Lüshi Chunqiu</i> 呂氏春秋 (Mr. Lü’s [commentaries on the] <i>Spring and Autumn Annals</i> ; ca. 239 B.C.E.)	Lü Buwei 呂不韋 (d. 235 B.C.E.)	2 <i>cai</i> ; <i>zhu</i>
<i>Wuyue chunqiu</i> 吳越春秋 (Annals of the Wu and Yue kingdoms [during the Warring States period])	Zhao Ye 趙擘 (fl. 40)	1 <i>cheng</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE YZFS (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Guoyu</i> 國語	Attributed to Zuoqiu Ming, completed during the Warring States period	1 <i>Chuan</i>
<i>Shiben</i> 世本 (Pre-Qin historical book; lost)	commentary by Song Zhong 宋衷 (Han period)	3 <i>gong; caihua; jing</i>
<i>Shiji</i> 史記 (Records from the Grand Scribe)	Sima Qian 司馬遷 (ca. 145–ca. 86 B.C.E.)	3 <i>lou; cai; pingqi</i> 平棊 (ceilings)
<i>Hanshu</i> 漢書 (History of the [Western] Han)	Ban Gu 班固 (32–92)	3 <i>taixie; goulan</i> 鉤闌 (balustrades); <i>cai</i>
<i>Hanji</i> 漢紀 (also known as <i>Qian Hanji</i> 前漢紀, Abstract of [Ban Gu’s] <i>Hanshu</i>)	Xun Yue 荀悅 (148–209); presented to the court in 200	1 <i>chiwei</i> 鷓尾 (owl-headed fish tail [tile decorations])
<i>Gushikao</i> 古史考 (Examinations of history of ancient times)	Qiao Zhou 譙周 (third century)	1 <i>wa</i>
<i>Songshu</i> 宋書 (History of the [Liu] Song 宋 [420–479])	Shen Yue 沈約 (441–513)	1 <i>douba zaojing</i> 鬪八藻井 (octagonal or round coffer)
Commentaries on the <i>Qianhanshu</i> 前漢書註	second to sixth centuries; collected by Yan Shigu 顏師古 (581–645)	1 <i>huabiao</i> 華表 (ornamental columns in front of a palace)
<i>Shiji suoyin</i> 史記索隱 (Search for the profound truth of the <i>Shiji</i>)	Sima Zhen 司馬貞 (early eighth century)	1 <i>fangyuan pingzhi</i>
<i>Cangjie pian</i> 蒼頡篇 (Contents of the characters created by Cangjie); with Xu Jian’s 徐堅 (659–729) commentary	Li Si 李斯 (ca. 280–208 B.C.E.)	2 <i>dian; gong</i> (bracket arms)
<i>Fangyan</i> 方言 (Local dialects)	Yang Xiong 揚雄 (53 B.C.E.–18 C.E.)	2 <i>dong; yan</i>
<i>Baihu tongyi</i> 白虎通義 (General comprehension [of the Five Classics] compiled at the White Tiger Hall)	Ban Gu 班固 (32–92)	2 <i>gong</i> (palaces and chambers); <i>que</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE YZFS (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Fengsu tongyi</i> 風俗通義 (Comprehensive meanings of customs)	Ying Shao 應劭 (140–ca. 208)	6 <i>gong</i> (palaces and chambers); <i>que</i> ; <i>ting</i> 亭 (pavilions); <i>men</i> ; <i>douba zaojing</i> ; <i>jing</i>
<i>Tongsuwen</i> 通俗文 (Words of common use)	Fu Qian 服虔 (second century)	1 (plus 1 repetition) <i>juzhe</i> *
<i>Shuowen [jiezhi]</i> 說文(解字) (Explanations of words); with commentary by Xu Kai 徐鍇	Xu Shen 許慎 (ca. 55–ca. 149)	26 (plus 1 repetition) <i>qiang</i> ; * <i>gong</i> (palaces and chambers); <i>que</i> ; <i>dian</i> ; <i>lou</i> ; <i>ting</i> ; <i>cheng</i> ; <i>zhuchu</i> ; <i>cai</i> ; <i>fei'ang</i> 飛昂 (flying cantilevers); <i>dou</i> ; <i>zhu</i> ; <i>yangma</i> ; <i>xiezhu</i> 斜柱 (slanted braces); <i>dong</i> ; <i>bofeng</i> ; <i>fu</i> ; <i>chuan</i> ; <i>yan</i> ; <i>men</i> ; <i>huabiao</i> ; <i>chuang</i> ; <i>wa</i> ; <i>tu</i> ; <i>jie</i> 階 (stairs); <i>jing</i>
<i>Shiming</i> 釋名 (Explanations of terms)	Liu Xi 劉熙 (fl. 200)	27 (plus 1 repetition) <i>quzhen</i> ; <i>qiang</i> ; * <i>gong</i> (palaces and chambers); <i>que</i> ; <i>dian</i> ; <i>lou</i> ; <i>ting</i> ; <i>taixie</i> ; <i>cheng</i> ; <i>gong</i> (bracket arms); <i>fei'ang</i> ; <i>dou</i> ; <i>liang</i> ; <i>zhu</i> ; <i>zhuruzhu</i> ; <i>xiezhu</i> ; <i>dong</i> ; <i>chuan</i> ; <i>yan</i> ; <i>men</i> ; <i>chuang</i> ; <i>pingfeng</i> ; <i>luli</i> 露籬 (open-air fences); <i>wa</i> ; <i>tu</i> ; <i>jie</i> ; <i>jing</i>
<i>Boya</i> 博雅 (Extended Literary Exposition)	Zhang Yi 張揖 (fl. 227–233)	17 (plus 1 repetition) <i>qiang</i> ; * <i>que</i> ; <i>dian</i> ; <i>zhuchu</i> ; <i>gong</i> (bracket arms); <i>dou</i> ; <i>liang</i> ; <i>dong</i> ; <i>chuan</i> ; <i>yan</i> ; <i>men</i> ; <i>chuang</i> ; <i>goulan</i> ; <i>luli</i> ; <i>tu</i> ; <i>jie</i> ; <i>zhuan</i>
<i>Gujinzh</i> 古今註 (Explanations of [terminology of] ancient and present times)	Cui Yao 崔豹 (fl. 290–306)	2 <i>que</i> ; <i>huabiao</i>
<i>Shenglei</i> 聲類 (Phonetic similarities)	Li Deng 李登 (Wei period)	1 <i>men</i>
<i>Zilin</i> 字林 (Forest of words)	Lü Chen 呂忱 (fl. 266)	1 (plus 1 repetition) <i>quzhen</i> *
<i>Kanmiu zhengsu yinzi</i> 刊謬證俗音字 or 刊謬正俗音字 (Correction of errors, popular forms, and sounds of characters)	Yan Shigu 顏師古 (581–645)	2 (plus 2 repetitions) <i>quzhen</i> ; * <i>juzhe</i> *

CLASSICS AND HISTORICAL SOURCES CITED IN THE YZFS (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Yixun</i> 義訓 (Explanation of meanings [of words])	Dou Yan 竇儼 (tenth century?)	27 (plus 1 repetition) <i>qiang</i> ; * <i>gong</i> (palaces and chambers); <i>que</i> ; <i>dian</i> ; <i>zhuchu</i> ; <i>fei'ang</i> ; <i>dou</i> ; <i>pingzuo</i> 平坐 (balcony substructures); <i>liang</i> ; <i>yangma</i> ; <i>xiezhu</i> ; <i>dong</i> ; <i>liangji</i> ; <i>bofeng</i> ; <i>fu</i> ; <i>yan</i> ; <i>men</i> ; <i>wutoumen</i> ; <i>chuang</i> ; <i>goulan</i> ; <i>juma chazi</i> ; <i>lian zhu</i> 椽柱 (posts under beams or purlins for holding frames of doors and windows); <i>luli</i> ; <i>wa</i> ; <i>tu</i> ; <i>jie</i> ; <i>zhuan</i>
<i>Zhoubi suanjing</i> 周髀算經 (Mathematical classic of the Zhou shadow-gauging instrument; completed during the first century B.C.E.)	Anonymous	1 <i>fangyuan pingzhi</i>
<i>Jiuzhang suanjing</i> 九章算經 (Nine-chapter mathematical classic)	Anonymous; commentary by Li Chunfeng 李淳風 (602–670)	1 <i>qujingwei</i> 取徑圍 (geometrical relationship between diameter and circumference)
<i>Tang liudian</i> 唐六典 (Six codes of the Tang; compiled 735)	Zhang Jiuling 張九齡 (678–740) et al.; also attributed to Emperor Xuanzong of the Tang 唐玄宗 (685–762, r. 712–756)	2 <i>dinggong</i> 定功 (fixed work limits); <i>wutoumen</i> 烏頭門 (<i>wutou</i> gate; an entrance structure in the residences of middle and high-ranking officials)
<i>Han Boliangshi</i> 漢柏梁詩 (Poems composed at the Boliang Terrace of the Han)	Han-period composers: emperors, court officials, et al.	1 <i>puzuo</i> 鋪作 (bracket sets; putting together all bracketing elements)
<i>Changmen fu</i> 長門賦 (Rhapsody on the Changmen Palace)	Sima Xiangru 司馬相如 (179–117 B.C.E.)	2 <i>liang</i> ; <i>xiezhu</i>
<i>Ganquan fu</i> 甘泉賦 (Rhapsody on the Ganquan Palace)	Yang Xiong 揚雄 (53 B.C.E.–18 C.E.)	4 <i>zhuruzhu</i> ; <i>liangji</i> ; <i>bofeng</i> ; <i>chuan</i>
<i>Xidu fu</i> 西都賦 (Rhapsody on the Western Capital)	Ban Gu 班固 (32–92)	6 <i>cai</i> ; <i>liang</i> ; <i>zhu</i> ; <i>dong</i> ; <i>goulan</i> ; <i>caihua</i>
<i>Xidu[jing] fu</i> 西都[京]賦 (Rhapsody on the Western Capital)	Zhang Heng 張衡 (78–139)	3 <i>pingzuo</i> ; <i>yan</i> ; <i>douba zaojing</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE *YZFS* (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Lu Lingguangdian fu</i> 魯靈光殿賦 (Rhapsody on the Hall of Numinous Brilliance in Lu); with Li Zhouhan’s 李周翰 commentary	Wang Yanshou 王延壽 (ca. 124–ca. 148)	8 <i>gong</i> (bracket arms); <i>dou</i> ; <i>pingzuo</i> ; <i>zhuruzhu</i> ; <i>xiezhu</i> ; <i>fu</i> ; <i>douba zaojing</i> ; <i>goulan</i>
<i>Qiju</i> 七舉 (Seven-set refined verses exemplifying [historical affairs to memorialize the emperor])	Liu Liang 劉梁 (fl. 147–167)	1 <i>fei’ang</i>
<i>Qiming</i> 七命 (Seven-set rhapsody on fates)	Zhang Jingyang 張景陽 (fl. 301–307)	1 <i>yangma</i>
<i>Jingfudian fu</i> 景福殿賦 (Rhapsody on the Hall of Great Blessings); with commentaries by Li Shan and the Five Officials	He Yan 何晏 (190–249)	9 <i>dingping</i> ; <i>fei’ang</i> ; <i>puzuo</i> ; <i>liang</i> ; <i>zhu</i> ; <i>yangma</i> ; <i>chuan</i> ; <i>yan</i> ; <i>goulan</i>
<i>Wudu fu</i> 吳都賦 (Rhapsody on the Capital of Wu)	Zuo Si 左思 (?–306)	2 <i>gong</i> (bracket arms); <i>caihua</i>
<i>Weidu fu</i> 魏都賦 (Rhapsody on the Capital of Wei)	Zuo Si	1 <i>yangma</i>
Xue Zong’s Commentary on Zhang Heng’s <i>Xidu fu</i>	Xue Zong 薛綜 (Three Kingdoms period)	1 <i>gong</i> (bracket arms)
<i>Xuchanggong fu</i> 許昌宮賦 (Rhapsody on the Palaces at Xuchang)	Bian Lan 弁蘭 (Wei-Jin period)	1 <i>cai</i>
<i>Taijidian ming</i> 太極殿銘 (Epigraph for the Supreme Ultimate Hall)	Xu Ling 徐陵 (Chen dynasty, 557–589)	1 <i>puzuo</i>
<i>Mingtang fu</i> 明堂賦 (Rhapsody on the Mingtang)	Li Bai 李白 (701–762)	1 <i>puzuo</i>
<i>Hanyuandian fu</i> 含元殿賦 (Rhapsody on the Hall of Enfolding Vitality)	Li Hua 李華 (Tang period)	1 <i>puzuo</i>
<i>Bowuzhi</i> 博物誌 (Record of legendary stories and exotic animals and plants)	Zhang Hua 張華 (232–300)	2 <i>cheng</i> ; <i>wa</i>
<i>Shanhaijingtu</i> 山海經圖 (Illustrations of the <i>Classic of Mountains and Seas</i>)	Guo Pu 郭璞 (276–324?)	1 <i>pingqi</i>

CLASSICS AND HISTORICAL SOURCES CITED IN THE *YZFS* (continued)

Title	Authorship and dating	Number of citations and entries in which the source is cited; citations repeated in the “Zongshi” and “Kanxiang,” marked by an asterisk, are counted once
<i>Tanbinlu</i> 譚賓錄 (Record of anecdotes of contemporary personages)	Hu Qu 胡璩 (Tang period)	1 <i>chiwei</i>
<i>Toubujing</i> 投壺經 (Manual of the pitch-pot game)	Shangguan Yi 上官儀 (seventh century)	1 <i>wutoumen</i>
<i>Zirenzhuan</i> 梓人傳 (Biography of a carpenter)	Liu Zongyuan 柳宗元 (773–819)	1 <i>juzhe</i>
<i>Huangchao jingwengong Song Qi bilu</i> 皇朝景文公宋祁筆錄 (Jottings of our dynasty’s Master Jingwen Song Qi)	Song Qi 宋祁 (998–1061)	1 (plus 1 repetition) <i>juzhe*</i>
<i>Huapin</i> 畫品 (Appraisals of paintings)	Xie He 謝赫 (fl. 479–501)	1 <i>caihua</i>

Notes:

1. In the “Zongshi,” there are five excerpts of quoted texts under the title “Li” with three more under the title “Liji” and three more under “Yili.” Although there is no indication of whether “Li” stands for “Liji” or “Yili,” I take it as “Liji” because, in the entry for *yan* (eaves) in *juan 2*, “Zongshi,” 3b, there is an excerpt under “Li,” followed by one under “Yili.” Moreover, there is an excerpt specified as being from the “Yueling” section of the “Li” in the entry for *cheng* (city) (*juan 1*, “Zongshi,” 5a), along with an excerpt specified as being from the “Yueling” section of the “Liji” in the entry for *taixie* 臺榭 (pavilions on high terraces) (*juan 1*, “Zongshi,” 4b). In addition, in ancient times, the “Five Classics” included the *Shi*, the *Shu*, the *Li*, the *Yi*, and the *Chunqiu*, and here, “Li” refers to the *Liji*.

Notes

Introduction

1. Li Hua, “Hanyuandian fu” 含元殿賦 (Rhapsody on the Enfolding-Vitality Hall), author’s preface, in Li Fang et al., *Wenyuan yinghua*, 1:215, *juan* 48, “Fu” 賦 (Rhapsodies), “Gongshi” 宮室 (Palaces), part 2.
2. Ibid.
3. Li Jie, “Jin xinxiu *Yingzao fashi xu*” 進新修營造法式序 (Preface to [my] presentation of the newly compiled *Building Standards*), *YZFS*, 1a. More detailed discussion can be found in chap. 2.
4. Jurchen (Nǚzhēn 女真), ancestors of the Manchus who ruled the Qing (1644–1911), established the Jin 金 dynasty (1115–1234) and overthrew the Northern Song in 1127, twenty-four years after the publication of the *YZFS*.
5. See Cheng Ju, *Beishan ji*, *juan* 33:16a–20a. The epitaph was written on behalf of Fu Chongyi 傅冲益 (1066–1118), who was a subordinate official under Li Jie. It is collected as an appendix in the 1925 edition of the *YZFS*, 1a–3b.
6. For an English translation of this work, see Strassberg, *Chinese Bestiary*.
7. For Li Jie’s official career and experience in construction practice before and after serving in the Directorate of Construction, see Li Jie’s epitaph, in the appendices of the 1925 edition of the *YZFS*, 1a–3b. Although most of the important imperial and public building projects that Li accomplished were done after he finished the *YZFS*, the epitaph tells us that he took charge of the construction of the magnificent Five Princes’ Mansions (五王邸) while writing the *YZFS*.
8. Ibid., 1b.
9. Willis, *Architectural Nomenclature of the Middle Ages*, 21.

Chapter 1: The Historical Tradition of Writing on Architecture

1. Li Jie, “Jin xinxiu *Yingzao fashi xu*” 進新修營造法式序 (Preface to [my] presentation of the newly compiled *Building Standards*), *YZFS*, 1a. In translating the text related to the *Classic of Changes* (*Yi*), I consulted Shaughnessy, *I Ching*, “Appended Statements” 繫辭, 205–207.

2. For the authorship, dating, contents, and transmission of these two texts, see Loewe, *Early Chinese Texts*, 216–223, also 24–31.
3. Sima Qian, *Shiji*, *juan* 6, *Qinshihuang benji* 秦始皇本紀 (Basic annals of the First Emperor of the Qin), 1:255. See also Nienhauser, *Grand Scribe's Records*, 1:147–148.
4. For the authorship, dating, contents, and transmission of the *Yili* and the other five texts that follow it, see Loewe, *Early Chinese Texts*, 67–73, 229–232, 234–241, 293–296, 376–383, 415–420. For some works, such as the *Liji*, the dates of compilation span from the Warring States period (475–221 B.C.E.) to Han times, but they are discussed in this section since most of the materials in them were written during the pre-Qin period.
5. Translations of the titles of the *Yili* sections follow Loewe, *Early Chinese Texts*, 235.
6. See Zhang Erqi, *Yili Zhengzhu judu*, *juan* 4:3a.
7. *Ibid.*, *juan* 7:8b.
8. The dates for the Zhou kings follow Loewe, *Early Chinese Texts*, 509.
9. “Guming,” *Shangshu*, in Cai Chen, *Shujing jizhuan*, *juan* 6: 125–126.
10. With minor modifications, the translation follows Legge, *Chinese Classics*, 551–555. Page 552 includes detailed explanations of *fuyi* 黼辰: the ax heads on the screen were emblematic of imperial determination. In addition, Cai Chen, *Shujing jizhuan*, 125–126 and Qian Zongwu and Jiang Hao, *Shangshu*, 486–489 explain *fuyi* as the king's screen painted with a hatchet motif.
11. For instance, the excavated remains of the early Zhou architectural complex at Fengchu 鳳雛, Qishan 岐山 County, Shaanxi, present an enclosed courtyard with a main hall at its center and a gatehouse in front (south) that includes a left lobby and a right one, although there are three stairs instead of two in front of the main hall. See Shanxi Zhouyuan Kaogudui, “Shanxi Qishan Fengchucun Xizhou jianzhu jizhi fajue jianbao.” Earlier examples are the palatial remains at Erlitou 二里頭, Yanshi 偃師, Henan, which is probably the site of palaces of the Xia or early Shang.
12. James Legge translates Mingtang as Hall of Distinction or Brilliant Hall, while in James T. C. Liu's language, it is Hall of Enlightenment, and Michael Loewe translates it as Hall of Holiness; see Legge, *Li Chi*, 2:28–39; James Liu, “Sung Emperors and the Ming-t'ang”; Loewe, *Faith, Myth, and Reason in Han China*, 135. The variation in interpretation is associated with various commentaries on the history of the function of the Mingtang during the Zhou dynasty. I follow Legge's “Hall of Distinction” because of its definition in the *Liji*.
13. *Liji*, chap. 14, “Mingtang wei,” in *Songben Liji Zhengzhu*, *juan* 9:411.
14. *Ibid.*
15. *Ibid.*, 414.
16. The translation is based on Legge, *Li Chi*, 2:34. I have made some adjustments. According to Zheng Xuan's commentary (*Songben Liji Zhengzhu*, 414) and Legge's explanation (2:34n1), the Gao gate, Ku gate, Zhi gate, and Ying gate were four of the five gates (in the order of front to rear, followed by the Lu 路 gate at the end) of the royal palace during the Zhou period. Only a few primary sources explain the literal meanings of the names of the gates, which include Zheng Xuan's explanation of *gao* as “tall” (*Songben Liji Zhengzhu*, 414). The *Erya* 爾雅 (Approaching elegance; literary exposition), the earliest Chinese dictionary, in chap. 5, “Shigong” 釋宮 (Glosses on architecture), explains, “正門謂之應門” (The front gate is called the Ying gate); see *Songben Erya*, 41; Guo Pu 郭璞 (276–324) annotates, “朝門” (court gate or reception gate). I offer my translations of *ku* 庫 and *zhi* 雉 according to my best understanding of these characters.

17. James Legge translated *shanjie* as “the capitals of the pillars with hills carved on them”; see *Li Chi*, 2:34. Most other sources interpret it as brackets with mountains carved on them. I propose another possible meaning: mountain-shaped brackets, which is based on the actual style of bracketing during the Zhou period. A typical bracket in a pre-Qin palatial building, as suggested by the architectural images on contemporary bronzes and lacquerwork, is in the form of a single huge block on the column. Such a block has roughly the shape of a mountain turned upside down. *Shanjie* may also have meant *shan* 山 (mountain) character-shaped brackets, considering the form of a single-layer arm on the column bearing three small blocks above it, two at its ends and one in the center. This form was developed as one of the common styles of bracketing from the Zhou to Han periods.
18. Duke Zhou was the younger brother of King Wu 武王 (r. 1049/45–1043 B.C.E.) and regent for the minor King Cheng (r. 1042/35–1006 B.C.E.).
19. *Yi Zhoushu*, *juan* 5:8b–9a.
20. I translate this passage based on both Kong Chao’s commentary (*Yi Zhoushu*, 9a) and Li Shujun *Zhongguo gudai jianzhu wenxian zhuyi yu lunshu*, 31n23. *Fandian* 反坫 is explained with two different meanings, designating either a clay stand for wine vessels in the ceremony, as is seen in the quotation of the *Liji*, or an eave bending upward. Here I select the second meaning in consideration of the order of appearance of the term in the architectural features described. The term is placed right after *si’e* 四阿 (hip roof), the first feature described, and before *chongkang* 重亢 (overlapped purlins), *chonglang* 重郎 (two-storied structure), and *changlei* 常累 (string net under the eaves). It seems that the descriptions are written in the order of roof style and upper beam structure first, followed by other structural features like bracketing and columns, and then interior displays, concluding with stairs and walls.
21. *YZFS*, *juan* 12, section on “Zhuzuo zhidu” 竹作制度 (System of bamboo work), entry for *hu dianyan queyanwang*. It is also called *hu diange yan zhuwang* 護殿閣簷竹網 (bamboo net protecting eaves of a hall).
22. In addition to the preface (see note 1), the *Zhouli* text is cited in the *YZFS*, “Kanxiang,” 3b, entry for *quzheng* 取正 (determining the directions), *juan* 1, “Zongshi” (General explanations), 7a, entry for *quzheng*.
23. See Wang Anshi, *Zhouguan xinyi*, *juan* 1, “Tianguan” 天官 (Celestial offices), 1.
24. *Shijing*, *Yongfeng* 鄘風, “Ding zhi fangzhong,” Mao no. 50, which includes, “定之方中、作于楚宮。揆之以日、作于楚室” (Determining the four cardinal directions/ the Chu[*qiu*] [楚丘] palaces were built/Observing the cardinal directions by [measuring] the sunlight [at sunrise and sunset]/the Chu[*qiu*] houses were established). The poem eulogizes the deed of Duke Wen of Wei 衛文公, who built palaces in Chuqiu (modern Hua County 滑縣, Henan), reestablished the state, and made it strong and powerful during the Spring and Autumn period (770–476 B.C.E.).
25. *YZFS*, “Kanxiang,” 3b, entry for *quzheng*; *juan* 1, “Zongshi,” 1b, entry for *gong* 宮 (palaces); *juan* 1:7a, entry for *quzheng*. The historical commentaries on this *Shijing* text cited in the *YZFS* read as follows: “定、營室也。方中、昏、正四方也。揆、度也。度日出日入以知東西。南視定、北準極、以正南北” (*Ding* means constructing buildings. *Fangzhong* corresponds to [the time of] sunset [when the *ding* star appears right in the midst of the sky], meaning determining the four cardinal directions. *Kui* is to observe, measuring the sunlight at sunrise and at sunset in order to determine east and west. To be oriented to the south, observe the *ding* star; to be oriented to the north, observe the North Star, so as to determine south and north.).
26. More detailed information of the orientation-related technologies was made available in a technology document written around the Warring States period, which was the *Kaogongji* 考工記 (Records of artificers), discussed in the next section.

27. For the whole poem and a full translation, see Legge, *Chinese Classics*, 4:437–441; Mao number 237. The translation here basically follows Legge’s, but I have made some modifications, such as translating *xue* 削 as “trim” instead of “pare.”
28. *YZFS*, “Jin xinxiu *Yingzao fashi xu*,” 1a.
29. *Mencius*, book VI, “Gaozi” 告子, part B: “舜發於畎畝之中、傳說舉于版築之間” (Shun [ancient king] rose from the fields; Fu Yue was raised to office from amongst the builders); see Lau, *Mencius*, 282–283. Here, Fu Yue 傳說 refers to the prime minister under King Wuding 武丁 (ca. 1250–ca. 1192 B.C.E.) of the Shang. King Wuding sought talent among the ordinary and found Fu, who was a builder.
30. For a more detailed explanation, see Legge, *Chinese Classics*, 4:439n.
31. For a few archaeological remains where fragments of rammed-earth walls are found, see Wen Renjun, *Kaogongji yizhu*, 96n14. The examples that Wen presents include the Wangchenggang 王城崗 remains at Gaocheng 告成, Dengfeng 登封, Henan, which is dated to the foundation of the Xia or earlier.
32. *YZFS*, *juan 3*, “Haozhai zhidu” 壕寨制度 (System of moats and fortifications), 3b–5a, entries for *zhuji* 筑基 (building a foundation), *cheng* 城 (city [walls]), *qiang* 牆 (walls), and *zhu linshuiji* 筑臨水基 (building a waterside foundation).
33. *YZFS*, “Kanxiang,” 6b–7b, entry for *qiang* (walls); *juan 1*, “Zongshi,” 5a–6b, entries for *cheng* (city [walls]) and *qiang* (walls).
34. *YZFS*, *juan 3*, “System of Moats and Fortifications,” 3b, entry for *zhuji* (building a foundation). *Cun* 寸 is a measure of length.
35. Mao number 189.
36. The translation is based on Legge, *Chinese Classics*, 4:305, but I have made quite a few modifications. Legge translates *ru niao si ge* 如鳥斯革 as “like a bird which has changed its feathers,” which I am afraid does not make sense architecturally. In Wang Rongpei and Ren Xiuhua, *Shijing*, it is translated as “as balanced as a bird hovering” (805). In Li Shujun, *Zhongguo gudai jianzhu wenxian*, 57n8 and 59, it is interpreted as (the eaves extending) as if a bird is unfolding its wings.
37. The translations of both the title of the rhapsody and this phrase follow Knechtges, *Wen xuan*, 2:279, 289; I made only a slight modification in the translation of the phrase. See also Xiao Tong *Wenxuan* (Hong Kong 1965), *juan 11*, “Gongdian” (Palaces), 240 (236–247 for the complete work).
38. *YZFS*, *juan 1*, “Zongshi,” entry for *fei’ang*, 8b. See also *juan 4*, “Damuzuo zhidu” 大木作制度 (Major carpentry system), 4b–7a, entry for *fei’ang*.
39. Further discussion can be found in chap. 4.
40. *Mozi*, *juan 14*, “Bei chengmen,” 122–128.
41. *Mozi*, *juan 1*:5. The phrase *heng yi shui* 衡以水 is missing from the received text but is preserved in the same text cited in the *YZFS*; see “Kanxiang,” entry for *fang*, *juan*, *ping*, *zhi* 方圓平直 (square, circle, evenness, straightness), 1b. In the cited text, the word *xuan* 縣 has been changed to *chui* 垂. As Liang Sicheng 梁思成 has pointed out, the change of *xuan* to *chui* in the *YZFS* was owing to the taboo of using the name of the first ancestor of the Song emperors, Xuanlang 玄朗. See Liang Sicheng, *Yingzao fashi zhushi*, “Kanxiang,” 9n1.
42. The Chinese title is alternatively translated as “Records of the Scrutiny of Crafts” in modern scholarship. *Kao* 考, as in the title, can mean “examine” or “inspect” but can also mean “skilled,” both meanings seen in pre-Qin and Han texts. Thus, *kaogong* 考工 may mean “scrutiny of crafts,” or just “skilled craftsmen” or “artificers.” Wen Renjun has suggested that the title, acquired during the Han period, most likely was related to the *Kaogongshi* 考工室 (section on *kaogong*) under “Shaofu” 少府 (Assisting prefecture), an administrative prefecture during the Western Han

- period (206 B.C.E.–25 C.E.). See Wen Renjun, *Kaogongji yizhu*, 153, appendix 12, “*Kaogongji de banben yuanliu*” 《考工記》的版本源流 (The origin and evolution of the editions of the *Kaogongji*).
43. The dating of the *Kaogongji* has been problematic since the Han dynasty. Among the most influential opinions of scholars in history, Zheng Xuan, the great Han-period commentator on the Confucian classics, maintained that the text was completed in its final form during the late Zhou dynasty. In modern scholarship, most scholars accept a date of the late Spring and Autumn or the early Warring States periods. For more discussions of dating, see Zhang Jingxian, “*Kaogongji*,” 37–38, 48n1; Wen Renjun, *Kaogongji yizhu*, 144–153, appendix 11, “*Kaogongji chengshu niandai xinkao*” 《考工記》成書年代新考 (New research on the date of completion of the *Kaogongji*).
 44. The earliest such identification is Lin Xiyi’s 林希逸 (*jinsbi* 進士 1235) *Juanzhai Kaogongji jie* 麴齋考工記解 (Explanations of the *Kaogongji* written at Juanzhai). The identification was further acknowledged by Jiang Yong 江永 (1681–1762) in the Qing dynasty (1644–1911) and is generally accepted by scholars nowadays. See Zhang Jingxian, “*Kaogongji*,” 48n1; Wen Renjun, *Kaogongji yizhu*, 138–139, appendixes 4 and 6.
 45. Guo Moruo 郭沫若 (1892–1978) was one of the earliest scholars to propose this identification. See Guo, “*Kaogongji de niandai yu guobie*,” 381–385. See also Wen Renjun, *Kaogongji yizhu*, 152–153, and “Preface,” 1–2.
 46. See Zhang Jingxian, “*Kaogongji*,” 38, 47. Zhang exemplified the standards of the techniques and quality of production with the entry for *ziren wei yinqi* 梓人為飲器 (artisans specialized in ritual utensils make drinking utensils), which includes the *zishi*’s 梓師 (a master artisan specialized in ritual utensils) methods of examining the quality of the utensils (*shizi* 試梓 [testing the ritual-utensil artisan’s product]) and the line *zishi zuizhi* 梓師罪之 (the master artisan will punish the ritual-utensil artisan for products of poor quality).
 47. There remains an ongoing debate about whether or not and to what extent the work represented the actual technological systems of the Zhou dynasty. He Yeju has proposed that the urban planning theory in the *Kaogongji* represented the Zhou system of urban design and expressed an intention of the Qi to maintain the old systems of the Zhou; see He Yeju, *Kaogongji yingguo zhidu yanjiu*, 37. Shi Nianhai, in his “*Zhouli Kaogongji*,” argues that the *Kaogongji* does not reflect the Zhou system (46–56). Sun Qingwei investigated excavated relics of the Zhou and found that most of them do not correspond to the descriptions of jade objects in the *Kaogongji*, and thus he proposes that the section on jade craftsmen was only an idealized description of the actual Zhou system; see Sun Qingwei, “*Kaogongji*,” 115–139.
 48. For the six government posts of the Zhou, see Loewe, *Early Chinese Texts*, 24.
 49. Wang Anshi, “*Kaogongji jie*” 考工記解 (Explanations of the *Kaogongji*), in his *Zhouguan xinyi*, 239–265.
 50. Further discussion can be found in chap. 3.
 51. See Wen Renjun, *Kaogongji yizhu*, appendix 12, 154–155.
 52. The other five categories are the work of managing metalwork (攻金之工), the work of managing leatherwork and armor (攻皮之工), the work of applying colors (設色之工), the work of scraping and milling (刮磨之工, including jade carving), and the work of making pottery (搏埴之工).
 53. Some scholars also make use of other parts of the technologies in this text to obtain significant information related to the architecture of the pre-Qin period. For example, Yang Hongxun was able to discuss the development of the curved roof and eaves characteristic of Chinese architecture by referring to the regulation on the canopy of

- a vehicle set forth under *lunren* 輪人 (wheelwrights); see Yang Hongxun, “Zhongguo gudian jianzhu aoqu wumian fashen fazhan wenti chutan,” 1:7. Earlier, Lin Maozhang, in his “Zhongguo jianzhu yingzao fashi zhi yanjiu,” also briefly discusses the *lunren* passage in his analysis of the methods of roof construction (49).
54. *Kaogongji*, in Wang Anshi, *Zhouguan xinyi*, appendix, part 2, 260.
 55. In translating *shuidi yi xuan* 水地以縣, I consulted Li Shujun, *Zhongguo gudai jianzhu wenxian*, 15n1. In addition, Wen Renjun suggests a different interpretation of *shuidi* in his *Kaogongji yizhu*, 84–85n2. He discusses the *shuidi* 水地 (water ditch) method of finding level that emerged during the Shang period, in which water was poured into intercrossed ditches dug in the ground in order to determine level at a construction site. He interprets *shuidi yi xuan* in the *Kaogongji* as the *shuidi* method with the application of a weight rope hanging down, which, he suggests, might have been a primitive level-determining instrument with an intercrossed base that held water.
 56. Wang Anshi, *Zhouguan xinyi*, *juan* 1, “Tianguan” (Celestial offices), 1.
 57. YZFS, “Kanxiang,” 3b–6b.
 58. *Ibid.*, 4a.
 59. *Ibid.*, 5b.
 60. The same strategy is also used in the examination of traditional and practical methods for rammed walls and for determining the height of a roof, discussed later in this section.
 61. *Kaogongji*, part 2, 260. *Li* 里 in the text is a measure of length, approximately fifteen hundred *chi* 尺. One *chi* is equal to ten *cun*. *Chi* occurs in the texts that follow and its value in ancient times is discussed in a subsequent note.
 62. For a comprehensive study of the urban system of the *Kaogongji*, see He Yeju, *Kaogongji yingguo zhidu yanjiu*.
 63. *Chi* 尺 is a basic unit of length of ancient China and its value varies depending on era. Thus far, no measuring instruments of the Zhou dynasty have been excavated, leaving the precise value of the Zhou *chi* unknown. During the Warring States period, it was approximately 23 cm. See Nienhauser, *Grand Scribe’s Records*, 1:xxxii, “Weights and Measures”; Yin Falu and Xu Shu’an, *Zhongguo gudai wenhuashi*, 3:58, 66.
 64. See Ledderose, *Ten Thousand Things*.
 65. A detailed discussion of the *Mujing* can be found in chap. 2.
 66. YZFS, *juan* 4, “Major Carpentry System,” entry for *cai*, 1a–2a.
 67. Tuotuo, *Songshi*, *juan* 101, *zhi* 志 (records) 54, *li* 禮 (rites) 4, *jili* 吉禮 (auspicious rites) 4, *mingtang*, 8:2472–2475. For a preliminary study and reconstruction drawings of the Mingtang patronized by Huizong, see Wang Shiren, “Mingtang meixue guan” 明堂美學觀 (The aesthetic concept of the Mingtang), in his *Lixing yu langman de jiaozhi*, 108–109.
 68. *Kaogongji*, part 2, 261.
 69. In translating these sentences, I consulted Wen Renjun, *Kaogongji yizhu*, 92, 95–96n13.
 70. Zuoqiu Ming, *Chunqiu Zuozhuan*, 170. In translating this text, I consulted Du Yu 杜預 (222–284) and Kong Yingda’s 孔穎達 (574–648) annotations and commentaries of the text; Shen Yucheng, *Zuozhuan yiwen*, 181; Li Shujun, *Zhongguo gudai jianzhu wenxian*, 78–79.
 71. YZFS, *juan* 16–25.
 72. YZFS, *juan* 26–28.
 73. YZFS, “Kanxiang,” 7b, entry for *qiang* (walls). In Song times, one *chi* was equal to 31.68 cm.

74. *Ibid.*, 6b–7b: “今來筑牆制度、皆以高九尺厚三尺為祖……正與經傳相合。今謹按《周官·考工記》等群書修立下條。” (Today’s systems of building walls are all based on [the rate of] nine *chi* high and three *chi* wide . . . , [which] conforms precisely to [the records of] the classics and historical texts. Now [your subject] cautiously compiles the next item according to all books, including the “Kaogongji” of the *Zhouguan*). Wen Renjun has also pointed out the preservation in the *YZFS* of the proportion between the height of a wall and its width in the *Kaogongji*. See Wen Renjun, *Kaogongji yizhu*, 97n17.
75. *Kaogongji*, part 2, 261.
76. *YZFS*, *juan* 5, “Damuzuo zhidu” (Major carpentry system), part 2, entry for *juzhe*, 9b–11a; also “Kanxiang,” 7b–9b, entry for *juzhe*. For an illustrated explanation of the *juzhe* method, see Liang Sicheng, *Yingzao fashi zhushi*, 265.
77. *YZFS*, “Kanxiang,” 8a, entry for *juzhe*: “今來舉屋制度……雖殿閣與廳堂及廊屋之類略有增加、大抵皆以四分舉一為祖、正與經傳相合。今謹按《周官·考工記》修立下條” (Today’s systems of raising roofs . . . although [in the cases of] tower halls, residence halls, and such secondary buildings as corridors [the roof pitches are] slightly higher, [they] basically are all based on one-fourth, [which] conforms precisely to [the records of] the classics and historical texts. Now [your subject] cautiously compiles the next item according to the “Kaogongji” of the *Zhouguan*).
78. For example, in the *Shiji* (Records from the Grand Scribe), amid the historical narrative are incidental references to architectural practices, such as the construction of the Imperial Shanglin Garden 上林苑 and the building of the mausoleum of the First Emperor of the Qin; see Sima Qian, *Shiji*, *juan* 6:256, 265; Nienhauser, *Grand Scribe’s Records*, 1:148–149, 155. In the *Huainanzi*, references to architecture occur in its critiques of contemporary social trends and morals; see Chen Guangzhong, *Huainanzi yizhu*, *juan* 9, “Zhushu xun” 主術訓 (Explanations of the arts of governing a state), 404–408. This work also includes a passage on the method of determining the four directions by observing the shadow of the sun, although the information is not accurate; see *juan* 3, “Tianwen xun” 天文訓 (Explanations of astronomy), 169–170.
79. *Zhoubi suanjing*, *juan* 1:30, *juan* 2:42.
80. *Jiuzhang suanshu*, *juan* 5:39–48, *juan* 9:86–92.
81. This dictionary was compiled on the basis of radicals. Many terms for wood-framed buildings can be found in the section under the radical *mu* 木 (wood or tree), as shown in the following: “枅、屋櫨也。從木……古兮切” (*Ji* is a square timber block [on the capital] of a building. [It] belongs to [the radical of] wood . . . [Its] orthography is [g of] *gu* and [i of] *xi*); see Xu Shen, *Shuowen jiezi*, *juan* 6, part 1. Since Chinese architecture employed various materials, although mainly timber, architectural terms were designated by different radicals, including “earthen” (土), “stone or masonry” (石), and so on. In the compilation format of dictionaries like the *Shuowen jiezi*, these terms are not arranged in the same section as those words classified with the “wood” radical.
82. *Songben Erya*, chap. 5, 39–42. According to the definition of *gong* 宮 in the text and the whole content of the “Shigong,” I translate *gong* in the “Shigong” as “architecture” instead of “palaces.” A more detailed discussion is provided later in this section.
83. For example, in the definitions “室中謂之時、堂上謂之行、堂下謂之步、門外謂之趨、中庭謂之走、大路謂之奔” ([Walking but barely moving] inside a chamber is called *shi*; [walking slowly] in a hall is called *xing*; [marching] beside a hall is called *bu*; [hastening] outside a door is called *qu*; [walking] in the courtyard is called *zou*; [hurrying] on an avenue is called *ben*; see *Songben Erya*, 42), classical words for different

kinds of walking in different architectural settings are explained in contemporary popular language.

84. *Ibid.*, 39.
85. *Ibid.*, 41. In translating this sentence, I consulted Guo Pu's annotation of *wei* in the *Songben Erya*, 41.
86. In translating this sentence, I consulted Guo Pu's annotation in the *Songben Erya* (*ibid.*) and Hu Qiguang and Fang Huanhai, *Erya yizhu*, 211n4, 212, under entry 5.017 for *xiang* 街 (lanes).
87. Lu Deming, *Jingdian shiwen*, *juan* 29, "Erya yinyi" 爾雅音義 (The pronunciations and meanings of [the words of] the *Erya*), 1626, part I, "Shigong."
88. *Songben Erya*, 39: "牖戶之間謂之宸、其內謂之家" ([The wall or the space] between the window and the door is called *yi*; the inside [space surrounded by the door and windows] is called *jia*).
89. *Ibid.*, 40: "雞棲於弋為櫟、鑿垣而棲為埒" (A roost on which a fowl rests is called *jie*; a roost made by digging a hole is called *shi*). In translating these sentences, I consulted Hu Qiguang and Fang Huanhai, *Erya yizhu*, 207–208.
90. *Songben Erya*, 41: "容謂之防" (The small curved screen [used in the rites of archery meets to protect one from arrows] is called *fang*). In translating this, I consulted Guo Pu's annotation.
91. Not to be confused with a term represented by the same character that designates structural beams or lintel beams over a door; see the two terms *liang* and *ji* that follow.
92. *Songben Erya*, 42: "堤謂之梁、石杠謂之倚" (A bridge is called *liang*; stepping stones [placed in water for crossing a river] are called *ji*). In translating these terms, I consulted Guo Pu's annotations, in which sources for the relevant terms, such as the *Shijing*, are cited.
93. *Ibid.*, 39–40.
94. *Ibid.*, 39. Guo Pu annotates, "所以序別內外" (so as by which to properly distinguish the inside and the outside).
95. *Ibid.*, 41.
96. *Ibid.*
97. *Ibid.*
98. *Ibid.*
99. *Ibid.*, 40.
100. *Ibid.*, 40–41.
101. In making my translation, I consulted Guo Pu's annotations under each definition and Hu Qiguang and Fang Huanhai, *Erya yizhu*, 208–209.
102. In the *YZFS*, the definitions of *yue* and *jiao* in the *Erya* are quoted in the "Zongshi" under the entry for *liangji* 兩際 (two side ends of a gable [or gable-hip] roof) and for *yangma* 陽馬 (corner beams), respectively; see *YZFS*, *juan* 2, "Zongshi," part 2, 2a, and *juan* 1, "Zongshi," part 1, 10b.
103. Tanaka, *Chūgoku kenchikushi no kenkyū*, chap. 2, 46–48. Tanaka's proposed reconstruction of the wood-framed structure of a pre-Qin palatial building is based on the *Erya* and other pre-Qin texts, including the *Yili* and the *Shijing*.
104. The Han-dynasty scholarship on the *Erya* was later collected from a variety of sources in which Han scholars' commentary was cited; see Zang Yongtang, *Erya Hanzhu*. During the early Northern Song period, Xing Bing 邢昺 (932–1010) and others completed a ten-chapter work on the *Erya* under the order of Emperor Zhenzong 真宗 (r. 998–1022); it was entitled *Erya zhushu* 爾雅注疏 (Commentary and annotations on the *Erya*). Other Song scholarship on the *Erya* includes Lu Dian's 陸佃 (1042–1102) twenty-chapter *Erya xinyi* 爾雅新義 (New explanation of the *Erya*), Zheng Qiao's

- 鄭樵 (1104–1162) three-chapter *Erya zhu* 爾雅注 (Commentary on the *Erya*), and Luo Yuan's 羅願 (1136–1184) thirty-two-chapter *Erya yi* 爾雅翼 (Supplement to the *Erya*).
105. On the authorship and editions of this work, see Loewe, *Early Chinese Texts*, 424–428.
 106. Liu Xi, *Shiming*, *juan* 3 (chap. 9), section on “Shi zirong” 釋姿容 (Explanations of appearances), 36.
 107. The twenty-seven chapters treat the following subjects: (1) the heavens and seasons, (2) geographical terms, (3) mountains, (4) rivers, (5) hills, (6) roads, (7) states, (8) the human body, (9) appearances and gestures, (10) terms for the older and the younger, (11) relatives, (12) languages, (13) food and drink, (14) colorful silks, (15) ornaments, (16) clothing, (17) architecture, (18) beds and canopies, (19) books and writing materials, (20) the arts (*dianyi* 典藝), (21) utensils, (22) musical instruments, (23) warriors, (24) vehicles, (25) boats, (26) diseases, (27) the burial system.
 108. Liu Xi, *Shiming*, *juan* 5 (chap. 17), 84.
 109. *Ibid.*, 84–85. *She* 舍 is glossed as “於中舍息也” ([*She* is] to rest and live in it). This is one of the few examples in the “Shigongshi” in which no homophonic words are used to explain the meaning of a term.
 110. *Ibid.*
 111. *Ibid.*
 112. *Ibid.*
 113. *Ibid.*, 87.
 114. *Ibid.*, 84.
 115. *Ibid.*, 87–89.
 116. *Ibid.*, 87: “斗在欒兩頭、如斗也” (*Dou* are [installed] on the two ends of a curved arm and are like a peck [measure]).
 117. The author is also known as Zhaoming Taizi 昭明太子 (Crown Prince Zhaoming of the Liang [502–557]). The *Wenxuan* comprises more than thirty types of literary writings from the late Zhou to Liang periods. These writings include rhapsodies, poems, linked verse, laudatory writings, prefaces to literary works, imperial edicts, imperial orders, reports to the emperor, memorializing documents submitted to the emperor, official calls to arms, eulogies, discussions on histories, epigraphy, funeral eulogies, tomb memorial tablets, funeral orations, and so on. For a complete English translation, see Knechtges, *Wen xuan*.
 118. These works include Sima Xiangru's 司馬相如 (ca. 180–117 B.C.E., courtesy name Changqing 長卿) “Shanglin fu” 上林賦 (Rhapsody on the Shanglin [Imperial Hunting Park]), which extols the Shanglin Park of Emperor Gaozu 高祖 (r. 206–195 B.C.E.) of the Han; Yang Xiong's 揚雄 (53 B.C.E.–18 C.E., courtesy name Ziyun 子雲) “Ganquan fu” 甘泉賦 (Rhapsody on the Ganquan [Palace]), which extols the Ganquan Palace built by Emperor Wu 武帝 (r. 140–87 B.C.E.); Ban Gu's 班固 (32–92, courtesy name Mengjian 孟堅) “Dongdu fu” 東都賦 (Rhapsody on the Eastern Capital) and “Xidu fu” 西都賦 (Rhapsody on the Western Capital); Zhang Heng's 張衡 (78–139, courtesy name Pingzi 平子) “Dongjing fu” 東京賦 (Rhapsody on the Eastern Capital) and “Xijing fu” 西京賦 (Rhapsody on the Western Capital); and Three Kingdoms–period Zuo Si's 左思 (ca. 250–ca. 306, courtesy name Taichong 太沖) “Sandu fu” 三都賦 (Rhapsody on the Three Capitals), which depicts architectural features of the capital cities of the Wei 魏 (220–265), the Shu 蜀 (221–263), and the Wu 吳 (222–280) kingdoms. See Xiao Tong, *Wenxuan* (Hong Kong 1965), *juan* 1–8 (1–170).
 119. *Ibid.*, *juan* 11 (230–236). As mentioned in my discussions on the *Shijing* poem “Sigan” in the section on “Incidental Evidence in Classics and Philosophy” of this chapter, the

- Jingfudian fu* depicts the imperial palace (built in 232) of Emperor Ming of the Wei (220–265) in Xuchang.
120. *Ibid.*, 233. The translation is based on Knechtges, *Wen xuan*, 2:269–271. I have made some modifications.
 121. In addition to the poems of the *Shijing*, works in the *Chuci* 楚辭 (Songs of Chu), an anthology of poems composed by poets of the south, also include incidental references to architecture. For instance, Qu Yuan's 屈原 (ca. 343–ca. 277 B.C.E.) “Zhaohun” 招魂 (Summoning the soul) includes depictions of architectural decorations of the imperial sacrificial hall; see Zhou Binggao, *Xinbian Chuci suoyin*, 57–61.
 122. Cai Yong, *Mingtang yueling lun*.
 123. See Cui Bao, *Gujinzhu*. *Duyi* is the second of a total of eight categories; specific architectural terms are glossed in this category. Also see Zhang Yi, *Guangya*, 81–84, *juan* 7.
 124. On the *Wenxuan* anthology, see note 117.
 125. See *Sanfu huangtu*, 1–29. Anonymous authors, but the original text had been cited in the works of several commentators from the Three Kingdoms and early Jin to Southern Dynasties (420–589) periods. The text was enlarged during the Tang period. See He Qinggu, *Sanfu huangtu jiaoshi*, “Preface,” 1–5.
 126. See Yang, Xuanzhi, *Luoyang qielan ji*, 1–52. “Qielan” in the title is alternatively pronounced “jialan” by modern scholars. For an English translation, see Yi-t'ung Wang, *Record of Buddhist Monasteries in Lo-yang*.
 127. *Sanfu huangtu*, *juan* 3, section on “Weiyangong” (Weiyang Palace).
 128. *Ibid.*, *juan* 2, section on “Hangong” 漢宮 (Han palaces).
 129. *Ibid.*, *juan* 1, section on “Qingong” 秦宮 (Qin palaces).
 130. *Ibid.*, *juan* 4, section on “Chizhao” 池沼 (large ponds).
 131. Li Mi, *Mingtang zhidu lun*, 2899–2903.
 132. *Ibid.*, 2902.
 133. See Wei Zheng et al., *Suishu*, 1588–1593, *juan* 68, “Liezhuan” 列傳 (Biographies) 33.
 134. As summarized in Yuwen's presentation, the historical drawings available to him include two versions: those made by the Han and Jin scholars Liu Xi 劉熙 (fl. 200), Ruan Chen 阮譔, Liu Changzong 劉昌宗, and others, respectively, which, in Yuwen's view, are somewhat identical; and the one made in 54 C.E. under the patronage of Emperor Guangwu 光武帝 (r. 25–57) of the Eastern Han.
 135. Wei Zheng, *Suishu*, 1593. For a proposed reconstruction drawing of Yuwen's wood model of the Mingtang, see Tanaka, *Chūgoku kenchikushi no kenkyū*, 240, fig. 78.
 136. In Tanaka Tan's view, Yuwen's *Mingtang yibiao* is probably the earliest essay on architectural history known to date; see Tanaka, *Chūgoku kenchikushi no kenkyū*, 226. As mentioned, Han and Wei scholarship already included treatises on the Mingtang, and in particular, Li Mi's essay on the Mingtang examined the architectural system from the viewpoint of construction principles. These works should also be considered as research on architectural history.
 137. See Du You, *Tongdian*, chap. 44, “Li” 禮 (Rites), “Taixiang mingtang” 太享明堂 (The Extreme-Enjoyment Hall of Distinction); Liu Xu et al., *Jiu Tangshu*, *juan* 22, “Liyi zhi” 禮儀志 (Record of rituals), 856–862.
 138. For a proposed reconstruction drawing based on this record, see Wang Shiren, *Lixing yu langman de jiaozhi*, “Mingtang meixue guan,” fig. 4 (between pp. 102 and 103); Tanaka Tan has also offered a reconstruction drawing of the plan of the Mingtang; see his *Chūgoku kenchikushi no kenkyū*, 237, fig. 75.

139. It was compiled by order of Emperor Yang 煬帝 (r. 604–617). Only the first two chapters have survived, in which the architectural section is included.
140. Du Gongzhan, *Bianzhu*, *juan* 2:1a, 2a, 4a–b, 6b.
141. Ouyang Xun et al., *Yiwen leiju*, *juan* 61–64, v. 2:1094–v. 3:1156, “Juchubu.” The compilation was ordered by Emperor Gaozu 高祖 (r. 618–626).
142. *Ibid.*, *juan* 38–39.
143. Xu Jian et al., *Chuxueji*, *juan* 24, “Juchubu,” v. 3:1805–1826. This work was compiled under the order of Emperor Xuanzong 玄宗 (r. 712–756).
144. Ouyang Xun et al., *Yiwen leiju*, *juan* 65, v. 3:1159–1165, 1169–1170.
145. More details about this work can be found in chap. 2.
146. Bai Juyi, *Baishi liutie shileiji*, *juan* 3 and 11, v. 3:1967–1974, 2051–2055.
147. Xiao Yi, *Jinlouzi*, “Xingwang pian” 興王篇 (The rise of dynasties), *juan* 4 (2865).
148. Zhang Jiuling, *Tang liudian*, 217–218, *juan* 23, “Jiangzuo dushui jian” 將作都水監 (Directorates of Construction and of Waterways and Boats), 11b–12a.
149. A longer text is collected in Wang Pu 王溥 (922–982), *Tang huiyao* 唐會要 (Important institutional documents of the Tang dynasty), cited in Tao Zongyi, *Jigu dingzhi*, section on the rules for buildings in the Tang dynasty.
150. According to Charles O. Hucker, “consultants-in-ordinary,” or *changcanguan* 常參官, is “a generic term for officials regularly expected to attend audiences,” and refers, in the Tang period, to court officials of the fifth rank and higher. See Hucker, *Dictionary of Official Titles in Imperial China*, 116.
151. *Chouxinshe* 抽心舍 has no match in the *YZFS*. Tanaka Tan has pointed out that *chouxinshe* is a scribal error for *zhouxinshe* 軸心舍 (literally, “axle-center residences”), which refers to official residences taking the form of a “*gong* 工 character-shaped hall,” a layout commonly used in government offices during the Tang and Song periods. Tanaka cites *juan* 20 of the Qing-period encyclopedic work *Gezhi jingyuan* 格致鏡原 (The origins of all things and principles, 1708), in which a passage in the *Shiwu yuanshi* 事物原始 (The origins of things) is cited: “抽心舍者乃穿廊也” (*Chouxishe* is a covered corridor). See Tanaka, *Chūgoku kenchi-kushi no kenkyū*, 118. Here, the source likely refers to Xu Ju’s 徐炬 thirty-chapter *Xinjuan gujin shiwu yuanshi quanshu* 新鐫古今事物原始全書 (Newly engraved origins of things of ancient and present times) (unofficial printing of 1593). The layout of a “*gong*-shaped hall” is characterized by a compound in which main halls in the front and at the rear are connected by a corridor on the axis of the compound.
152. *YZFS*, *juan* 6, “Minor Carpentry System,” entry for *wutoumen*, 3a–4b.
153. *YZFS*, *juan* 4, “Major Carpentry System,” entry for *yangma* 陽馬 (corner beams).

Chapter 2: From the *Mujing* to the *Yingzao Fashi*

- Li Jie, “Jin xinxiu *Yingzao fashi* xu,” 1a. Liang Sicheng has explained that *sangong* 三宮 here is a generic term for architecture; see Liang Sicheng, *Yingzao fashi zhushi*, 3.
- Ouyang Xiu, *Guitianlu*, 83:428, *juan* 1:1a–1b: “世傳浩……撰成木經三卷、今行於世者、是也” (It is transmitted through generations that [Yu] Hao . . . wrote the *Mujing* [in] three chapters. Nowadays what is being practiced [in construction activities] is just this book). Shen Kuo, *Mengxi bitan*, 28:76, *juan* 18:1b, “Jiyi” 技藝 (Artistry): “營舍之法謂之木經。或云喻皓所撰” (Methods of building houses are called *Mujing*. Some say that [this book] was written by Yu Hao).
- Ouyang Xiu, *Guitianlu*, 1.1a–1b: “開寶寺塔在京師諸塔中最高、而制度甚精。都料匠預浩所造也” (The pagoda of the Kaibao Monastery is the tallest among all pagodas in the capital and [its structural] system is quite excellent. [It was] built by the

- architect Yu Hao). Other accounts include Yang Yi, *Yang Wengong tanyuan*, 107–108, entry for *Yu Hao zao ta* 喻皓造塔 (Yu Hao made a pagoda).
4. See Yang Yi, *Yang Wengong tanyuan*, 107–108; also Monk Wenying, *Yubu qinghua*, *juan* 2:21.
 5. Shen Kuo, *Mengxi bitan*, 28:80, *juan* 18:9a: “錢氏據兩浙時、於杭州梵天寺建一木塔……密使其妻見喻皓之妻、賂以金釵、問塔動之因” (When Master Qian [Chu] governed the two Zhejiang provinces, he authorized the construction of a wooden pagoda at the Fantian [Brahma-Heaven] Monastery in Hangzhou . . . [The craftsman] privately sent his wife to see Yu Hao’s wife with a present of golden hairpins and enquired about the cause of the motion of the pagoda). With some modifications, the translation follows Needham, *Science and Civilisation in China*, 141. From the context of this account, it must have been the craftsman (rather than Qian Chu himself) who “privately sent his wife to see Yu Hao’s wife” and consulted Yu Hao.
 6. Needham, *Science and Civilisation in China*, 141, dates the event that occurred in this account incorrectly, saying that it was some ten years later than the establishment of the Kaibao Pagoda (989). On the contrary, it was some ten years earlier.
 7. See Wu Renchen, *Shiguo chungiu*, *juan* 88, section on Wuyue, biographies, entry for Yu Hao. This text considers Yu Hao as a subject of the Wuyue.
 8. Yang’s oral account was recorded by Huang Jian 黃鑑 (a contemporary of Yang’s) and edited by Song Xiang 宋庠 (996–1066).
 9. See Shen Kuo, *Mengxi bitan*, in note 2.
 10. Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 74.
 11. Shen Kuo, *Mengxi bitan*, 76–77, *juan* 18:1b–2a.
 12. Xia Nai suggested that Shen might have added words to or deleted words from the original text; see Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 75.
 13. Ouyang Xiu, *Guitianlu*, *juan* 1:1a–1b (83:428). I discuss this account in detail later in this chapter.
 14. Xia Nai suggested that in all extant editions of the *Mengxi bitan*, the words *cuideng* 檁等 are scribal errors for *dengcui* 等衰, which means here that measurements increase or decrease progressively according to a fixed ratio; see Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 75. According to Chen Fuhua, *Gudai Hanyu cidian*, 259, *cui* 檁 and *cui* 衰 are interchangeable when they designate “place in a series, grade,” or “class.” Thus, in the *Mujing* text, the same word *cui* is used in two meanings: the above one and as “rafters” in the compound *cuijue* 檁桷.
 15. Xia Nai suggested that the phrase *ting fa tang* 廳法堂 is an erroneous transcription of *tingtang fa* 廳堂法; see Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 75. Both variants could make sense in terms of the actual architectural technology during the Five Dynasties and early Song periods; I discuss these terms below.
 16. For my translation, I consulted Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” and Needham, *Science and Civilisation in China*, 82, 84. While I tried to follow Needham’s translation as closely as possible, I have made many modifications. As Xia pointed out (75), Needham’s translations of *ji* 極 as “the uppermost crossbeams” and of the phrase *jiwei cuideng* 以為檁等 as “as well as the rafters, etc.” are incorrect.
 17. Both Needham and Xia Nai explained that the “middle unit” includes those above “the ground floor” and that the platform belongs to the “lower unit,” even though the text about the “middle unit” indeed mentions the principle of determining the dimension of the base according to that of the columns. It seems to me that the division of the three “units” in the *Mujing* possesses a textual coherence, in which each unit treats the relationship between measurements of elements that belong to the same unit. Its definition of the “middle unit” is “above the ground” (地以上), and its discussion of

- this unit includes the platform. Moreover, its discussion of the “lower unit” does not mention “platform” at all, but instead it treats only gradients of the *jieji* 階級 (stairs).
18. See Needham, *Science and Civilisation in China*, 82: “This (2.28) is the Upper Unit.”
 19. Refer to note 15.
 20. In Needham’s translation (*Science and Civilisation in China*, 82), the dimensions of all components in the middle unit, including corbelled brackets and rafters, follow this ratio (2.44).
 21. As Xia Nai pointed out (“*Mengxi bitan zhong de Yu Hao Mujing*,” 75), this part in the text treats the methods for determining the dimensions of rafters, and there is no reason that the dimensions of rafters are determined by both the length of the beam and the height of the column, as seen in Needham’s translation of “以為檼(衰)等” in both the upper and middle units.
 22. For a detailed discussion and illustrations of these gradients, see Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 76–78.
 23. Needham provided a ratio for each of the three gradients, and they are 1:3.35 (steep), 1:2.18 (intermediate), and 1:1.38 (easy or gentle); but he did not explain how these data were deduced, although he referred to the proportions of the human body given in the *Huangdi neijing taisu* 黃帝內經太素 (The Yellow Emperor’s Inner Canon: The Great Blank [completed about 678]). He admitted that “to determine the absolute gradients it would be necessary to know the lengths of the standard litters, but we have not gone into this.” See Needham, *Science and Civilisation in China*, 82, note (e) and translation. Xia Nai (“*Mengxi bitan zhong de Yu Hao Mujing*,” 77–78) deduced entirely different ratios: 1:2 (steep), 1:4 (medium), and 1:7.8 (gentle). He deduced the length of an imperial carriage by measuring one that is depicted in a Southern Song painting and by referring to the *YZFS* method related to stone stairs. But he did not give any source for the height (6.7 *chi*) where the leading bearers of the carriage stand, an important factor in his deduction.
 24. *YZFS*, *juan* 3, “Shizuo zhidu” 石作制度 (System of stonework), entry for *tadao*.
 25. Xia Nai proposed that in addition to the proportions between two elements or two parts of a building, the “unit” in the *Mujing* might also stand for a ratio of the height to the width of a certain component (see “*Mengxi bitan zhong de Yu Hao Mujing*,” 78). However, such a ratio is not suggested by the extant *Mujing* text.
 26. See Feng Jiren, “Ribei Jiuzhou Daxue cang Dunhuang wenshu suo ji kuyan de fuyuan yu fenxi.”
 27. Among extant Tang wood-framed structures, the Great Hall of the Foguang Monastery 佛光寺 (built 857) presents a beam structure of the tower type, while the rest of them clearly present a beam structure of the *tingtang* type.
 28. *YZFS*, *juan* 5, “Major Carpentry System,” entry for *juzhe* (raise and break of roofs).
 29. Xia Nai suspected that the height of the ridge purlin, “3.5 *chi*,” is probably a scribal error for “2.5 *chi*” (“*Mengxi bitan zhong de Yu Hao Mujing*,” 75–76).
 30. See Feng Jiren, “Zhongguo gudai mugou jianzhu de kaoguxue duandai,” 55, 57. The Great Hall of the Hualin Monastery at Fuzhou, Fujian Province 福建福州華林寺大殿 (built in 964 under the Wuyue regime [904–978]), is an example of a residential hall built in a mixed style of the tower type and the residential-hall type.
 31. Joseph Needham translated this phrase as “(the proportions are maintained) in larger and smaller halls.” He seemed to distinguish *ting* and *tang* as “larger halls” and “smaller halls.” Xia Nai argued that *tingtang* should be understood as medium-size residential halls based on the *YZFS*, “Major Carpentry System,” entry for *cai*, in which *diange* and *tingtang* represent two types of buildings; see Xia Nai, “*Mengxi bitan zhong de Yu Hao Mujing*,” 76.

32. For instance, see the entries for *cai* and *juzhe*.
33. *YZFS*, *juan* 13, “Tile System,” entry for *lei wuji* 壘屋脊 (build ridges of a hall [by piling up tiles]).
34. *Ibid.*
35. This is the opposite of Needham’s translation (see note 31).
36. Ouyang Xiu, *Guitian lu*, *juan* 1:1b.
37. *Ibid.*, *juan* 2:16a; an anecdote under “治平二年” records that the capital city was flooded overnight after heavy rains and that Emperor Yingzong asked court officials for proposals to deal with the situation.
38. See Ji Yun 紀昀 et al., *Qinding siku quanshu zongmu* 欽定四庫全書總目 (A general list of all books in the four collections under imperial order), “Guitianlu tiyao” 歸田錄提要 (Summary of the *Guitianlu*); cited in Ouyang Xiu, *Guitianlu*, appendix, 1a–2a.
39. See Chen Zhensun, *Zhizhai shulu jieti*.
40. *Guitianlu*, *juan* 2, 10a.
41. Ouyang Xiu, *Guitianlu*, *juan* 2:11b.
42. *Ibid.*, *juan* 1:1b.
43. Shen Kuo, *Mengxi bitan* (28:77), *juan* 18:2a.
44. With a few modifications, my English translation follows Needham, *Science and Civilisation in China*, 84.
45. Nie Chongyi, *Xinding Sanlitu*, 57–74, *juan* 4. The Northern Song edition was lost in 1127, but a copy that was published in Sichuan was recovered during the early Southern Song. The 1175 edition is the earliest extant edition and, because of the complete preservation of its content, is probably the best edition available today. See the Southern Song postscript by Chen Boguang 陳伯廣 (fl. 1174–1189) and the postface by Shanghai Guji Chubanshe (272, 276).
46. *Ibid.*, 3–4. Dou indicated that he was in charge of the compilation of a comprehensive work on rituals entitled *Gujin tongli* 古今通禮 (General rituals of ancient and present times) upon imperial orders (most likely of Emperor Taizu 太祖 [r. 960–976]), and thus he added the *Xinding Sanlitu* to that book.
47. *Ibid.*, 3: “周世宗暨今皇帝恢堯舜之典則、總夏商之禮文、思隆大猷、崇正舊物儀形、作範旁詔四方” (Both Emperor Shizong of the [Later] Zhou and today’s Emperor [Taizu] restore the institutions and laws of [the Founding Emperors] Yao 堯 and Shun 舜 and gather the ritual documents of the Xia and the Shang. The thought is lofty and the plan great. [They] promote the correction of rites and forms of old [ritual] objects, make standards [of them], and issue edicts throughout the world).
48. *Ibid.*, 74: “此秦制、改周法為九室三十六戶、七十二牖、十二階、今以月令是秦法、故存其制、圖之於後” (This [Mingtang] is the Qin-period system. [It] changed the Zhou system into [one that had] nine chambers, thirty-six doors, seventy-two windows, and twelve stairs. Now, because the “Yueling” [of the *Liji*] is of the Qin system, so [I] keep its system and illustrate it at the last).
49. *Ibid.*, 4, Dou Yan’s preface: “博採三禮舊圖、凡得六本、大同小異……吾誰適從之嘆” ([Nie] widely collected old illustrations of the *Zhouli*, the *Liji*, and the *Yili* and acquired in all six copies [of illustrations]. [These old illustrations] were similar with minor differences . . . [And then, Nie] sighed about which he ought to follow). The six versions of illustrations that Nie acquired included those made by the great Han-period commentator on the classics Zheng Xuan, the Jin-period (265–420) scholar Ruan Chen 阮譔, a Sui-period scholar called Kaihuangguan 開皇官 (official of the Kaihuang 開皇 [581–600]), and the Tang scholar Zhang Yi 張鎰 (fl. 760–784). See the postface by Shanghai Guji Chubanshe, 275; also see Zhongguo Wenhua Yanjiusuo et al., *Zhongwen dacidian*, 1:278, entry for *Sanlitu*.

50. Fragments of some of these pre-Song illustrations were reconstructed during the Qing period. For example, Ma Guohan reconstructed the *Sanlitu* by Zhang Yi and that by Liang Zheng 梁正, both of which are only one chapter long, compared to Nie's twenty-chapter illustrations of various aspects of the Zhou ritual system. See Ma Guohan, *Zhangshi Sanlitu*.
51. See Dou's preface (in Nie Chongyi, *Xinding Sanlitu*, 4): “遂鑽研尋繹、推較詳求原始以要……躬命績素、不差毫釐” (Therefore, [Nie] scrutinized intensively [the classics] and investigated the reasons [for the differences between those old images], examined and compared [the classics and old illustrations] and sought in detail the original reasons [for the differences] and essentials [of the classics] . . . [he] painted [those pictures] on silk himself, [trying hard] not to make the least bit of difference [from the classics]).
52. The illustrations in this edition present a much better quality than those in the Mongolian edition (1247 or 1248), which is the second-earliest known to date.
53. Song scholarship on classical ritual architecture also includes Wang Anshi's commentarial study of the *Zhouli* (which includes two chapters on the *Kaogongji*), Lin Xiyi's 林希逸 (*jinsbi* 1235) *Juanzhai Kaogongji jie* 廬齋考工記解 (Explanations of the *Kaogongji* written at Juanzhai), and Li Rugui's 李如圭 (*jinsbi* 1133; fl. 1117–1195) *Yili shigong* 儀禮釋宮 (Explanations of the palaces in the *Yili* [Rites and ceremonies]).
54. For example, in 1199, Pu Shuxian 蒲叔獻 (fl. 12th c.) wrote in his preface to the *Taiping yulan*: “太宗皇帝……四方既平、修文止戈、收天下圖書典籍、聚之昭文、集賢等四庫” (Emperor Taizong . . . , [because] the empire was at peace, engaged in developing culture and education while sheathing the sword, collecting books and classics from the whole nation, gathering them in the four treasuries such as the Zhaowen and the Jixian). See Li Fang et al., *Taiping yulan*, 1:1.
55. Ibid., 1:3, *Guochao huiyao* 國朝會要 (Record of essential affairs of our state [i.e., the Song *huiyao* 宋會要 (Record of essential affairs of the Song)]): “先是、帝閱前代類書、門目紛雜、失其倫次、遂詔修此書” (Earlier, the emperor [Taizong] read through reference works of preceding dynasties. [Because] the categories and sections were numerous and complicated as well as disorganized, lacking coherence, therefore, [the emperor] ordered that this book be compiled).
56. As Pu Shuxian commented, this book included the “principles of the ten thousand things in the universe, origins of politics, education, laws and moral standards, causes of administrative disorder and the fall and rise of all dynasties, as well as profoundness in meanings of ethics and life” (備天地萬物之理、政教法度之原、理亂廢興之由、道德性命之奧). See Li Fang et al., *Taiping yulan*, 1:1.
57. Ibid., *juan* 173–197, 2:973–1080.
58. See chap. 1, “Architectural Literature from the Jin to the Tang,” section c.
59. Li Fang et al., *Taiping yulan*, *juan* 196, 2: 1073–1076.
60. Exceptions to this arrangement exist. For instance, in the entry for *chiwei*, the citation of the fourth and last text, the *Tang huiyao* (Record of essential affairs of the Tang), is accidentally mixed with that of the third text, the *Chenshu* 陳書 (Book on the [history of] Chen [557–589]). The end of the line of the *Chenshu* citation has a one-character space, which is filled by the *tang* of *Tang huiyao*, and *huiyao* occurs at the beginning of the next line. See Li Fang et al., *Taiping yulan*, *juan* 188, 2:1041. This kind of exception is most likely the result of mistakes made in the process of hand copying the text.
61. These hand-copied fragments were discovered in the Stone Study of Cave No. 288 at Dunhuang in the early twentieth century and, because of the special forms and writing styles of some characters in them, the copying was dated to the Tang period. Modern scholars have identified the text of these fragments as either the *Xiuwendian yulan* or

- the imperially patronized Liang-period reference work *Hualin bianlue* 華林遍略 (An extensive browsing [from the books] at the Imperial Academy [completed 523]). The compilation of the *Xiuwendian yulan* was based significantly on that of the *Hualin bianlue*. See Hu Daojing, *Zhongguo gudai de leishu*, 45–54. A photocopy of a part of these fragments can be seen on the first flyleaf of this source.
62. See Li Fang et al., *Taiping yulan*, 1:3, *Guochao huiyao* 國朝會要 (Record of essential affairs of our state): “以前代《修文御覽》、《藝文類聚》、《文思博要》及諸書參詳條次、分定門目” ([Under the emperor’s order, the compilers of the *Taiping yulan*] consulted [reference works of] preceding dynasties [including] the *Xiuwen [dian] yulan*, the *Yiwen leiju*, the *Wensi boyao* [Tang imperial reference book, completed in 641, lost after the Northern Song], and others to make the entries and classify the categories).
 63. See Hu Daojing, *Zhongguo gudai de leishu*, 119–121.
 64. Thus far, according to the earliest editions (Song to Ming editions or copies) available of the major Sui-Tang reference works, the previously mentioned mixed format was still dominant.
 65. Guo Pu, *Erya zhushu*, “Preface,” 1a–1b. In this preface, Xing states that they believed that Guo’s scholarship on the classics was the best of all commentators: “惟東晉郭景純……學者祖焉、最為稱首” ([Among those who commented on the *Erya*,] only Guo Jingchun [Guo Pu] of the Eastern Jin period [well comprehended the essence of the classics] . . . [and therefore,] scholars followed his [scholarship], and [his scholarship] was the best of all [commentators]).
 66. Regarding *wulou*, Guo comments: “《詩》曰：‘尚不媿於屋漏。’其義未詳” (In the *Shijing*, it is written, “[you ought to be] still free from shame by *wulou*.” Its [*wulou*] meaning is unknown). Regarding *yi*, Guo’s commentary reads as follows: “宦見《禮》、亦未詳” (*Yi* is seen in the *Liji*, [whose meaning] also is unknown). See *YZFS*, *juan* 1, “Zongshi,” 2a.
 67. See Guo Pu, *Erya zhushu*, *juan* 5:1b. After quoting the explanations of *wulou* by Zheng Xuan and Sun Yan 孫炎 (Han-period commentators), Xing Bing and his cocompilers comment, “郭云‘其義未詳’者、以孫、鄭之說皆無所據、故不取也” (That Guo says “its meanings are unknown” is because the explanations of Sun and Zheng all have no grounds, and therefore [these explanations are] not accepted). Similarly, after quoting the Han-period commentaries on *yi*, Xing also indicates the reason Guo disagreed and thus asserts “also unknown” (亦未詳).
 68. This early-Tang official geomancy book was commissioned by Taizong (627–649) and completed in 641. It was distributed throughout the state and became popular thereafter. See Wang Zhu, “*Dili xinshu xu*” 地理新書序 (Preface to the *New Book on Geomancy*), in Wang Zhu et al., *Chongjiaozheng Dili xinshu*, 10–11. The book is now lost.
 69. Wang Zhu, “*Dili xinshu xu*,” 11–15.
 70. More regarding the compilation of the *YZFS* is discussed later in this chapter.
 71. The one-chapter illustration was said by Wang Zhu to be included in the Song edition of this work; see Wang Zhu, “*Dili xinshu xu*,” 13–14. The Song edition has not survived. The Jin-period hand-copied editions include fifteen chapters, each containing one to seven essays. Many essays are illustrated with figures, which were added to the book by Jin-period scholars, including Bi Lüdao 畢履道 (fl. 12th c.) and Zhang Qian, who commented on the work.
 72. *Ibid.*, 6–9. The authors cite classics such as the *Yijing*, the *Shijing*, and the *Zhouli* that record early Chinese kings building capitals and residential districts in accordance with geomantic principles; these constructions, as the authors conclude, bore a common

- feature: “代皆相其吉兇然後居之” (In each historical period, [these kings] all observed and judged the auspicious and ominous [omens of the construction sites] and after that resided in these [auspicious locations]).
73. Ibid., 10, 14.
74. See Feng Jiren, “Lun yinyang kanyu dui Bei Song huangling de quanmian yingxiang.”
75. See Wang Zhu et al., *Chongjiaozheng Dili xinshu*, *juan* 1:25–26; YZFS, “Kanxiang,” 3b, entry for *quzheng*, 5a, entry for *dingping*.
76. Bi Lüdao produced illustrations of these technologies in the 1192 edition of the *Dili xinshu*. Refer to his “Tujie jiaozheng *Dili xinshu* xu” 圖解校正地理新書序 (Preface to the collated *Dili xinshu* with illustrations), in Wang Zhu et al., *Chongjiaozheng Dili xinshu*.
77. See Zeng Gongliang et al., *Wujing zongyao (qianji)*, 493, “Preface”: “朕聞天道尚武……深惟帥領之重、恐鮮古今之學、命天章閣待制曾公亮等同加編定” (I heard that the heavenly law is to esteem martial qualities . . . [I] deeply consider the importance of the commanders in chief and generals. Afraid that [the generals] had little knowledge of ancient and present-day [military strategies], [I] ordered the Heavenly Composition Office’s advisor Zeng Gongliang, along with others, to compile [this book on the military]).
78. Ibid., 611, *juan* 11:1a–b.
79. Li Quan, *Shenji zhidi taibai yinjing*, 44, *juan* 4, essay 37, “Shuigongju” 水攻具 (Tools for attacking with water). See also Zhang Wencai and Wang Long, *Taibai yinjing quanjie*, 208–209.
80. The 1488–1522 edition follows the format of the 1231 edition.
81. For a comparative study of the instruments as recorded in the *Taibai yinjing* and in the YZFS, see YZFS, “Kanxiang,” entry for *dingping*, 6a; *juan* 3, “Haozhai zhidu,” entry for *dingping*, 3a; see also Beijing Kexue Chubanshe, *Zhongguo gudai jianzhu jishushi*, 3:896–898. The latter source points out some mistakes in the illustrations of leveling technology in the Ming and Qing editions of the text and offers a new illustration (p. 897); it modifies the form of the reflecting board held in the hand of the soldier in the Ming illustration.
82. In the *Wujing zongyao* illustration, two additional vertical stakes are depicted on the sides of the central stake. These two stakes are shorter than the central one and are not connected to the upper horizontal trough. No explanation of these two stakes is offered in the text.
83. Zeng Gongliang et al., *Wujing zongyao (qianji)*, 611, *juan* 11:3a: “以水注之、三池浮木齊起、眇目視之、三齒齊平、則為天下準” (Pour water into it [the groove]. The wood blocks of the three water cases all float up. With one eye closed, observe them. If the three alveoli [on the floating wood blocks] are even, [the instrument] then becomes the leveling instrument of the world). See also Li Quan, *Shenji zhidi taibai yinjing*, 44.
84. See YZFS, “Kanxiang,” entry for *dingping*, 6a; *juan* 3, “Haozhai zhidu,” entry for *dingping*, 3a.
85. Ibid., “望兩頭水浮子之首、遙對立表處、於表身內畫記、即知地之高下” (Observe the tops of the floating wood blocks at the two ends, facing the standing poles from a distance; mark [the heights observed through the water-level instrument] on the body of the poles, then one knows the differences in heights of the earth). Here, Li Jie is talking about the case of two water “ponds” in the instrument, but in a few annotations he also includes the case of three water “ponds.” Thus, we can deduce that the method would involve “observing the tops of the floating wood blocks at the two ends and in the center.”

86. YZFS, “Kanxiang,” entry for *dingping*, 5b–6a.
87. The following passage from the *Wujing zongyao* provides important details about the methods and tools for accurately surveying the terrain of distant locations: “度竿長二丈、刻作二百寸、二千分、每寸內小刻其分、隨其分向遠近高下、其竿以照版映之、眇目視三浮木齒及照版、以度竿上尺寸為高下、遞而往視、尺寸相乘、山崗溝澗水之高下淺深、皆可以分寸度之” (A measuring pole is two *zhang* [one *zhang* is equal to ten *chi*] long, marked in two hundred *cun* [one *chi* is equal to ten *cun*], two thousand *fen* [one *cun* is equal to ten *fen*]; within each *cun*, [the pole is] further marked in [the unit of] *fen*. As the poles are distributed to [different locations that are] distant or close, [whose terrains are] high or low, these poles are reflected with [and then in] the reflecting board. Observe with one eye closed the alveoli on the three floating wood blocks [on the water-level instrument] and the reflecting board, use the measurements of the [reflected] measuring poles as the differences in the heights [of the terrains], successively observe the other [poles], and count these measurements, [by doing so,] the differences in heights and depths of hills, gullies, and rivers can all be measured [as precisely as] in *fen* and *cun*). See Zeng Gongliang et al., *Wujing zongyao (qianji)*, 1:3b (p. 612). This passage was also transmitted from Li Quan’s *Taibai yinjing*, but there are variations in some words and phrases.
88. Zeng Gongliang et al., *Wujing zongyao (qianji)*, 622, *juan* 12:1b, entry for *shoucheng* 守城 (defending a city).
89. *Ibid.*, 623–628, *juan* 12:2a–13a.
90. See YZFS, *juan* 1, “System of Moats and Fortifications,” entry for *cheng*, 4a.
91. *Ibid.*
92. Zeng Gongliang et al., *Wujing zongyao (qianji)*, 623, *juan* 12:2a–3a, entry for *shoucheng*.
93. Chen Zhensun, *Zhizhai shulu jieti*, 507, *juan* 7:35a, section on “Faling lei” 法令類 (Category of laws), entry on “修城法式條約二卷” (The *Xiucheng fashi tiaoyue*, two *juan*): “判軍器監沈括、知監丞呂和卿等所修敵樓、馬面、團敵式樣、并申明條約、熙寧八年上” ([It was] compiled by the director of the Office for the Supervision of Ordnance (Production), Shen Kuo, assistant officer of the Office of Intelligence, Lü Heqing, and others and [was about] forms of defense towers, “horse face” protruding walls, and round-cornered defense towers. [They] also clearly explained the regulations [concerned]. [It was] presented to the court in the eighth year [1075] of the Xining [1068–1077] period).
94. *Ibid.* Also, in Ma Duanlin, *Wenxian tongkao*, *juan* 221, bibliography of the *Zhizhai shulu jieti*, the book listed right after the YZFS is the *Xiucheng fashi tiaoyue*, but there is no indication of whether or not it was approved by the court and issued.
95. See Xu Song, *Song huiyao jigao*, 15:7442, “Fangyu” 方域 (Local areas), section 8, “Xiucheng: zhucheng xiu, gai, yi bingshang” 修城: 諸城修、改、移並上 (Construction of city walls: all matters related to construction, repair, and relocation of city walls are included in this section), 4a–4b.
96. *Ibid.*
97. *Ibid.*, 15:7441–7442.
98. *Ibid.*, 7443, “Fangyu,” section 8, “Xiucheng,” 5a–6a.
99. *Ibid.*

Chapter 3: The *Yingzao Fashi*

1. YZFS, “Zhazi,” 1a.
2. For Li Jie’s biography, learning, and experience of supervising imperial building

- projects, see his tomb tablet included in Cheng Ju, *Beishanji*, *juan* 33:16a–20a; *YZFS*, appendices; Liang Sicheng, *Yingzao fashi zhushi*, “Preface,” 6–7.
3. Liang Sicheng thought that it was Emperor Huizong who ordered Li Jie to recompile the *YZFS*, and Liang explained that because of Huizong’s artistic attainments and excessive demands related to the design of buildings, he was not satisfied with the former *YZFS*, which presented “rules for materials only.” See Liang Sicheng, *Yingzao fashi zhushi*, 6, “Preface.” Liang confused Huizong with Zhezong, who ordered the recompilation in 1097 because he assessed the former *YZFS* as containing nothing but “rules for materials only,” as Li Jie stated; see *YZFS*, “Zhazi” 箒子 (Prefatory document [dated 1103]), 1a. Liang’s mistake remains in many works by other scholars as well.
 4. See Cheng Ju, *Beishanji*, *juan* 33:16a–20a, “Inscription on Li Jie’s Tomb Tablet.”
 5. See *YZFS*, appendices, “Inscription on Li Jie’s Tomb Tablet,” 1b. Cheng dates all of Li’s merits related to compiling the *YZFS* to the time when Li finished the Five Princes’ Mansions project during the Yuanfu 元符 period (1098–1100); these merits include Li’s receipt of the imperial order to compile the *YZFS*, his accomplishment of it, and its issue under imperial orders. This record is not accurate according to the “Zhazi” of the *YZFS*—Li’s memorandum to Emperor Huizong about previous imperial orders for compiling the *YZFS* and its completion as well as his request for its distribution. What the “Five Princes’ Mansions” refers to is unclear. It might refer to a large palatial compound dedicated to the five younger brothers of Emperor Zhezong, the sixth son of Shenzong. Shenzong had fourteen sons, eight of whom died young, including the first five, the seventh, eighth, and tenth. Li Jie supervised the Five Princes’ Mansions project during the reign of Zhezong, who had no sons. It is most likely that the mansions of this magnificent compound were for the other five brothers of Zhezong, including Zhao Ji, later Emperor Huizong, who was the eleventh son of Shenzong. Another possibility is that this compound served as a memorial to Zhezong’s five brothers who died young.
 6. *YZFS*, “Zhazi,” 1a. The “Zhazi” does not clarify which emperor gave this order.
 7. For example, see Li Tao 李燾 (1115–1184), *Xu Zizhi tongjian changbian* 續資治通鑑長編 (Continuation of the first draft of the *Zizhi tongjian* [History as a mirror; by Sima Guang 司馬光 (1019–1086)]), *juan* 471. In modern scholarship, Liang Sicheng also believed that the former *YZFS* was issued in 1091; see Liang Sicheng, *Yingzao fashi zhushi*, 6. Else Glahn believed that the former *YZFS* “was never printed”; see Glahn, “On the Transmission of the *Ying-tiao Fa-shih*,” 237.
 8. *YZFS*, “Kanxiang,” entry for *zong zhuzuo kanxiang* 總諸作看詳 (general comments in detail on all systems), 12a.
 9. *YZFS*, “Zhazi,” 1a.
 10. *Ibid.*, 1b.
 11. *YZFS*, “Jin xinxiu *Yingzao fashi xu*,” 1a.
 12. Liang Sicheng, in his *Yingzao fashi zhushi* (p. 4), corrects his earlier wrong interpretation of this sentence, which was interpreted as “[they] did not know either that the multiple of the measurement of the block should be used to determine the dimensions of the building and elements” in his “Song ‘*Yingzao fashi*’ zhushi xuanlu,” 2:1–2.
 13. *YZFS*, “Jin xinxiu *Yingzao fashi xu*,” 1b.
 14. *Ibid.*
 15. *YZFS*, *juan* 12, “Sawing System,” 6b, entry for *yong caizhi* 用材植 (employment of timbers).
 16. *Ibid.*, 6b–7a, entry for *pengmo* 桴墨 (applying carpenter’s marks).
 17. *Ibid.*, 7a, entry for *jiu yucai* 就餘材 (proper use of remainder materials).
 18. See Wang Caizhong, “Song Shenzong yu Wang Anshi bianfa,” 29.
 19. See Glahn, “Chinese Building Standards in the 12th Century,” 166–169; Li Zhizhong,

- “Yingyin Songben *Yingzao fashi* shuoming,” 4; Guo Qinghua, *Structure of Chinese Timber Architecture*, 66–67.
20. See Deng Guangming, *Wang Anshi*; Qi Xia, *Wang Anshi bianfa*, 237–254.
 21. For a well-written English explanation of this law, see Glahn, “Chinese Building Standards in the 12th Century,” 165–166.
 22. For further discussion of Huizong’s rule, see Ebrey and Bickford, *Emperor Huizong and Late Northern Song China*. For Huizong’s political concerns with regard to many construction activities, see also Kuhn, *Tragedy of a Gardening Passion*; Jiren Feng, “Emperor as an Unconventional Artist.”
 23. *YZFS*, “Kanxiang,” entry for *zong zhuzuo kanxiang*, 12a.
 24. Cited in Chen Zhongchi, “*Yingzao fashi* chutan,” 13. Chao was a governor of the prefecture 縣尉 of Chenliu 陳留 (in Henan).
 25. Cited in Chen Zhongchi, “*Yingzao fashi* chutan,” 13. Zhuang was formerly an official in Shunchang 順昌 (modern Fuyang 阜陽, Anhui 安徽) and other prefectures.
 26. See Chen Zhongchi, “*Yingzao fashi* chutan,” 12. The Song Directorate of Construction exercised control over ten units, one of which was the Dongxi Bazuosi 東西八作司 (Office of Eight Workshops in the East and in the West), which included the following workshops: major carpentry 大木作, timber-sawing craftsmanship 鋸匠作, minor carpentry 小木作, leatherwork 皮作, large furnaces 大爐作, small furnaces 小爐作, hemp work 蔴作, stonework 石作, brickwork 磚作, clay work 泥作, well work 井作, red-and-white (polychrome painting?) work 赤白作, barrel work 桶作, tile work 瓦作, bamboo work 竹作, strong-flame oil work 猛火油作, nails and hinges work 釘鉸作, gunpowder work 火藥作, and so on.
 27. *YZFS*, “Kanxiang,” entry for *zong zhuzuo kanxiang*, 12b.
 28. *Ibid.*
 29. *Ibid.*
 30. *Ibid.*
 31. See Chen Zhongchi, “*Yingzao fashi* chutan,” 16–17.
 32. According to Chen Zhongchi, the entire fifth leaf of chapter 8 was found together with the first half of the first leaf of the same chapter in 1920. Liang Sicheng mentions only the discovery of the first leaf, which he and many other scholars of his time presumed to be of the 1103 edition. See Liang Sicheng, *Yingzao fashi zhushi*, 8. The fifth leaf of chapter 8 is not included in the photo-offset copy of the Shaoding edition of 1992.
 33. Li Jie, *Yingzao fashi*.
 34. See Chen Zhongchi, “*Yingzao fashi* chutan,” 16–17.
 35. Liang Sicheng (*Yingzao fashi zhushi*, 8) believed that there were only two Song-period editions of this text, 1103 and 1145, and he provided a photocopy of these “1103” and “1145” editions in the appendix (pp. 335–336). This mistake has been modified by Fu Xinian in the reprint of Liang’s work; see Liang Sicheng, *Liang Sicheng quanji*, 7:9n1. Takeshima Takuichi offered a detailed discussion of the transmission of this text, but he was not aware of the discovery of those fragments in 1956 and not aware of Chen Zhongchi’s article either; thus, he also thought that there were only two editions during the Song period. See Takeshima, *Eizō hōshiki no kenkyū*, 1:17–23. Else Glahn, in her review of the transmission of the text, gave credit to Chen’s scholarship, but she did not seem to be aware of Chen’s conclusion that these fragments were of the Shaoding edition instead of the 1145; see Glahn, “On the Transmission of the *Ying-tsoo Fa-shih*,” 264.
 36. See Chen Zhongchi, “*Yingzao fashi* chutan,” 16–17; Li Zhizhong, “Yingyin Songben *Yingzao fashi* shuoming,” 9–10.
 37. See illustrations in Li Jie, *YZFS* (1925 ed.). Here, new drawings were added that were supposed to reconstruct the Song style but did not reflect it. This edition also includes

- a photocopy of what was then believed to be an 1103 edition fragment—the first half of the first leaf of chapter 8—in its appendix.
38. See Yetts, “Note on the ‘*Ying Tsao Fa Shib*.’”
 39. See Needham, *Science and Civilisation in China*, 107.
 40. See Liang Sicheng, *Yingzao fashi zhushi*, 11, “Preface.”
 41. *Ibid.*, 6, 11.
 42. Paul Demiéville saw no relationship but rather a significant distance between Li’s architectural principles and the classics cited in the “Kanxiang.” See Demiéville, “Che-yin Song Li Ming-tchong *Ying tsao fa che*,” 11–12. This view is also maintained in Takeshima, *Eizō hōshiki no kenkyū*, 1:23.
 43. As mentioned in chapter 1, these instances are seen in the four entries on orientation (取正), leveling (定平), principles of building walls, and “raise and break” (舉折, method of determining the height of a roof and individual purlins so as to make a curved roof). See *YZFS*, “Kanxiang,” 3b–9b.
 44. See chap. 1, “Pre-Qin and Han Architectural Literature,” section (b).
 45. See *YZFS*, *juan* 1, “Zongshi,” 5a, entry for *cheng*.
 46. *YZFS*, “Kanxiang,” 2a, entry for *fang yuan ping zhi*.
 47. *Ibid.*
 48. Paul Demiéville suggested that the *Yixun* might have been written by a contemporary of Li Jie’s or someone active during a period close to Li’s time. He proposed that Dou Yan 竇儼 (10th c.), of the early Northern Song period, could have been the writer, as suggested in the “Jingji zhi” 經籍誌 (Record of books) of the *Songshi*. See Demiéville, “Che-yin Song Li Ming-tchong *Ying tsao fa che*,” 13.
 49. *YZFS*, *juan* 2, “Zongshi,” part 2, 11b.
 50. *YZFS*, *juan* 1, “Zongshi,” part 1, 2a.
 51. *Ibid.*, 6a.
 52. *YZFS*, *juan* 1, “Zongshi,” part 1, 11a.
 53. *YZFS*, *juan* 2, “Zongshi,” part 2, 7a.
 54. For example, the architecture category in the *Taiping yulan* encyclopedia includes twenty-two texts under the entry for *que* (gate towers), but only three of them are included in the *YZFS*, allowing for some variations in the quotations. The three extracts are from the *Zhouli* classic and the *Shiming* and *Gujinzhu* dictionaries, which were recognized as the most reliable etymological studies in the early period. Similarly, only the first four of thirty-eight sources in the entry for *lou* in the *Taiping yulan* are cited in the *YZFS*. They are the *Erya*, *Shuowen*, *Shiming*, and the *Shiji* (Records from the Grand Scribe).
 55. Xu Shen, *Shuowen jiezi*, 120, *juan* 6, part 1: “枅、屋櫨也” (The *ji* [bracket] is a *lu* of a building). The connection of a bracket and a cap block in the *Shuowen jiezi* reflects a factual interrelationship between these two elements in the primitive stage of the development of bracketing. In addition to a big cap block as the simplest form of bracketing, a simple, horizontal timber (square or curved) installed exactly or almost in the same position as the large cap block, i.e., directly on the head of a column, is another simple form of bracketing at this stage. Such a horizontal bracket arm indeed functioned, was positioned, and looked almost the same as (at least extremely similar to) a big cap block when either of them solely formed the bracketing on top of a column. This situation must be taken into consideration in order to understand why *ji*, a bracket, and *lu*, a cap block, are connected in the *Shuowen jiezi*.
 56. In commenting on the meaning of *lu* in the “Lu Lingguangdian fu,” Li Shan quoted a so-called *Shuowen jiezi* gloss on *bo* 榑 (wall brackets or columns): “《說文》曰：榑櫨、柱上枅” (The *Shuowen [jiezi]* says: “[*Bo*, as in] *bolu*, is a bracket on top of a column”)

- and then explained *lu* to be the same as “brackets”: “然枅櫨為一、此重言之、蓋有曲直之殊爾” (However, *ji* [bracket arms] and *lu* are the same thing. This [*Shuowen jiezi* gloss] is redundant [using terms for the same element to explain each other]. Probably there was a distinction [between *ji* and *lu*] in a curved one [*ji*] and a straight one [*lu*]); see Xiao Tong, *Wenxuan* (Shanghai 1935), 153, *juan* 11. In commenting on He Yan’s 何晏 (190–249) “Jingfudian fu” 景福殿賦 (Rhapsody on the Hall of Great Blessings), Li provided another variant quotation of the *Shuowen jiezi* gloss of *lu*: “說文曰：櫨、柱上枅也” (The *Shuowen [jiezi]* says, *lu* is a bracket on top of a column); see *ibid.*, 158, *juan* 11. Else Glahn pointed out that Li Shan, in his commentary on the “Lu Lingguangdian fu,” confused *lu* with the compound *bolu* 櫨櫨 (“brackets and blocks,” i.e., in Glahn’s language, bracket construction); see Glahn, “Some Chou and Han Architectural Terms,” 107. Similarly, in the *YZFS*, the *Yupian* text “櫨櫨、枅也” (*Bolu* is *ji* [brackets]) was also excluded. See Gu Yewang, *Yupian*, *juan* 12:14a, entry for *bo*.
57. The *YZFS* recognizes historical texts that regard *bo* and *ji* as “bracket arms” (*juan* 1, “Zongshi,” part 1, 8a) and puts *bolu* under the entry for *puzuo*, i.e., bracket sets or combinations of all bracketing members (9a).
58. For a *wan*-character motif mentioned in the systems of stonework and color painting, see the notes that follow. For this motif mentioned in the minor carpentry and the wood-carving systems, see *YZFS*, *juan* 8, “Minor Carpentry System,” entry for *goulan* 鉤闌 (balustrades), 6b–8b; *juan* 21, “Work Limits of Minor Carpentry System,” entry for *goulan*, 11b; *juan* 24, “Zhuzuo gongxian” 諸作功限 (Work limits of all systems), entry for *diaomuzuo* 雕木作 (wood-carving system), 5a.
59. *YZFS*, *juan* 14, “System of Color Painting,” entry for *wucai bianzhuang* 五彩遍裝 (five-colored fully decorated pattern), 4b, section on “Suowen” 瑣文 (Linked patterns): “瑣文有六品……六曰曲水[註：或作王字及萬字、或……宜於普拍方內外用之” (Linked patterns have six types . . . The sixth is winding water, or . . . [It] should be used in the form of the *wang* [王] character and the *wan* character, or . . . [It] should be used in the inside and outside [front and back] of a *pupai*[fang]).
60. *YZFS*, *juan* 3, “System of Stonework,” entry for *chongtai goulan*, 8b: “萬字版、長隨蜀柱內……[註：重臺鉤闌不用]” (A *wan*-character board: its length is within two neighboring dwarf posts . . . [annotation: not used in a double-layered balustrade]).
61. *Ibid.*, 7b: “單鉤闌……其益唇、地枅之內作萬字[註：或透空、或不透空]” (For a single-layer balustrade . . . a *wan*-character [board] is made between its *penchun* [益唇, long horizontal element above the board] and *difu* [地枅, ground beam; horizontal element at the bottom of a balustrade]. [Annotation: either hollowed out or not]).
62. The Ji River, Yangtze River, Huai River, and Yellow River have been esteemed as the Four Great Rivers and worshiped by Chinese rulers since the pre-Qin period. Among many sources that record this is the *Erya*, in the section on “Shishui” 釋水 (Gloss on rivers): “江、淮、河、濟為四瀆。” (The Yangtze River, Huai River, Yellow River, and Ji River are the Four Great Rivers).
63. For a brief introduction to this hall and other extant buildings at this shrine, see Cao Xiuji, “Jidumiao”; Tanaka, *Chūgoku kenchikushi no kenkyū*, 114–115.
64. Regarding the period style of Song architecture, see Feng Jiren, “Zhongguo gudai mugou jianzhu de kaoguxue duandai,” 57–64.
65. See Alexandra Harrer, “Fan-shaped Bracket Sets,” Ph.D. diss., University of Pennsylvania, 2010.
66. The earliest extant examples of angled protruding arms are seen in the following Liao architecture: the Guanyin Pavilion 觀音閣 (984) and Gate of Dule Monastery 獨樂寺 (Jixian 薊縣, Tianjin 天津), the Three-Bodhisattvas Hall 三大士殿 (1025) of Guangji Monastery 廣濟寺 (Baodi 寶坻, Tianjin), and the Bojiajiaozang Hall 薄伽教藏殿

- (1038) of Lower Huayan Monastery 下華嚴寺 (Datong 大同, Shanxi). See Feng Jiren, “Zhongguo gudai mugou jianzhu de kaoguxue duandai,” 61.
67. *YZFS*, *juan* 12, “Diaozuo zhidu” 雕作制度 (System of [wood] carving), 3a, entry for *qitu juanyehua* 起突卷葉華 (raised leaf-scrolled flowers).
 68. Takeshima, *Eizō hōshiki no kenkyū*, 3, chap. 7, 16–39. For the *YZFS* illustrations, see *juan* 32, “Diaomuzuo tuyang san” 雕木作圖樣三 (Third plate of the wood-carving system), 24a.
 69. *YZFS*, *juan* 3, “System of Stonework,” entry for *zaozuo cixu* 造作次序 (process of stonework), 5a–5b.
 70. See Liang Sicheng, *Yingzao fashi zhushi*, 44n5.
 71. *YZFS*, *juan* 12, “Diaozuo zhidu” (System of wood carving), entry for *qitu juanyehua*, 3a.
 72. *YZFS*, *juan* 3, “System of Stonework,” entry for *zaozuo cixu* 造作次序 (process of stonework), 5a. The pronunciation of *sa* in *jiandi pingsa* is alternatively *se*; see Chen Fuhua, *Gudai Hanyu cidian*, 1341.
 73. See the explanation of this carving method in Liang Sicheng, *Yingzao fashi zhushi*, 44n5.
 74. *YZFS*, “Kanxiang,” entry for *zong zhuzuo kanxiang*, 12b.

Chapter 4: The *Yingzao Fashi* Architectural Terminology (I)

1. *YZFS*, “Kanxiang,” 10a, entry for *zhuzuo yiming* 諸作異名 (variant terms in all systems).
2. For these scholars’ studies on the *YZFS*, see Demiéville, “Che-yin Song Li Ming-tchong *Ying tsao fa che*”; Takeshima, *Eizō hōshiki no kenkyū*; Liang Sicheng, *Yingzao fashi zhushi*, v. 1 (as a posthumous work, it reflects scholarship that had been completed before Liang’s death in 1972); Chen Mingda, *Yingzao fashi damuzuo yanjiu*.
3. Glahn, “Some Chou and Han Architectural Terms,” 105: “The bracket arms at right angles to and protruding from the wall were called hua-kung, flower arms.”
4. Steinhardt, “Bracketing System of the Song Dynasty,” 123.
5. Xu Bo’an and Guo Daiheng, “Song ‘*Yingzao fashi*’ shuyu huishi,” 38, entry for *huagong*. According to the authors’ note, this work was revised from a draft written during 1960s.
6. See *Songben Erya*, 83–84, section 13, “Shicao” 釋草 (Explanation of vegetation): “華、莠也。華、莠、榮也。木謂之華、草謂之榮” (*Hua* is *fu* [flowers]. *Hua* and *fu* are [the same as] *rong* [blossom]. A tree [blossoming] is called *hua*; an herb [coming into bloom] is called *rong*). Xu Shen, *Shuowen jiezi*, *juan* 6, part 2, leaf 3, p. 128: “華、榮也。從艸從𠂔” (*Hua* is *rong* [blossom]; [the character] from the grass radical and [the character] *yu* [flowers]).
7. For a few examples in early-period literature, see *Liji* 禮記 (Record of rites), “Yueling” 月令 ([Ritual orders of] lunar months): “桃始華” (Peach trees began blossoming) and “桐始華” (Parasol trees began blossoming); see *Reiki Son chū*, chap. 6, leaves 5, 7. Sima Xiangru, “Shanglin fu” 上林賦 (A rhapsody on the Shanglin [Imperial Hunting Park]): “發紅華、垂朱榮” (red flowers are out, and red blossoms droop [from trees]); see Tian Zhaomin, *Lidai mingfu yishi*, 107.
8. See Duan Yucai, *Shuowen jiezi zhu*, 6:11, sixth *pian* 篇 (essay), part 2, entry for “華”: “俗作花、其字起於北朝” (popularly written as *huā* [花], this character emerged in the Northern Dynasties). Another Qing-period etymologist, Gao Xianglin 高翔麟 (*jinsshi* 1808), suggested that there had never been a character 花 before the Han and Wei 魏 (220–264) period and that from the Jin (265–420), it began to be used in books; see Ding Fubao, *Shuowen jiezi gulin*, 2698.

9. Gu Yewang, *Yupian*, part 2, *juan* 13:23b, entry for *hua* 花.
10. Chen Pengnian et al., *Guangyun*, 166, *juan* 2:18b, subentry on *hua* 花 under the entry for *hua* 華 (flowers): “俗。今通用” ([花 is] a popular character [for 華]. Nowadays [the two characters are] interchangeable.)
11. For the Chinese text, see Lü Qingfei, *Wang Anshi*, in *Sanwen Tang Song badajia xinshang* 11, part 2, 359.
12. *Ibid.*, 361.
13. In general, architectural elements ornamented with carving are not common in wood-framed Chinese architecture. In particular, carved elements in pre-Song wood structures are not as common as those in buildings of the Ming and Qing periods.
14. *YZFS*, *juan* 4, “Damuzuo zhidu” (Major carpentry system), part 1, 9a, entry for *zong puzuo cixu* 總鋪作次序 (general order of bracket sets): “當心間須用補間鋪作兩朵、次間及梢間各用一朵” (In the central bay, [it is] necessary to use two *duo* of intermediate bracket sets, and one *duo* in the second bay and in the end bay, respectively). Also, in *juan* 18, “Damuzuo gongxian” 大木作功限 (Work limits of major carpentry system), part 2, 1a: “每轉角鋪作一朵用拱、昂等數” (number of arms, cantilevers, and others needed for each *duo* of corner bracket sets); 4b–5a: “每轉角鋪作一朵用料、拱等數” (number of square blocks, arms, and others needed for each *duo* of corner bracket sets); 10a: “每鋪作料拱一朵” (for each *duo* of bracket sets). Clearly, *duo* is used to count a whole bracket set, regardless of its structural location.
15. Xu Kai, *Shuowen xizhuan*, 126, entry for *duo*. Xu’s definition of *duo* as a measure for flowers was written as his commentary to the *Shuowen jiezi*, in which *duo* is explained to be “樹木垂朵朵也” (trees whose flowers [or leaves] hang down, or tree flowers in clusters) (*Shuowen jiezi*, 119). Duan Yucai, *Shuowen jiezi zhu*, 6:48, sixth *pian* (essay), part 1: “凡枝葉華實之垂者皆曰朵朵” (Every spray, leaf, flower, and fruit that hangs down is called *duo duo* [clusters and clusters]).
16. For examples, Yuan Zhen’s 元稹 (779–831) poem “Baiyishang” 白衣裳 (literally, “white clothes,” metaphorically referring to the blossoms of pear trees) includes the line “一朵梨華壓象床” (a pear-tree blossom is superior to an ivory bed); his poem “Yingtaohua” 櫻桃華 (Cherry blossoms) includes the line “一枝兩枝千萬朵” (spray after spray, thousands of clusters of flowers); see Si Dai et al., *Yong hua shi xuan*, 63, 72. Du Mu’s 杜牧 (803–ca. 852) poem entitled “Qiangweihua” 薔薇華 (Rose blossoms) includes the line “朵朵精神葉葉柔” (every single flower is vigorous and every single leaf is delicate); see Hu Guangzhou et al., *Zhongguo lidai mingshi fenlei dadian*, 1:617. Lu Chang’s 陸暢 (fl. 7th–9th c.) “Qiangweihua” includes the line “錦窠華朵燈叢醉” (splendid flowers, like a clump of lanterns, are intoxicating); see Si Dai et al., *Yong hua shi xuan*, 195.
17. *YZFS*, *juan* 17, “Damuzuo gongxian” 大木作功限 (Work limits of major carpentry system), part 1, 2b–3a, entry for *diange waiyan bujian puzuo yong gong, dou deng shu* 殿閣外檐補間鋪作用拱、料等數 (number of arms, blocks, and others needed for an intermediate bracket set on outward eaves of halls and towers): “自八鋪作至四鋪作……每補間鋪作一朵用拱、昂等數、下項” (From eight *puzuo* [i.e., a bracket set that includes five flower arms] to four *puzuo* [i.e., a bracket set including one flower arm] . . . the number of arms, cantilevers, and others needed for each *duo* of intermediate sets is the next item). Many entries in *juan* 17 include formulae that read like this one. See also note 14.
18. *YZFS*, *juan* 17, “Damuzuo gongxian,” part 1, 9b, entry for *doukoutiao mei feng yong gong, dou deng shu* 料口跳每縫用拱、料等數 (number of arms, blocks, and others for each set of *doukoutiao*).

19. Ibid., 9b, entry for *batou jiaoxiangzuo mei feng yong gong, dou deng shu* 把頭絞項作每縫用栱、料等數 (number of arms, blocks, and others for *batou jiaoxiangzuo*): “把頭絞項作、每柱頭用栱、料等下項” (Next item [is the number of] arms, blocks, and others used on *batou jiaoxiangzuo* on each capital).
20. See Takeshima, *Eizō hōshiki no kenkyū*, 1:251.
21. See Xu Bo’an and Guo Daiheng, “Song ‘Yingzao fashi’ shuyu huishi,” 49, entry for *miao*.
22. See Chen Mingda, “‘Chao’? ‘Miao’?” 197–198.
23. *Shuowen jiezi*, 119: “杪: 木標末也。” (*Miao* are the ends of tree branches). Zhu Junsheng, a Qing-period scholar, commented: “按高遠之木枝曰標、曰杪” (Note: tall and far tree branches are called *biao*, and *miao*); see Zhu Junsheng, *Shuowen tongxun dingsheng*, 271, entry for *miao*.
24. See Li Fang et al., *Wenyuan yinghua*, *juan* 176, “Shi” 詩 (Poetry), 26, “Yingzhi” 應制 (Works composed under the order of emperors), 9(2:856).
25. Ibid., *juan* 236, “Shi” (poetry), 86, “Siyuan” 寺院 (Monasteries), 4 (2:1189).
26. See Zhao Chongzuo, *Huajianji*, 263, “Bomingnü” 薄命女 (Lady born unlucky).
27. Li Gefei, *Luoyang mingyuan ji*, 2, entry for *fuzheng gongyuan* 富鄭公園 (the park of the rich Mr. Zheng).
28. Lu Dian, *Piya*, *juan* 6, “Shiniao” 釋鳥 (Explanations of birds), 131, entry for *que* 鵲 (magpie).
29. *YZFS*, *juan* 4, “Damuzuo zhidu,” part 1, 9b, section on “Zong puzuo cixu” 總鋪作次序 (General order of bracket sets, or General order of putting together bracketing components).
30. “Nanzhong” 南中 in the text historically denotes the regions of southern China or, specifically, the regions in the south of the central base of the Shu 蜀 of the Three Kingdoms period, which covers the southern area of modern Sichuan and the areas of modern Yunnan and Guizhou; see Wang Jianyin 王劍引 et al., *Guhanyu dacidian*, 139, entry for Nanzhong. Also, Takeshima, *Eizō hōshiki no kenkyū*, 3:3, section on glossary and explanations, entry for “一枝” (*isshi*, a branch), explains this term as “dialect of south-central China corresponding to ‘a jump,’” thus, in Takeshima’s view, “Nanzhong” represents the south-central China, although he does not give the sources on which his interpretation is based.
31. Chen Mingda pointed out sharply that Xu Bo’an and Guo Daiheng fabricated the term *chumiao* 出杪 (extending a twig); see Chen Mingda, “‘Chao’? ‘Miao’?” 197; see also Xu Bo’an and Guo Daiheng, “Song ‘Yingzao fashi’ shuyu huishi,” 49, entry for *miao*: “《營造法式》中……把華栱出跳叫做出杪” (In the *YZFS* . . . a *huagong* jump is called *chumiao*). Indeed, no such term is found in the *YZFS*. However, the term *chuyizhi* 出一枝 (extending a branch) is indeed included, which supports the conclusion that *miao* is the correct term for protruding arms. Both Chen and Xu and Guo in the 1980s neglected the material in the above annotation in the text that could have been turned to good account.
32. Although “一枝” is included in Takeshima’s glossary of *YZFS* terminology, he does not relate this term to the *miao* of *miaogong*, ignoring all other relevant terms, including *ye*, *zhuanye*, and *hua* of *huagong*. In Xu and Guo’s glossary of *YZFS* terminology, *zhuanye* and *buzhuanye* are explained only as the equivalents of *jixin* and *touxin* (Xu Bo’an and Guo Daiheng, “Song ‘Yingzao fashi’ shuyu huishi,” 25, 50), without any interpretation of *ye* itself.
33. Guo Daiheng, *Zhongguo gudai jianzhushi*, 636. Unlike her previous scholarship on the *YZFS*, which did not explain the semantic meanings of *ye*, *zhuanye*, and *zhi*, in this work Guo briefly explains the dialect terms *zhi* and *zhuanye*.

34. I interpreted the *ye* of *zhuanye* as “leaves” and introduced this “branches” and “leaves” metaphor to the staff of the Bureau of Culture at Putian 莆田, Fujian, in the spring of 1995, when I was invited by the bureau to join a team of cultural relics specialists to inspect the historic remains there. I presented this metaphor at a graduate seminar offered by Professor Nancy Steinhardt at the University of Pennsylvania (fall 1995). I later wrote about it in an independent study paper entitled “The Flower-Tree Based Architectural Terminology in the *YZFS*” for Professor Maggie Bickford at Brown University (spring 1998). In the spring of 2001, I sent Professor Su Bai 宿白, at Peking University, a manuscript entitled “*YZFS* dougong shuyu de huamu yinyu” 營造法式料拱術語的花木隱喻 (Architectural metaphors of bracketing as flowers and trees in the *YZFS* terminology), and a few months later, I spoke with him in person and tried to convince him of the validity of this metaphor. He suggested that I study Han-period architectural terminology in my research, which is offered later in this chapter.
35. Refer to notes 6, 7.
36. For instance, Yu Xin’s 庾信 (513–581) poem “Xinghua” 杏華 (Apricot blossoms) includes the line “枝枝綻翠英” (Every branch bursts into greenish flowers), in Hu Guangzhou et al., *Zhongguo lidai mingshi fenlei dadian*, 2:54; also see Yuan Zhen’s (779–831) line “一枝兩枝千萬朵” in note 16; Cen Shen’s 岑參 (715–770) “Jiangxing yu meihua zhi zuo” 江行遇梅花之作 (Composed upon coming across blossoming plums while walking along the river) includes the line “摘得一枝在手中” (Pluck a spray [and hold it] in the hand); Yu Jingxiu’s 庾敬休 (dates unknown) “Chunxue ying zaomei” 春雪映早梅 (Spring snows set off early blossoming plums) includes the line “隱映幾枝開” (Indistinctly setting off the sprays that are in blossom), in Deng Guoguang et al., *Zhongguo huahui shici quanji*, 10, 16. In addition, Bai Minzhong’s 白敏中 (fl. 821–824) “Taohua” 桃花 (Peach blossoms) poem includes “一枝枝綴亂雲霞” (Spray after spray [of blossoms] droop disorderly like variegated red clouds), in Si Dai et al., *Yonghua shixuan*, 56. For two examples in Song poetry, see the monk-poet Wang Zhu’s 汪洙 (dates unknown) poem “Lihua” 梨華 (Pear blossoms), which includes “一枝輕帶雨” (A spray lightly bears raindrops), in Si Dai et al., *Yonghua shixuan*, 69. A poem by Huang Tingjian 黃庭堅 (1045–1105) has “水仙華五十枝” (fifty sprays of narcissus) in its title (王充道送水仙華五十枝, 欣然會心、為之作詠 Wang Chongdao presented [me] with fifty sprays of narcissus; with pleasure, [I] compose this poem for him), in Wu Zaiqing, *Xinbian Songshi sanbai shou*, 420.
37. For example, Guo Ruoxu, *Tuhua jianwen zhi*, *juan* 6, “Jinshi” 近事 (Anecdotes of recent times), section on “Shuhua” 術畫 (Mystery paintings), 1:94: “每畫華一枝、張于壁間。則遊蜂立至” (Whenever [the Daoist adept] painted a single spray of blossoms, [he] stretched [his painting] out on a wall, and then wandering bees would alight on it). With minor modifications, the English translation follows Soper, *Kuo Jo-Hsu’s Experiences in Painting*, 104.
38. Tang-period examples include Wei Yingwu’s 韋應物 (737–after 786) line “飛去華枝猶裊裊” (While [the bird] hovered away from the flower sprays, [the cry of it] still is sweet and melodious) and Li Shangyin’s 李商隱 (813–858) line “鳳城何處有華枝” (In Fengcheng where are there flower sprays?), in Yang Rufu et al., *Yong niao shi xuan*, 375, “Ting ying qu” 聽鶯曲 (Listening to the voice of the warbler), and 378, “Liuying” 流鶯 (Wandering warblers). For Song-period examples, a *ci* poem in the style of a folk song written by Ouyang Xiu (1007–1072) entitled “Changxiangsi” 長相思 (Having been languishing with lovesickness for long) frequently uses *huazhi*: “深華枝、淺華枝、深淺華枝相並時、華枝難似伊” (Sprays of dark flowers, sprays of light flowers/[those] sprays of dark and light flowers are merged together and at that moment/[those] flower sprays hardly are [as pretty] as that person [whom I love]),

- in Zeng Zao, *Yuefu yaci*, *juan* 2:47. Also, Zheng Gangzhong wrote, “人愁春去少華枝” (Man is anxious about spring’s going and flower sprays becoming rare); see Zheng Gangzhong, *Beishan wenji*, *juan* 11:153, “Sanyue wuri puzhong” 三月五日園中 (In the garden on the fifth day of the third lunar month).
39. See He Baomin, *Zhongguo shici qufu cidian*, 1584, entry for *yizhibhua* (a spray of flowers).
40. *YZFS*, *juan* 24, “Zhuzuo gongxian” 諸作功限 (Work limits for all systems), part 1, 3a, entry for *diamuzuo* 雕木作 (system of wood carving).
41. See Hu Guangzhou et al., *Zhongguo lidai mingshi fenlei dadian*, 2:110, “Yong binglang” 詠檳榔 (A song on the betel palm).
42. For example, Shi Dazu’s 史達祖 (fl. 1195) *ci* “Shuangshuang yan” 雙雙燕 (Swallows in pairs) includes the line “飄然快拂華梢” (Waving to and fro and whisking on the tips of sprays), in Yang Rufu et al., *Yong niao shi xuan*, 19.
43. *Erya*, 81, “Shicao”: “Tu wei ye” 荼(茶)萎葉 (Leaves of the rose-leaf raspberry are withered). Taiwan Shangwu Yinshuguan Bianshenbu, *Ciyuan*, 1279, entry for *ye* 葉 (leaves), explains that *wei ye* 萎葉 means “fallen petals” and that petals also are called *ye*.
44. Shen Yue, *Songsbu*, *juan* 29, “Zhi” 志 (Records), 19, “Furui” 符瑞 (Auspicious omens), part 2, 3:873.
45. Su E, *Sushi yanyi*, *juan* 2:26.
46. See Si Dai et al., *Yong hua shi xuan*, 210, “Zhaochang shaoyao” 趙昌芍藥 (Herbaceous peony at Zhaochang). Si Dai notes, “千葉: 千瓣” (thousands of *ye* means thousands of petals).
47. Yang Yi, *Yang Wengong tanyuan*, 116.
48. Li Fang is the Song scholar who was in charge of the compilation of the official anthology *Wenyuan yinghua* under the order of Emperor Taizong 太宗 (r. 976–997).
49. Song Qi, *Yibu fangwu lueji*, 8, entry for *chongye Haitang*.
50. *YZFS*, *juan* 4, “Damuzuo zhidu,” part 1, 8a, entry for *dou* 料 (block).
51. *Ibid.*
52. *YZFS*, *juan* 30, “Damuzuo zhidu tuyang” 大木作制度圖樣 (Illustrations of the major carpentry system), part 1, 16b, “Jiaoge puzuo gong, ang, dou deng suoyong maokou diwu” 絞割鋪作栱、昂、料等所用卯口第五 (The fifth illustration: the openings and mortises applicable to arms, cantilevers, blocks, and others of a bracket set that intertwine and interpenetrate each other). In this illustration, the captions of the three images of the *qixindou* specify that the *qixindou* is used on the *nidaogong* 泥道栱 (mud-line arm, the lowest cross arm on the center of a set) and the *linggong* 令栱 (medium-size arms, commonly installed on the last protruding arm or, in the case of “single-tier-arm construction” [單栱造], on the heads of all protruding arms), respectively.
53. Xu Shen, *Shuowen jiezi*, 120.
54. Many pre-Song texts that mention or explain *lu* have been excerpted in the entries for *gong* 栱 (arms), *fei'ang* 飛昂 (flying cantilevers), *dou* 料 (blocks), and *puzuo* 鋪作 (bracket sets) in the terminology section of the *YZFS*, *juan* 1, “Zongshi” (General explanations), part 1, 8a–9b. For English translations of those texts in the first three entries, see Glahn, “Some Chou and Han Architectural Terms,” 106–111, although one should be careful about the incorrect characters and missing words in the handwritten Chinese characters provided on pp. 116–117. Glahn overstates in claiming that the line “層檣礧侷以岌峩” (layered bearing blocks are precipitously piled, precariously positioned) from the Han-period “Lu Lingguangdian fu” 魯靈光殿賦 (Rhapsody on the Hall of Numinous Brilliance in Lu; by Wang Yanshou 王延壽 [ca. 124–ca. 148]) quoted in the *YZFS* “does not add anything to our knowledge about it [*lu*]” because of

- Tang-period Li Shan's 李善 (ca. 630–689) misinterpretation of *lu* (109). In fact, this text, which was written slightly later than the *Shuowen jiezi* dictionary, serves in the *YZFS* as an early-period usage of *lu* meaning “bearing blocks.” The English translation of Wang’s line follows Knechtges, *Wen xuan*, 2:271.
55. *YZFS*, *juan* 1, “Zongshi,” part 1, 9a: “說文：櫨、柱上柎也。柄、柎上標也” (The *Shuowen [jiezi]* [says]: “*Lu* is a *fu* on top of a column”; [it also says] “*Er* [small block] is a *biao* [uppermost member; more literally, “end of a twig”] on top of a bracket arm”). As Glahn pointed out, this quotation distinguishes between the two kinds of blocks, the cap block and the small blocks on top of a bracket arm (Glahn, “Some Chou and Han Architectural Terms,” 109). For *ludou* as an official Northern Song architectural term for cap block, see *YZFS*, *juan* 4, “Damuzuo zhidu,” part 1, 7b, and *juan* 30, illustrations, 2b.
56. Lu Chen’s 呂忱 (fl. 266) *Zilin* has been lost since the Song and Yuan periods but was reconstructed by Ren Dachun 任大椿 (1738–1789) during the Qing. See Ren Dachun, *Zilin kaoyi*, *juan* 4:6b: “櫨、柱上柎也。” Regarding the significant place of the *Zilin* in history, Ren wrote, “《唐六典》載：書學博士以石經、《說文》、《字林》教士。《字林》之學閱、魏、晉、陳、隋至唐極盛……今字書傳世者、莫古於《說文》、《玉篇》、而《字林》實承《說文》之緒、開《玉篇》之先” (The *Tang liudian* [Six Codes of the Tang] records that the court academicians taught scholars with the [traditional Confucian] classics inscribed on stone [under imperial orders], the *Shuowen [jiezi]* and the *Zilin*. Study and examination of the *Zilin* was extremely common during the Wei [220–265], Jin [265–420], Chen [557–589], Sui [581–618], and Tang periods . . . Today, among those works on characters propagated in the world, none is older than the *Shuowen [jiezi]* and the *Yupian*. Nevertheless, the *Zilin* actually served as a continuation of the *Shuowen [jiezi]* and a forerunner of the *Yupian*); see *ibid.*, *juan* 1, “Preface,” 1a. In addition, Sun Mian 孫愐 (fl. 8th c.), in the preface to his rhyming manual *Tangyun* 唐韻 (Rhymes of the Tang; lost but largely preserved in the content of the Northern Song *Guangyun*), regarded the *Cangjie pian* 蒼頡篇 (Contents of the characters created by Cangjie; by Li Si 李斯 [ca. 280–208 B.C.E.], lost), the *Erya*, the *Shijing* (Classic of odes), and the *Zilin* as outstanding traditional works treating characters and their meanings.
57. See Gu Yewang, *Yupian*, part 2, *juan* 12:13b: “櫨……柱上柎也” (*Lu* . . . is a *fu* on top of a column).
58. Lu Deming, *Jingdian shiwen*, *juan* 29, “*Erya* yinyi,” part 2, section on “Shigong” 釋宮 (Explanation of architecture), 1628: “櫨……《字林》云：柱上柎也” (*Lu* . . . The *Zilin* says: [*Lu* is] a *fu* on top of a column). This source serves as additional evidence of the *Zilin*’s gloss of *lu* (see note 56). As discussed in chapter 1, *gong* 宮 (commonly corresponding to “palaces”) in the *Erya* generally refers to architecture.
59. Xu Kai, *Shuowen xizhuan*, 18: “櫨、柱上柎也。”
60. Wang Zhu et al., *Leipian*, *juan* 16, leaf 6, entry for *lü*, *lu* 櫨、櫨: “《說文》：柱上柎” (In the *Shuowen [jiezi]*, [*lu* is explained as] a *fu* on top of a column). The character *lü* preceding *lu* must have been a popular form of *lu* before or during the Song dynasty since the *Leipian* glosses synonymous words together in each entry.
61. Xu Kai, *Shuowen xizhuan*, 18. Xu’s commentary is faithfully quoted in the *Kangxi zidian*, 1272, entry for *lu*; here, *dougong* 斗栱 is written as 斗栱, a later form. In a Qing-period reprint of Huang Gongshao and Xiong Zhong’s *Gujin yunhui juyao*, Xu’s commentary is cited, but one word is missing at the end of the quotation, which reads “ji jin zhi dou ye” 即今之斗也 (that is today’s blocks). See *Gujin yunhui juyao*, *juan* 3:36a, entry for *lu*. Comparing these texts, the *Gujin yunhui juyao* likely provided a quotation with a scribal error or attempted to modify the last part of this text. In any

- case, neither version of Xu's commentary affects the fact that the entire bracket set supported by a cap block was considered to resemble a flower.
62. For example, *Shanhaijing*, *juan 5*, “Zhongshan jing” 中山經 (Canon of the Middle Mountain), 70: “狀如葵而赤華、莢實白拊” ([Its] appearance is like a sunflower while [its] flower is red, and [it is of] double fruits and a white ovary); *juan 2*, “Xishan jing” 西山經 (Canon of the Western Mountain), 24: “黃華而赤拊(拊)” (yellow flower and red ovary). Here, *fu* 拊 with the “carrying hand” radical is used as a variable form of *fu* 拊, with the “tree” radical; refer to note 63. “Middle Mountain” and “Western Mountain” refer to Boshan 薄山 (Bo Mountain, Shanxi) and its environs and to Huashan 華山 (Hua Mountain, Shaanxi) and its environs.
63. In his annotations to the *Shanhaijing*, Guo Pu wrote: “今江東人呼草木子房為拊、音府；一曰：拊、華下鄂（萼）、音丈夫字、或作拊、音符” (Nowadays people in the eastern reaches of the Yangtze River call the ovary of vegetation a *fu* 拊, pronounced *fu*. Alternative definition: *fu* 拊 is the calyx at the bottom of a flower, pronounced the same as the character *fu* as in *zhangfu* [husband], alternatively written as *fu* 拊, pronounced *fu*); see *juan 2*, “Xishan jing,” 24, under “員（圓）葉而白拊” (round leaves and white ovary). Also, Gu Yewang, *Yupian*, *juan 12*:18a, entry for *fu* 拊: “華萼足也” ([*Fu*] is the foot of the calyx of a flower).
64. Ding Du et al., *Jiyun*, 166, *juan 2*, entry for *fu*, *fu*, *fu*, *fu* (拊、拊、不、扶): “草木房為拊；一曰華下萼” (The ovary of vegetation is *fu*. Alternative definition: [*fu*] is the calyx under a flower); 167, entry for *fu*, *fu* (拊、拊): “草木華房，或作拊” ([The former *fu*] is) the flower ovary of vegetation, which alternatively is written as [the latter] *fu*). *Leipian*, *juan 16*, leaf 6, entries for *fu* 拊 and *fu*, *fu* (拊、扶) contain the same explanations as the *Jiyun*.
65. Else Glahn suggested that the shape of a cap block in the earliest texts must have been round (“Some Chou and Han Architectural Terms,” 110). I disagree. Based on the *Lunyu* 論語 (Analects [of Confucius]) phrase *shanjie zaozhuo* 山節藻梲 (mountain capitals and pond-weed king posts) and the *Shiming* 釋名 (Explanations of terms) phrase “都廬、負屋之重也；料在欒兩頭、如斗” ([a *lu* cap block is like] a [climber from] Dulu, carrying the weight of a building; a *dou* [block] is situated at both ends of a curved bracket arm, and it looks like a peck) as quoted in the *YZFS*, *juan 1*:9a (translations basically follow Glahn, “Some Chou and Han Architectural Terms,” 108–109), Glahn proposed that the cap block “looks like a peck measure, a mountain or a climber on a pole, which suggests that it must have been round.” I do not think that these texts give strong evidence of round cap blocks. That a cap block is compared to a climber on a pole does not necessarily indicate a round capital or block, since a round column or post can easily be topped with a square capital or cap block. A peck measure is not exclusively round; it can be square as well. The text about a peck-shaped bearing block on bracket arms describes the appearance of a bearing block, round or square, as wider in the upper part and narrower in the lower part. Square peck-shaped blocks are commonplace in Chinese architecture of all periods. Likewise, *shanjie* 山節 (mountain capitals) does not necessarily suggest a round shape of the capital or cap block. It could mean “as big as a mountain,” “many layers stacked up like a mountain,” or “carved with images of mountains,” which, along with “king posts carved or painted with pond weed” describes luxurious buildings. Even if *shan* 山 here meant “mountain shaped,” its structural feature must have been an inverted mountain, wider in the upper part and narrower in the lower part, as almost all archaeological materials depicting bracketing in early-period Chinese architecture (some are illustrated in Glahn, “Some Chou and Han Architectural Terms,” 120–124) show us.

66. The neglect of Xu's comment on *lu* in the *YZFS* may have resulted from Li's systematic treatment of a variety of traditional texts. As discussed, Li Jie imposes a sharp distinction between *lu* (to be regarded exclusively as "blocks") and any other terms for "brackets." He excluded all pre-Song texts that might confuse the meaning of *lu*. Xu Kai's commentary on *lu* might have fallen victim to Li's purposeful screening of earlier texts. In addition, Li faced variant explanations of *fu* 枋 from the Han to Tang periods; either it was associated with "column footing" or it was taken as "a cross timber on bearing blocks"; see *YZFS*, *juan* 1, "Zongshi," part 1, 6b, entry for *zhuchu* 柱礎 (base of a column): "說文: 櫨、枋也。枋、闌足也" (The *Shuowen* [*jiezi*] says: "*Zhi* is a *fu*." [It also says] "*Fu* is the foot of a door palisade"); in *juan* 2, "Zongshi," part 2, 2b, entry for *fu*, he quotes the Han-period rhapsody "Lu Lingguangdian *fu*" line that uses *fu* and Tang-period Li Zhouhan's 李周翰 (fl. 718) commentary on it: "枋、料上橫木、刻狡兔形致木於背也" (*Fu* is a cross timber on top of a block, [in which] the shape of a wily hare is carved [as if] putting the timber on its back). In the *YZFS*, Li Jie chooses *fu* as a term for the cushion timber between a purlin and brackets. Because of the confusing meanings of *fu*, plus Xu Kai's explanation of *fu* as a flower ovary in the same passage in which Xu takes *lu* as "brackets" in contravention of Li's rigid distinction, Xu's observation was pushed aside by the serious yet confused compiler.
67. See note 62, the *Shanhaijing* texts that describe the calyxes of flowers.
68. See note 6 for the *Shuowen jiezi*'s gloss of *hua*, which indicates that *hua* comes from the grass radical and the character *yu* 𦵏 (flowers). In this dictionary, *yu* is indicated to be from the character *shui* 𦵏, which means "flowers and leaves," and which resembles the form of flower petals and leaves; see *Shuowen jiezi*, 128, entry for *yu*: "艸木華也。從𦵏" ([*Yu*] means flowers of vegetation; [it] is from [the character] *shui* [flowers and leaves]); entry for *shui*: "艸木華葉、𦵏象形" ([*Shui*] means flowers and leaves of vegetation; [the form of this character] *shui* resembles the shape [of flowers and leaves]). Accordingly, the upper part of *hua* resembles the shape of flowers and leaves. *Kangxi zidian*, 2312, entry for *hua* 花, cites a commentary on the character *yu* as seen in the *Shuowen jiezi* text, which reads as follows: "鄭氏曰: 𦵏象華葉垂敷之形、亏象蒂萼也" (Mr. Zheng commented: *Shui* [the upper part of the character *yu*] resembles the shape of flowers and leaves drooping and spreading, and *yu* [the lower part of *yu*] resembles the [flower] base and calyx). This source does not specify the given name of the commentator "Mr. Zheng."
69. *Shijing*, "Xiaoya" 小雅 (Minor odes), "Luming zhi shi" 鹿鳴之什 (Decade of *Luming* [The deer calling to one another]), "Changdi" 常棣 (also pronounced *tangdi*) (Mao number 164): "常棣之華。鄂(萼)不(枋)韡韡。凡今之人，莫如兄弟" (The flowers of the cherry tree/Their calyxes and ovaries are shining/Of all the men in the world/There are none equal to brothers). See Legge, *Chinese Classics*, 250. I have modified the translation of the second line. In history, ever since Mao Heng 毛亨 (2nd c. B.C.E.) and Zheng Xuan, the question of how to interpret the second line has been controversial. Most scholars, including Kong Yingda 孔穎達 (574–648) of the Tang period and many Qing-period scholars, agree with Zheng Xuan that the word *fu* 不 here, which, in Mao's interpretation, meant "not true if not," was an alternative form of *fu* 枋, meaning "base of the calyx." See Kong Yingda, *Maoshi zhengyi*, *juan* 9:144; Duan Yucui, *Shuowen jiezi zhu*, *juan* 12, annotations for chap. 6 of the *Shuowen jiezi*, part 1, leaf 14: "鄂、承華者也、枋又在鄂之下、以承華與鄂、喻兄弟相依" (*E* [calyx] is what supports a flower, and *fu* [ovary] in turn is beneath the calyx in order to support the flower and the calyx. [This is] a metaphor for the interconnection of brothers). Refer to my note 64 for "不" as *fu* in the *Jiyun*.

70. For an example, see Tang scholar-official Gao Gai's 高蓋 (dates unknown), “Hua'elou fu” 華萼樓賦 (Rhapsody on the Flower-Calyx Tower), in *Wenyuan yinghua*, *juan* 49, “Fu” 賦 (Rhapsodies), 49, “Gongshi” 宮室 (Palaces), 3 (1:220), which includes the following lines: “開元中歲、天子筑宮于長安東郭。有以眷夫代邸之義。舊者中宮起樓、臨瞰于外、乃以‘華萼相輝’為名、蓋所以敦友悌之義也。睦親又比乎棠棣之華、裂土苴茅以表慶、錫珪分瑞以聯華、信可以受無窮之祉、而保乂我皇家者哉” (During the mid-Kaiyuan [713–741] period, the Son of Heaven built palaces in the eastern outer city of Chang'an. [Patronizing this construction, the emperor] had a desire to express solicitude for the nobles and use [the structures] as [their] dwellings. At that time the tower was constructed in the middle part of the palace compounds, overlooking the outside [scenery]. Then [the emperor] named [it] “Mutual Radiance of Flower and Calyx,” a meaning that was probably to stress fraternal love and the obedience of younger brothers to the elder. Close relatives were also compared to the flower of the bush cherry. By conferring territories upon [the princes] as praise and reward, and by bestowing jade tablets and auspicious jades [to them] so as to share the eminence, it is certain that [the princes] could enjoy endless happiness, and thus protect the affairs of our imperial family!)
71. See Deng Guoguang et al., *Zhongguo huahui shici quanji*, 1:9.
72. See Zhang Jiuling's “Tingmei yong” 庭梅詠 (A poem on the blossoming plum in the hall), in Deng Guoguang et al., *Zhongguo huahui shici quanji*, 8. For another example of the popular concept of a flower and its calyx in Tang poems, see Si Dai et al., *Yonghua shixuan*, 28, Bai Juyi's (772–846) “Wan yingchunhua zeng Yang Langzhong” 玩迎春華贈楊郎中 (Appreciation of spring-greeting flowers with which to present to Langzhong [an official title for emperor's servants of] Yang), which includes the line “金英翠萼帶春寒” (Gold flowers and greenish calyxes carry the chill of spring). Also see Song Qi's text describing the calyxes of flowers, note 49 above.
73. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1, “Xulun” 敘論 (General discussion), entry for *xu zhizuo kaimo* 敘製作楷模 (on the models [to be followed] in working), 1:6: “畫花果草木、自有四時景候、陰陽向背、筍條老嫩、苞萼後先。逮諸園蔬野草、咸有出土體性” (In painting flowers, fruits, grasses, or trees, naturally [one has to consider] seasonal [changes], the weather, sunlight and shade, three dimensionality, the age or youth of shoots and stems, and the order of appearance of buds and calyxes. Everything down to garden vegetables and wild grasses has its own form and nature in emerging from the ground). With minor modifications, the English translation follows Soper, *Kuo Jo-Hsu's Experiences in Painting*, 12. Here, the order of appearance of *bao* 苞 (bud) and *e* 萼 (calyx) is emphasized as one of the fundamental botanical facts that a painter must know. Botanically, the calyx grows to protect the bud as its outer covering; when the bud has opened, the calyx becomes the bottom support of the flower.
74. *YZFS*, *juan* 12, “Diaozuo zhidu” 雕作制度 (System of [wood] carving), 2b, entry for *diaocho xiashenghua* 雕插寫生華 (carved and inserted lifelike flowers).
75. *YZFS*, *juan* 14, “Caihuazuo zhidu” 彩畫作制度 (System of color painting), 4a, entry for *wucai bianzhuang* 五彩遍裝 (five-colored fully decorated pattern).
76. *YZFS*, *juan* 12, “Diaozuo zhidu,” 3a, entry for *qitu juanyehua* 起突卷葉華 (raised scrolled-leaf flowers): “凡彫剔地起突華 . . . 葉內翻卷、令表裏分明” ([For] all carved raised scrolled-leaf flowers . . . [carve and make] the leaves turned inward and rolled, and make their exteriors and interiors distinct).
77. *Ibid.*: “每一葉之上、三卷者為上、兩卷者次之、一卷者又次之” (On each leaf, the one having three scrolls is superior [in quality], the one with two scrolls takes second place, and that with one scroll is even more inferior).

78. *YZFS*, *juan* 12, “Diaozuo zhidu,” 3b, entry for *tidi wayehua* 剔地窪葉華 (Background-indented concave-leaf flowers). *Wayehua* 窪葉華 (concave-leaf flowers) is a carving style in which flower petals are made concave to the background. It includes various forms of flowers, including “lifelike flowers” and “scrolled-leaf flowers.” There is a need to specify the carving styles of these flowers under this category of *wayehua*. Thus, the term *juantou huicao* (scrolled-head fairy orchid) in the fifth class uses *juantou* to specify that the orchid is of the “scrolled-head” type, not the “lifelike” or another kind.
79. Yang Wanli 楊萬里 (1127–1206), “Yong bajiao” 詠芭蕉 [A poem] on the palm tree); see Si Dai et al., *Yonghua shixuan*, 390.
80. Wu Fu 吳芾 (fl. 12th–13th c.) poem on crab-apple blossoms titled “He Chen Ziliang *Haitang*” 和陳子良海棠 (Composed in reply to Chen Ziliang’s *Crab Apple*); see Deng Guoguang et al., *Zhongguo huahui shici quanji*, 1005.
81. *YZFS*, *juan* 12, “Diaozuo zhidu,” 3b, entry for *tidi wayehua*.
82. *YZFS*, *juan* 33, illustrations of the “System of Color Painting,” part 1, 4b, section on “Wucai zahua” 五彩雜華 (Five-colored variety of flowers).
83. *YZFS*, *juan* 28, “Zhuzuo yong ding liaoli” 諸作用釘料例 (Standard requirements for nails for various systems), entry for *yongding liaoli* 用釘料例 (standard requirements for nails), 2a–b, *wazuo* 瓦作 (tile system).
84. *YZFS*, *juan* 28, “Zhuzuo yong ding liaoli,” entry for *yongding shu* 用釘數 (number of needed nails), 5b, annotation under *huaban* 華版 (decorative roof plates) of *diaomuzuo* 雕木作 (wood carving).
85. Xu Bo’an and Guo Daiheng suggested that an exact term for this element should be *mohai huagong* 抹頰華拱 (chin-erased flowering arm); see Xu Bo’an and Guo Daiheng, “Song ‘*Yingzao fashi*’ shuyi huishi,” 10.
86. Han Hong 韓翃 (*jinsbi* 754, fl. 766–780), “Yulinji” 羽林騎 (Imperial guard cavalry), in *Quan Tangshi*, *juan* 245, 8:2757.
87. *YZFS*, “Kanxiang,” entry for *zhuzuo yiming* 諸作異名 (alternative names [of some elements] of all systems), 10b: “飛昂：其名有五：櫺、飛昂、英昂、斜角、下昂” ([For *fei’ang*, its names include [the following] five: *jian*, *fei’ang*, *ying’ang*, *xiejiao* [slanted horn], [and] *xia’ang* [downward cantilever]). *Jian* 櫺 is also a term that was transmitted from Han-period literature. The meaning of *jian* includes “filling timber” and “firlike tree,” which I discuss later in this chapter.
88. See *YZFS*, *juan* 1, “Zongshi,” part 1, 8b, entry for *fei’ang*. This entry quotes a verse by He Yan, “Jingfudian fu”: “Fei’ang niao yong, shuangyuan shi he” 飛昂鳥踊、雙轅是荷 (Flying cantilevers flitting like birds/ Paired shafts for their support); this entry also quotes a commentary by Li Shan of the Tang period: “飛昂之形、類鳥之飛” (The appearance of a flying cantilever resembles a bird flying). With minor modifications, the translation of He’s lines follows Knechtges, *Wen xuan*, 2:289.
89. The *Qiju* belongs to *qi* 七 (seven), a genre of rhapsody created during the Western Han period, with seven sets of refined verses in each work. The *Qiju* has not survived intact, but parts of it were collected in later historical and literary texts. A modern source reconstructs Liu’s *Qiju*; see Fei Zhen’gang et al., *Quan Hanfu*, 543–545.
90. See *YZFS*, *juan* 1, “Zongshi,” part 1, 8b, entry for *fei’ang*. The same text is also quoted in Li Shan’s commentary on the “Jingfudian fu,” in *Liuchen zhu Wenxuan*, *juan* 11, 1:224, under the verses gathered under “Fei’ang niao yong” 飛昂鳥踊.
91. See Li Shan’s commentary, in Xiao Tong, *Wenxuan*, 158, *juan* 11, Li’s comment on the “Jingfudian fu,” under the verses grouped under “Fei’ang niao yong.”
92. Refer to note 88 for the use of *he* as “support” in He Yan’s “Jingfudian fu.”
93. For instance, *dangong* 單拱 (single-layer arms) and *chongong* 重拱 (double-layer arms) are composed of straightforward words to describe the structural property of the

elements; *xiaxugong* 蝦須栱 (literally, “shrimp feeler arms”) is a figurative term for the arms of a corner set in which only half the body protrudes along different axes while the other half “disappears” through insertion into the column. *Yuanyang jiaoshou gong* 鴛鴦交首(手)栱 (literally, “mandarin duck crossing heads” or “crossing-wing arms”), also abridged as *yuanyanggong* 鴛鴦栱 (mandarin-duck arms, or birds-in-pairs arms), is a term for two cross arms on the same level whose ends are connected by sharing a block. This term is commonly considered to refer to their resemblance to birds in pairs. In Chinese literature, we also see the imagery in which flowers blooming in pairs are compared to birds in pairs and named *yuanyang* 鴛鴦 (mandarin ducks, or birds in pairs). Take two examples from the Song-Yuan period: Song Qi’s *Yibu fangwu lueji* (p. 10) includes an entry for *yuanyang cao* 鴛鴦草 (mandarin-duck grass): “翠蕊對生、甚似匹鳥。” (Greenish flowers grow in pairs, looking extremely like birds in pairs). A poem on *yuanyang mei* 鴛鴦梅 (mandarin-duck blossoming plum) by Xie Zongke 謝宗可 (a Yuan poet, dates unknown) likens the flowers in pairs to mandarin ducks that cross heads at the ends of the sprays: “枝頭交頸栖香暖、華底同心結子肥” (On the ends of sprays, [the flowers are like birds in pairs] crossing heads, staying fragrant and warm / The bottoms of the flowers share one [flower] heart and form plump seeds); see Si Dai et al., *Yong hua shi xuan*, 20.

94. YZFS, *juan* 1, “Zongshi,” part 1, entries for *gong*, *fei’ang*, *dou*, and *puzuo*, 8a–9b.
95. For the English translations and Latin terms for these trees, I consulted John DeFrancis, ed., *ABC Chinese-English Comprehensive Dictionary* (Honolulu: University of Hawai’i Press, 2003); Beijing Waiguoyu Daxue Yingyuxi 北京外國語大學英語系 (English Department of Beijing Foreign Studies University), *Hanying cidian* 漢英詞典/A Chinese-English Dictionary, rev. ed. (Beijing: Foreign Language Teaching and Research Press, 1995); Du Yaquan et al., *Zhiwuxue dacidian*; Herbert A. Giles, *A Chinese-English Dictionary*, 2nd ed. (Taipei: Literature House, 1964).
96. For example, *Shanbaijing*, *juan* 15, “Dahuangnan jing” 大荒南經 (Canon of the south of the vast tracts of wasteland) (p. 109): “有雲雨之山、有木名曰欒。禹攻雲雨、有赤石焉生欒。黃本、赤枝、青葉、群帝焉取藥” (There was a mountain [called] Yunyu [Clouds and rains], [where] there was [a kind of] tree whose name was *luan*. [Once, King] Yu [ordered to] fell [the trees on] Yunyu [mountain]; there were red stones that grew *luan*. [*Luan* was of] yellow stems, red branches, and green leaves. All kings acquired [fairy] medicines from it [the *luan* tree]). The fantasticality featured in this text lies in the fact that *luan* trees grew on red stones, not in the *luan* tree itself.
97. This Confucian text, titled “Li” 禮 (Rites), is quoted in the *Shuowen jiezi* (p. 117, chap. 6, part 1, 6). This “Li” text does not exist in the *Liji* 禮記 or the *Yili* 儀禮 (Rites and ceremonies) but derives from the *Liwei* 禮緯 (Esoteric meanings of the [*Classic of Li*]), one of the commentaries on the classics written by Han Confucian scholars; see Ding Fubao, *Shuowen jiezi gulin*, 2424a.
98. *Shuowen jiezi*, chap. 6, part 1, 6 (p. 117): “欒: 木、似欄” (*Luan*: a tree, like *lian* [chinateberry]). Post-Han scholarship either explains the word “欄” here as *lan* 蘭 or *mulan* 木蘭 (magnolia) or considers it as a variant form of *lian* 楝 (chinaberry); see Xu Kai, *Shuowen xizhuan*, *juan* 11:303; Ding Fubao, *Shuowen jiezi gulin*, 2424a–b, 2425a. Chen Fuhua, *Gudai Hanyu cidian*, 931, entry for *lan* 欄, explains that this character, when referring to a tree, is a variant form of *lian* 楝 and is also pronounced as such. *Lian* 欄 as a tree appears as early as in the *Kaogongji* 考工記 (Records of artificers); see *Jiao Song* “Zhouli” *Zhengzhu*, 787, *juan* 11, “Kaogongji,” part 2, 27a.
99. Du Yaquan, *Zhiwuxue dacidian*, 1179–1180, entry for *lian* 楝 (chinaberry, *Melia japonica* Don), explains that chinaberry is timber for architecture and implements. Zhongguo Dabaiké Quanshu Zong Bianji Weiyuanhui et al., *Zhongguo dabaiké*

- quanshu*, 2:865–866, entry for *lianke* 棟科 (Meliaceae), also indicates that many kinds of trees of the Meliaceae family contain fine wood with good hardness. For *mulan* 木蘭 (magnolia) used as a building material in history, see the records from the *Sanfu huangtu*, including “use magnolia to make rafters for the double-layered roof,” “use magnolia to make beams,” and “[ordered that] rudders be made from magnolia” (chap. 1, notes 128–130 above).
100. Li Shizhen, *Bencao gangmu*, 2:2002, entry for *lian* 棟 (chinaberry).
 101. See Du Yaquan, *Zhiwuxue dacidian*, 1567, entry for *luanshushu* 欒樹屬 (*Koelreuteria*), i.e., the *luan*-tree genus. See also Zhongguo Dabaikē Quanshu Zong Bianji Weiyuanhui et al., *Zhongguo dabaikē quanshu*, 3:1760, entry for *wuhuanzi ke* 無患子科 (Sapindaceae).
 102. See Chen Guiting, *Bencao gangmu tongshi*, 1664–1665. See also Zhongguo Dabaikē Quanshu Zong Bianji Weiyuanhui et al., *Zhongguo dabaikē quanshu*, 3:1760, entry for *wuhuanzi ke*.
 103. *Shuowen jiezi*, 121, *juan* 6, part 1, 14: “櫪: 楔也。” (*Jian* is *xie*); “楔: 櫪也。” (*Xie* is *jian*).
 104. For example, Zhu Junsheng, *Shuowen tongxun dingsheng*, 87, entry for *jian*: “凡木工于鑿柄相入處、有不固、則斫木札楔入固之” (In all cases that a carpenter [sees] a [lack of] solidity in the joint of mortises, [he] then cuts [and makes] a timber wedge to consolidate it). For modern scholarship, see Glahn, “Some Chou and Han Architectural Terms,” 111; Knechtges, *Wen xuan*, 2:288, L. 164n.
 105. See Li Shan’s commentary, in Xiao Tong, *Wenxuan*, 57, *juan* 4.
 106. *Ibid.*, 58. In addition, Guhanyu Changyongzi Zidian Bianxiezu, *Guhanyu changyongzi zidian*, 463, entry for *xie*, offers three meanings of *xie*, the first of which is a “pinelike, thorny arbor.” A variant gloss of *xie* is seen in the *Erya*: “楔、荊桃”; see Songben *Erya*, 85, section 14, “Shimu” 釋木 (Explanation of trees); Guo Pu notes that *jingtao* 荊桃 is “cherry tree.”
 107. Guo Zhongshu, *Peixi*, 32, *juan* 2.
 108. *Guangyun*, 229, *juan* 2:50a, entry for *jian*. Also, *Leipian*, 20, *juan* 16, 木 (tree) radical, entry for *jian* 櫪: “又 . . . 木名” (also . . . a name for “tree”).
 109. See Songben *Erya*, 84, section 14, “Shimu” (Explanations of trees).
 110. Du Yaquan, *Zhiwuxue dacidian*, 454–455, entry for *shan* (*Cryptomeria japonica* Don).
 111. See *Shuowen jiezi*, 120, *juan* 6, “tree” radical, 12, entry for *lu*.
 112. “Hongnong Mountain” likely refers to a large mountain in the prefecture of Hongnong 弘農, corresponding roughly to the areas covering east of modern Luoyang and its environs and the west of modern Shangxian 商縣 County, Shaanxi; see Zhongguo Wenhua Yanjiusuo et al., *Zhongwen dacidian*, 12:118–119, entry for *hongnong*.
 113. See Gu Yewang, *Yupian*, part 2, *juan* 12:13b; Guo Zhongshu, *Peixi*, 28, *juan* 2; Chen Pengnian et al., *Guangyun*, 84, *juan* 1:38b; Ding Du et al., *Jiyun*, *juan* 2:187, entry for *lu*.
 114. See Li Shan’s commentary, in Xiao Tong, *Wenxuan*, 109, *juan* 8; 51, *juan* 4.
 115. Du Yaquan et al., *Zhiwuxue dacidian*, 1149, entry for *huanglu* 黃欖, explains that *lu* is, namely, *huanglu*, which belongs to *qishuke* 漆樹科 (Anacardiaceae family), and *qishushu* (漆樹屬 *Rhus* genus); p. 1255, entry for *qishu* (sumac, or *Rhus vernicifera* DC), explains that this kind of tree produces good-quality wood for implements; also, p. 1255, entry for *qishuke*, indicates that the botanical characteristics of trees of the *Rhus* genus are similar to those of the Meliaceae family, which have fine wood with good hardness (refer to note 99, *Zhongguo dabaikē quanshu*, entry for *lianke* [Meliaceae]).
 116. Bao Ding, Liu Dunzhen, and Liang Sicheng, “Handai jianzhu shiyang yu zhuangshi,” 14, suggest that the long, curved bracket arms depicted in the pictorial

- stones of Liangchengshan 兩城山 (Liangchengzhen 兩城鎮 in some sources), Shandong, indicate the use of naturally curved timbers in the making of bracket arms in ancient China. But they think that those swelling, curved arms seen in both the pictorial stones and stone gateway markers of the Han period were purely decorative depictions and could not possibly have been the real form in building practice. Glahn, “Some Chou and Han Architectural Terms,” 112, cites this work but further deduces that those swelling, curved arms, as also seen in the Jin-period mural of the tomb at Zhaotong 昭通, Yunnan, “may originally have been naturally curved tree branches.” Both articles include some images of curved bracket arms of the period.
117. Zhongshanwang 中山王 [Liu Sheng], “Wenmu fu” 文木賦 (Rhapsody on the figured wood), in Liu Xin and Ge Hong, *Xijing zaji*, *juan* 6; see Xiang Xinyang 嚮新陽 et al., collators, *Xijing zaji jiaozhu* 西京雜記校註 (Collated and annotated *Jottings on the Western Capital*) (Shanghai: Shanghai guji chubanshe, 1991), 253. This rhapsody describes how the writer’s brother, Liu Yu 劉餘, Prince of Gong of the Lu 魯恭王, ordered highly skilled craftsmen to fell an old tree on a high cliff, who discovered a wonderful wood grain in it, and how these craftsmen made various kinds of implements (musical instruments, screens, small desks, canes, pillows, and utensils) from the timber by properly taking advantage of its varying lengths, thicknesses, and forms as well as the grain.
118. Zhang Qiao, *Guwenyuan*, 216, *juan* 3:11–12.
119. For instance, in a rhapsody entitled “Lin cengtai fu” 臨層臺賦 (Rhapsody on an outlook on storied terraces), Emperor Taizong 太宗 (r. 627–649) of the Tang wrote: “鑒前王之御世, 亦因機而化之。換卑宮于穴處, 改巢樹于茅茨” (I can only reflect on the reigns of former kings, who altered accommodations as conditions dictated—abandoning caves for simply constructed palaces, abandoning tree nests for domiciles with thatched roofs); see Li Fang et al., *Wenyuan yinghua*, *juan* 58, “Fu” 賦 (Rhapsodies) 58, “Xingxing” 行幸 (Conducting an imperial progress), 1; the English translation was offered by Professor Richard L. Davis in his comments on my dissertation in spring 2003. Although his purpose was to legitimize his own construction of magnificent palaces, the emperor’s references to the caves and tree nests of “former kings” reflect this profound concept of history.
120. See Li Shan’s commentary, in Xiao Tong, *Wenxuan*, 158, *juan* 11. This text is also quoted in *YZFS*, *juan* 1, “Zongshi,” part 1, 9b, entry for *puzuo*.
121. See Taiwan Shangwu Yinshuguan Bianshenbu, *Ciyuan*, 389, entry for *yaojiao*. This source offers three meanings of *yaojiao*, the first of which refers to the curvedness of tree branches. The other two meanings are “an appearance of protrusion,” and “consecutive extensions.”
122. See Fei Zhen’gang et al., *Quan Hanfu*, 65.
123. Xiao Tong, *Wenxuan*, *juan* 6, section on “Gongdian” 宮殿 (Palaces); see *Yingyin Songben wuchen jizhu Wenxuan*, 4:8a. The translation is based on Knechtges, *Wen xuan*, 2:269–271. I have made some modifications.
124. See Xiao Tong, *Wenxuan* (*Yingyin Songben wuchen jizhu Wenxuan*), 4:8a.
125. *Ibid.*, 7b–8a. Also refer to Knechtges, *Wen xuan*, 2:268, L.79n.
126. See Xiao Tong, *Wenxuan* (*Yingyin Songben wuchen jizhu Wenxuan*), 4:15b. The translation follows Knechtges, *Wen xuan*, 2:299–301.
127. See Xiao Tong, *Wenxuan* (*Yingyin Songben wuchen jizhu Wenxuan*), 4:15b.
128. Li Fang et al., *Wenyuan yinghua*, *juan* 822, “Ji” 記 (Records), 26, section on “Guan” 觀 (Monasteries), “Jingzhou Dachongfuguan ji” 荊州大崇福觀記 (Record of the Great Chongfu Monastery in Jingzhou).

129. See the “Lu Lingguangdian fu” for the lines “飛梁偃蹇以虹指,” as shown in the above, and “浮柱昭嶸以星懸” (Floating posts, sublimely soaring, suspended like stars); see Xiao Tong, *Wenxuan* (*Yingyin Songben wuchen jizhu Wenxuan*), 4:8a.

Chapter 5: The *Yingzao Fashi* Architectural Terminology (II)

1. Xu Bo'an and Guo Daiheng, “Song ‘*Yingzao fashi*’ shuyu huishi,” 33.
2. *YZFS*, *juan* 4, “Damuzuo zhidu” (Major carpentry system), entry for *gong* 栱 (arms), 3b: “[令栱]施之於裏外跳頭之上 ([註]外在撩檐方之下、內在算程方之下)、與耍頭相交 ([註]亦有不用耍頭者)、及屋內搏縫之下” ([A *linggong*] is installed on top of protruding arms inside and outside the eaves. [Author’s annotation: on the outside, (it is) under the eave purlin; on the inside, under the ceiling tie beam.] [It] intersects with the *shuatou* [耍頭, a protruding element on top of the uppermost protruding arm]. [Author’s annotation: There are also occasions where a *shuatou* is not used.] [It] also [is used] under the joining point of [two neighboring] purlins inside a hall).
3. *YZFS*, *juan* 17, “Damuzuo gongxian” 大木作功限 (Work limits of major carpentry system), 12a.
4. *YZFS*, *juan* 4, “Damuzuo zhidu,” entry for *gong* (arms), 3a–3b.
5. *Ibid.*, entry for *zong puzuo cixu* (general order of bracket sets), 9a: “自四鋪作至八鋪作、皆於上跳之上橫施令栱、與耍頭相交、以承撩檐方” (From a four-*puzuo* set to an eight-*puzuo* set, all have a *linggong* installed on the uppermost protruding arm transversely [perpendicularly to the protruding arm], intersecting with the *shuatou*, so as to support the eave purlin).
6. *Ibid.*, entry for *gong*, 3a.
7. *Ibid.*, 3a–3b. In the *YZFS*, a *fen* is one-tenth the width of a modular unit—namely a *cai* 材. Recall that a *cai* designates the section of a bracket arm.
8. *Ibid.*, entry for *zong puzuo cixu*, 10a–10b.
9. *Ibid.*, entry for *gong*, 3a–3b.
10. *Ibid.*, 3b: “四曰令栱 (或謂之單栱)” (The fourth [type of arms] is called *linggong* [(annotation) also called “single-level arms”]); “五曰慢栱 (或謂之腎栱)” (The fifth [type] is called *manggong* [(annotation) also called “kidney arms”]). The paragraph on *manggong* in *juan* 4 of the *YZFS* is missing from all surviving editions except for the hand-copied palace edition discovered in the Forbidden City in 1932.
11. In modern scholarship, *nidaogong* is sometimes translated as “wall arm.” However, it seems to me that “wall arm” is a more precise translation of *fubigong* 扶壁栱 (literally, “wall-supporting arm”). The *fubigong* includes any cross arms installed above the *nidaogong* (such as a *manggong*) and extending along the wall plane, even if these arms are partially shaped and merged into the timber lintels of a standard cross-section that, of course, also extend along the wall plane. The *nidaogong* is the bottommost “wall arm.”
12. Qing-dynasty architectural terminology no longer differentiates between a *nidaogong* and a *guazigong*. Instead, both are called *guagong* 瓜栱 (melon arms), although the Song *nidaogong* is now called *zhengxin guagong* 正心瓜栱 (melon arms in correct center). Part of the reason for the change is the obsolescence of Song mud walls between bracket sets and their substitution with a timber board during the Qing period.
13. Monk Huilin, *Yiqiejing yinyi*, 836, entry for *fahao shiling* 發號施令 (issuing orders), quotes the *Guangya* 廣雅 (Extended *Erya*): “令，教也” (*ling* is “instructing”). In modern scholarship, Glahn translates *linggong* as “order arm.”
14. *Shuowen jiezi*, 220, explains *man* as *duo* 惰 (lazy).

15. Chen Pengnian et al., *Guangyun*, 405: “慢: 怠也、倨也、易也” (*Man* is idle, or arrogant, or easy).
16. *YZFS*, “Kanxiang,” entry for *juzhe* 舉折 (raise and break of roofs), 8b; repeated in *juan* 5, “Damuzuo zhidu,” entry for *juzhe*, 9b.
17. *YZFS*, *juan* 3, “Shizuo zhidu” 石作制度 (System of stonework), entry for *chongtai goulan* 重臺鉤欄 (double-support balustrades), 7b; *juan* 8, “Xiaomuzuo zhidu” (Minor carpentry system), entry for *goulan* 鉤欄 (balustrades), 6b; *juan* 15, “Zhuanzuo zhidu” 磚作制度 (System of masonry), entry for *mandao*, 3b–4a; *juan* 27, “Zhuzuo liaoli” 諸作料例 (Convention on materials of various systems) 2, entry for *zhuanzuo* 磚作 (masonry work), 8a.
18. *YZFS*, *juan* 16, “Haozhai gongxian” 壕寨功限 (Work limits of moats and fortifications), entry for *banyungong* 般運功 (transport work), 5a.
19. Wen Ruxian, *Cipai huishi*, 94, entries for *mulanhua man* 木蘭華慢 (long tune of “Blossoms of Lily Magnolia”) and *mulanhua ling* 木蘭華令 (short tune of “Blossoms of Lily Magnolia”); p. 93, entry for *mulanhua* 木蘭華.
20. See Tang Guizhang, *Songci sanbai shou jianzhu*, 13.
21. *Ibid.*, 233.
22. Yu Chaogang et al., *Zhongguo gudai shige cidian*, 646, entry for *ling, yin, jin, man* 令、引、近、慢 (*ling, yin, jin, man* [four types of lyric poems]). In addition to *ling* and *man* being used to designate the length of a lyric poem, *yin* and *jin* are used to designate poems of lengths in between a *lingci* and a *manci*.
23. Yang Haiming, *Tang Song cishi*, 281.
24. Wu Chucai 吳楚材 (b. 1655) and Wu Diaohou 吳調侯, eds., *Guwen guanzhi* 古文觀止 (Gems from classical Chinese writings, 1694), (repr., Beijing: Zhonghua shuju, 2007), *juan* 7.
25. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1, section on “Xu zhizuo kaimo” 絞製作楷模 (On the models [to be followed] in working); English translation follows Soper, *Kuo Jo-Hsu’s Experiences in Painting*, 13.
26. See Soper, *Kuo Jo-Hsu’s Experiences in Painting*, 123n141.
27. The *YZFS* does not explain *boshui*. Soper offers this meaning (*Kuo Jo-Hsu’s Experiences in Painting*, 124n153), which I think is correct.
28. Translations of *pupai’fang*, *boshui*, *bofeng*, *huafei*, and *danggou* follow Soper, *ibid.*, 123–124nn150–156.
29. *Ibid.*, 123n143.
30. The word *shu* 蜀 in ancient Chinese means a moth larva or refers to the region of the *Shu* 蜀 (part of modern Sichuan). It thus can represent “small,” as in the compound *shuting* 蜀艇 (small boats) as seen in the *Huainanzi*; see Chen Fuhua, *Gudai Hanyu cidian*, 1459.
31. *YZFS*, “Kanxiang,” entry for *zhuzuo yiming*, 11b; *juan* 5, “Damuzuo zhidu,” entry for *zhuruzhu*, 6a.
32. *YZFS*, *juan* 4, “Major Carpentry System,” entry for *cai*.
33. *Ibid.* For further details and illustrations of the use of *anzhi*, see Liang Sicheng, *Yingzao fashi zhushi*, 240, 253; Glahn, “Chinese Building Standards in the 12th Century,” 172.
34. See Yang Haiming, *Tang Song cishi*, 59.
35. *Ibid.*, 60–61.
36. *YZFS*, *juan* 5, “Major Carpentry System,” entry for *yangma* 陽馬 (corner beams): “凡造四阿殿閣…… (註) 俗謂之吳殿、亦曰五脊殿” (Whenever building a four-slope tower-type hall . . . [Li Jie’s annotation:] it is popularly called “Wu hall” or called “five-ridge hall”).

37. Ibid.
38. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1, entry for *xu zhizuo kaimo*. Refer to Soper, *Kuo Jo-Hsu's Experiences in Painting*, 13. Soper has pointed out that the “Han” and “Wu” halls are equated in the YZFS to the “nine-ridge” and “five-ridge” halls, respectively; see Soper, *Kuo Jo-Hsu's Experiences in Painting*, 122n138.
39. Yu Zhuoyun, “Wudianding,” 48.
40. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1, entry for *lun Cao Wu tifa* 論曹吳體法 (On the styles and methods of Cao and Wu). English translation follows Soper, *Kuo Jo-Hsu's Experiences in Painting*, 16–17.
41. Ibid. (both sources).
42. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1, entry for *lun Wusheng shese* 論吳生設色 (On Master Wu's use of colors). English translation follows Soper, *Kuo Jo-Hsu's Experiences in Painting*, 17.
43. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1. I made a minor modification of the English translation by Soper (*Kuo Jo-Hsu's Experiences in Painting*, 17).
44. Guo Ruoxu, *Tuhua jianwenzhi*, *juan* 1.
45. Ibid., entry for *lun Wusheng shese*.
46. Ibid. In an annotation, Guo states, “彫塑之像亦有吳裝” (The same name is applied in sculpture as well).
47. Ibid.
48. For more details, see Henansheng Wenwu Yanjiusuo et al., “Song Taizong Yuande Lihou Ling fajue baogao.”
49. For more details, see Henansheng Wenwu Kaogu Yanjiusuo, *Bei Song huangling*, 164.
50. YZFS, *juan* 14, “Caihuazuo zhidu,” entry for *wucai bianzhuang*.
51. YZFS, *juan* 12, “Diaozuo zhidu,” entry for *tidi wayehua* 剔地窪葉華 (background-indented concave-leaf flowers).
52. See Ma Chengyuan, *Wenwu jianshang zhinan*, 137–138.
53. It is said that the Wu's style was a combination of the style of the central plain and that of the western region. See *ibid.*, 138.
54. Monk Wenying, *Yuhu qinghua*, 21, *juan* 2.
55. See *Yongle dadian* 永樂大典 (Great encyclopedia of the Yongle period, 1403–1424), *juan* 2281, “Hu” 湖, “Huzhoufu” 湖州府 (Prefecture of Huzhou), 7, 9b, section on “Miao” 廟 (Shrines).
56. Su Shi, “Zesheng ting ming” 擇勝亭銘 (Epitaph of the Zesheng Pavilion), in *Su Dongpo quanji* 蘇東坡全集 (A complete collection of Su Dongpo's essays) (1986; repr., Beijing: Zhongguo shudian, 1996).
57. Tuotuo, *Songshi*, *juan* 338, “Biography,” 97, “Su Shi zhuan” 蘇軾傳 (Biography of Su Shi).
58. Su Shi, *Sizhi lun* 思治論 (On some thoughts of management), cited in Chen Menglei et al., *Gujin tushu jicheng*, “Jingji huibian” 經濟彙編, “Kaogong dian” 考工典, “Kaogongbu zalu” 考工部雜錄 (Miscellaneous records in the category of crafts).
59. Shen Kuo, *Mengxi bitan*, *juan* 9.
60. YZFS, “Zhazi” (Prefatory document), 1a.
61. YZFS, *juan* 1, “Zongshi” (General explanations), part 1, 10b–11a, 8b.
62. Translation based on Hardie, *Craft of Gardens*, 39, but I have made some modifications.
63. See Zheng Yuanxun's foreword in Ji Cheng, *Yuanye*. Translation basically follows Hardie, *Craft of Gardens*.
64. Li Yu, *Xianqing ouji*, 145, *juan* 4, “Jushibu” 居室部 (Section on architecture), “Fangshe” 房舍 (Buildings).

65. Ibid., 151, “Chuanglan” 窗欄 (Window lattices).
66. For a recent study of this text, see Clunas, *Superfluous Things*.
67. This text is included as a chapter in Li Dou, *Yangzhou huafang lu*, juan 17:399.

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About the Author

Jiren Feng, who received his Ph.D. in History of Art and Architecture at Brown University in 2006, trained as an architectural historian at Tsinghua University in China and at the University of Pennsylvania and Brown University in the United States. He has taught at Peking University, Brown University, Technical University of Berlin, and Victoria University of Wellington, New Zealand, and was a postdoctoral research fellow at the Max Planck Institute for the History of Science in Berlin from 2006 to 2008. Currently he is assistant professor of Chinese at the University of Hawai'i at Hilo.

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Jacket illustration: Detail of corner bracket sets in the Soul-Sleeping Hall at the Shrine for the God of the Ji River in Jiyuan, Henan. Author photograph.

Jacket design: Carrie Yu

University of Hawai‘i Press
Honolulu, Hawai‘i 96822-1888

Hong Kong University Press
www.hkupress.org



Printed and bound in Hong Kong, China