CHINESE ARCHITECTURE AND METAPHOR
Song Culture in the Yingzao Fashi Building Manual
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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 营造法式 (Building standards; hereafter YZFS), published in 1103. The YZFS was written by the imperial official in the Directorate of Construction Li Jie 李诫 (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. 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, 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 (modern Kaifeng) 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 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.
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 1.2–1.3).

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 辭欄竿) and tree-protecting railings (kelongzi 根籬子). Furthermore, six chapters of the treatise are devoted to line drawings, illustrating
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, 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), compiled between the fourth and first centuries B.C.E., and the Shuowen jiezi 説文解字 (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. 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]” (堅竄之制、堂構之方、與繩墨之運、皆已了然於心). 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.
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:
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 jituan 脊榑 (main-ridge purlin) and chengchuanfang 承橡方 (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 剪釘 (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
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* (flower arms) and *miaogong* (twig arms). The *YZFS* does not give semantic explanations of *hua* or *miao* 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 (華) 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 (1901–1992), from Liang Sicheng (1901–1972) to Chen Mingda (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 Steinhardt).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, “花（華）是花。所謂華（華）桝, 就是花桝”⁵ ([The character] *hua* is [the character] *huā* [花]. So-called *huagong* is just *huāgong* [花桝]). The authors identify *hua* 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 metaphorical system, bracketing elements generally are likened to “flowers,”
<table>
<thead>
<tr>
<th>Bracketing terms</th>
<th>Literal translation</th>
<th>Structural properties</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual elements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>huagong</em> 華棋</td>
<td>flower arms, flowering arms</td>
<td>protruding arms, arms jutting toward front and rear</td>
</tr>
<tr>
<td><em>juantou</em> 卷頭</td>
<td>scrolled head</td>
<td>protruding arms</td>
</tr>
<tr>
<td><em>miaogong</em> 條棋</td>
<td>branch arms, treetop arms, spray arms</td>
<td>protruding arms</td>
</tr>
<tr>
<td><em>yimiao</em> 一杪 or <em>danmiao</em> 單杪</td>
<td>one branch (spray), single branch (spray)</td>
<td>one protruding arm</td>
</tr>
<tr>
<td><em>liangmiaoen</em>* 雙杪</td>
<td>two branches, double branches (sprays)</td>
<td>two protruding arms</td>
</tr>
<tr>
<td><em>yizhi</em> 一枝</td>
<td>single branch (spray)</td>
<td>one protruding arm</td>
</tr>
<tr>
<td><em>ye</em> 葉</td>
<td>leaf (or petal)</td>
<td>cross arms, usually perpendicular to protruding arms</td>
</tr>
<tr>
<td><em>ying'ang</em> 英昂</td>
<td>flower or petal cantilevers</td>
<td>cantilevers projecting from wall plane</td>
</tr>
<tr>
<td><em>huatouzi</em> 华頭子</td>
<td>flower head</td>
<td>strut under a downward-pointing cantilever; an incomplete protruding arm whose head is cut by a downward cantilever</td>
</tr>
<tr>
<td><em>huaxindou</em> 華心料</td>
<td>flower-heart block</td>
<td>block installed on the center of an arm</td>
</tr>
<tr>
<td><em>dinghua mohagong</em> 丁華抹類棋</td>
<td>“chin”-erased little flower arm</td>
<td>incomplete protruding bracket arm placed between two arms of inverted V-shaped brace under ridge purlin</td>
</tr>
<tr>
<td><strong>Composite units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>duo</em> 朵</td>
<td>flower, cluster of flowers</td>
<td>measurement for counting a whole bracket set that includes at least one protruding arm</td>
</tr>
<tr>
<td><em>yiduo</em> 一朵 or <em>liangduo</em> 兩朵</td>
<td>one flower, two clusters of flowers</td>
<td>one or two bracket sets</td>
</tr>
<tr>
<td><strong>Methods of combining elements</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>chuyizhi</em> 出一枝</td>
<td>protruding single branch</td>
<td>method by which arm projects from wall plane</td>
</tr>
<tr>
<td><em>zhuanye</em> 转葉</td>
<td>rotating leaves</td>
<td>method by which cross arms are installed on the head of a protruding arm</td>
</tr>
<tr>
<td><em>buzhuanye</em> 不轉葉</td>
<td>without rotating leaves</td>
<td>method in which a protruding arm supports no cross arms</td>
</tr>
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</table>
“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” 華棋 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 有瓜有鼓 as 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.

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In the earliest Chinese dictionaries, the Erya and Shuowen jiezi, the character hua 華 as in huagong 有瓜有鼓 has two basic meanings: “flowers” or “to burst into flower.” Throughout the literary record, hua with these two meanings is very common. Hua as “flowers” is frequently used in all sections of the YZFS, as in xieshenghua 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, and, as defined in the sixth-century dictionary Yupian 玉篇 (Jade thesaurus), this popular form often replaced the former character: “今為華華字” (Nowadays 花 is [used as] the character for hua [華, flower] and fu [焚, 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). 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 游抱禪山記 (Travel notes of Baochan Mountain), wrote as follows:

抱禪山亦謂之華山……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
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,

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” (huā) 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
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 4.3. 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)

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)
The 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. Duo as a term of measure for flowers is clearly defined in tenth-century texts. Xu Kai 徐鎬 (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” (Nowadays a flower is referred to as “one *duo*”). During the Tang and Song periods,
duo occurs frequently in literature and poetry and almost exclusively stood for “flower.”

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. But the situation varies for doukoutiao 科口跳 (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: “科口跳、每柱頭外出跳一朵用棋、科等下項” (The next item [is the number of] arms, blocks, and others used on each duo of doukoutiao jumping out from the capital). The batou jiaoxiangzuo is composed of a
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*. 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* 棄拱, an alternative standard term for protruding arms, has a variant form—*chaogong* 拱拱—in the surviving editions of the treatise. *Miao* 棄 (twig) and *chao* 拱 (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. 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.” 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. 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.” *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 蘇頌 (670–727) verse “栖鸞樹杪出行宮” (Going out of the imperial retreat while birds are perched on the ends of branches), Quan Deyu’s 權德與 (759–818) verse “重樓迴樹杪” (Multilayer towers encircled by treetops), He Ning’s 和凝 (898–955) 詞 (lyric) verse “殘月光沉樹杪” (Waning moonlight set on treetops), Li Gefei’s 李格非 (fl. 1080s) phrase “臺出竹木之杪” (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” ([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
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”:

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

FIGURE 4.12. Protruding arms likened to branches (author sketch)
“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, the annotation explicitly states that the protrusion of every “jump” (i.e., a projecting arm) was likened to “extending a branch” (出枝), and all cross arms installed on the heads of “jumping” arms were likened to “leaves” (叶). 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. 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 (计心, “filled heart”) or, in contrast, protruding arms continuing to “jump” forward without supporting any cross arms on them (偷心, “stolen heart”). In southern China, these two methods were called “rotating leaves” (转叶) and “no rotating leaves” (i.e., “no leaves at all”) (不转叶), respectively. Indeed, cross arms sitting on protruding arms may look like leaves growing lushly on branches (figure 4.13a). Where there are no cross arms on “jumping” arms, a bracket set looks as if all the leaves had fallen from the branches (figure 4.13b).

Such a vivid, logically consistent architectural metaphor, contained in an annotation to the text, has long been ignored by twentieth-century scholarship. Not until recently did Chinese scholarship begin to mention this metaphor. Having interpreted and communicated this building metaphor in unpublished form since 1995, 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” (花) can refer to a tree in blossom, while “branch” (枝 or 梢) can represent flower sprays; moreover, “leaves” (叶) can mean not only leaves under a flower but also flower petals. In Chinese literature, flowers are commonly counted using the measure word 枝 (sprays) as well, and “one spray” as yizhi 一枝. During the Tang-Song period, expressions such as huayizhi 花一枝 (a spray of flowers) or huazhi 華枝 (flower sprays) were so popular that Song scholars created yizhibua 一枝華 (a spray of flowers) as a cipai 詞牌, or name of a tune to which a song
lyric was composed. In the *YZFS*, the term *huazhi* is also used: "[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" (flowers open at the ends of tree branches), which links *hua* 花 and *miao* 條—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 poems 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 classics and is clearly defined in the Southern-dynasties (420–589) text *Songshu* 宋書 (History of the [Liu] Song [420–479]): "華葉謂之英" ("Flower leaves" are called *ying* [flower petals]). Ye for "petals" also often occurs in Tang and Song literary works. In Su E’s 蘇軾 (*jinshi* 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" (Those whose flowers are most beautiful . . . can have a large
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” (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, “Of the peonies in [Mr. Li Fang’s 李舫 (925–996)] 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”
(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 (block even with center), which alternatively is termed huaxindou (flower-heart block).

Qixindou is defined as “installed on top of the center of an arm” (施之于棋心之上). 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” (also called “flower-heart block”). There is a correspondence among qixin (even with the center), gongxin (center of an arm), and huaxin (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 4.17b). In these situations, the positions of the qixindou are by no means the centers of any protruding arms. The ZYFS illustrations of the mortises of brackets also have captions that explain the cases of the qixindou used on cross arms (figure 4.18). In addition, in the ZYFS illustrations of the color-painting system, bracket sets are
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.
TABLE 3. Huaxin in Tang and Song Poems

<table>
<thead>
<tr>
<th>Author</th>
<th>Title of poem or lyric</th>
<th>Line including \textit{huaxin}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Li Shimin 李世民 (599–649), Emperor Taizong 太宗 of the Tang</td>
<td>“Fu de li” 賦得李 (Composition of acquired plums)</td>
<td>“鶯啼密葉外、蝶飛脆華心”¹ (Orioles warble outside the dense leaves/butterflies playing in the center of the delicate flower)</td>
</tr>
<tr>
<td>Wang Wei 王維 (701–761)</td>
<td>“Hong mudan” 紅牡丹 (Red peony)</td>
<td>“華心愁欲斷”² (The flower heart anxious as if it is going to be broken)</td>
</tr>
<tr>
<td>Su Shi 蘇軾 (1037–1101)</td>
<td>“Mohua” 墨華 (Ink flowers)</td>
<td>“華心愁暈、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)</td>
</tr>
<tr>
<td>Fan Chengda 范成大 (1126–1193)</td>
<td>“Mufurong” 木芙蓉 (Cotton rose \textit{hibiscus mutabilis})</td>
<td>“華心應似華心酸”⁴ (Flower hearts seem alike in feeling sad)</td>
</tr>
<tr>
<td>Zhu Shuzhen 朱淑真 (fl. 1080–1131)</td>
<td>“Muxi” 木犀 (Sweet-scented osmanthus)</td>
<td>“人與華心各自香”⁵ (I and the flower heart [possess] particular fragrances)</td>
</tr>
<tr>
<td>Shi Dazu 史達祖 (fl. 1195)</td>
<td>“Dongfeng diyi zhi; Lichun” 東風第一枝：立春 (First branch in the east wind: The beginning of spring)</td>
<td>“華心夢醒”⁶ (The flower heart awakened from dream)</td>
</tr>
</tbody>
</table>

Notes
5. Ibid., 397.
Literati Perceptions of Brackets: The Fulcrum 檔 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 檯, the capital block in bracketing: “檯、柱上俯也”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 棪 (blocks) in its terminology sections and clearly terms a cap block ludou 檯棟 (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 説文系傳 (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 柱? 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:
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* 华房之蒂), 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. 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* 华房), as the calyx under flower petals (*hua xia* 花下萼), or as the base of the calyx (*hua'e zu* 華萼足). These definitions were also preserved in Northern Song official character and rhyming books. 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 4.21a).

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, 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 4.21b). 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" (柱上榍), 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, 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 flowers but also took delight in talking about it. The classical Chinese character hua (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). The Shijing (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. 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 (685–762, r. 712–756) of the Tang dynasty, had specially built a Hua’e Lou (Tower of Flower and Calyx; also called Hua’e Xianghui [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.

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 wrote a poem titled “Huadi” (The bottom of a flower), the first line of which reads as follows: “Purple calyxes support thousands of petals). Zhang Jiuling’s poem on
plum blossoms includes the line “更憐華蒂弱，不受歲寒移” (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 华蒂), 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 郭若虚 (fl. 1070–1080), Tuhua jianwen zhi 图画见闻志 (Experiences in painting), the relationship between a flower and its calyx (“苞萼後先” [the order of appearance of buds and calyces]) is stressed as one of the fundamental botanical facts of nature that a painter must know in depicting flowers and flowering plants. 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” (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” (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 卷叶花 (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) (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.

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:

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
strut would otherwise be a “flower arm,” it is termed *huatouzi*, that is, “head of a flower.” The term *huatou* is often found in ancient Chinese poetry; here are two Song-period examples: “華頭倒插紫荷香” (The flower head droops, sending off fragrance like purple lotus) and “雨後華頭頓覺肥” (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), “華頭用紅、葉並用綠” (flower heads are painted red; leaves all painted green), “華頭筒瓦” (round tiles with a flower-head [end]), or “其華頭系貼釘者、每朵一枚” (For those [roof plates] whose flower heads are to be stuck with nails, use one nail on each flower).

*Dinghua mohaigong* 丁華抹額拱 (mini flower-“chin”-erased arm) 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
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 抹頸 (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, “華頸驕嘶上苑風” ([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 華頸). Hái 頸 and hán 頸 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, 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. 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). “Shuang fu jing ling, he chui ying ang” (雙覆井菱, 荷垂英昂) 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” (雙幟覆井, 菏荷垂英) 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 菊, 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. 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.
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. 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. From those bracketing terms, we see that bracket arms were called *luan* (goldenrain tree, *Koelreuteria paniculata*), cantilevers were called *jian* (firlike tree), and blocks were called *lu* (smoke tree or sumac, *Rhus cotinus*, L.) or *jie* (alternatively written 聚, the joint of newer and older stems). 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. A Han-period Confucian text records, “天子樹松, 諸侯柏, 大夫欏, 士楊” ([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* (欏) tree, a high-quality material for architecture. Li Shizhen 李時珍 (1518–1593), in his *Bencao gangmu* 本草綱目 (Materia medica pharmacological compendium, completed 1578), tells us: “欏長甚速, 三五年即可作椽” (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.\textsuperscript{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.\textsuperscript{102}

The \textit{Shuowen jiezi} glosses \textit{jian} 橿 only as \textit{xie} 楇 without offering any explanation of what \textit{xie} is.\textsuperscript{103} While commonly understood as a “stiffener” or “wedge” in Qing-period and modern scholarship,\textsuperscript{104} \textit{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, “其樹則有木蘭樛桂……楔枝樛樛”\textsuperscript{105} ([As far as] the trees there [are concerned], there are magnolias, cinnamon trees, and laurels . . . palm trees, \textit{ya} trees [a huge, exotic tree], \textit{xie} [pinelike, thorny trees], and \textit{cong} [cypresslike trees]). The Tang-period scholar Li Shan comments on this: “楔、似松、有刺也”\textsuperscript{106} (\textit{Xie} is like pine, but having thorns). \textit{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 \textit{Peixi} 柏楔 (Bodkin worn on the girdle [of young people, a metaphor for philological studies]), writes, “楔……木、與杉同” \textsuperscript{107} (\textit{Jian} . . . [is] a tree identical to fir). In the official rhyming book \textit{Guangyun} 廣韻 (Spreading rhymes), \textit{jian} is glossed as the same as \textit{shan} 杉 (fir) and \textit{shan} 樸 (fir), the latter of which is also glossed as follows: “木名、似松” (name for a tree [that is] like the pine tree).\textsuperscript{108} The \textit{Shuowen jiezi}’s terse gloss of \textit{jian} as \textit{xie} may thus merely have represented the equation of \textit{jian} with \textit{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 \textit{Erya}, Guo Pu 郭璞 (276–324) explains, “отов (樹)、似松、生江南、可以為船及棺材、作柱埋之、不腐”\textsuperscript{109} (\textit{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.\textsuperscript{110}

\textit{Lu} as the name of a tree is also seen in the \textit{Shuowen jiezi}: “一日宅檜木、出弘農山也”\textsuperscript{111} (Alternatively called \textit{zhailu} [or \textit{tuolu}] tree, [which] grows on Hongnong Mountain). Hongnong 弘農 Mountain was likely located in the central plains or middle area of China.\textsuperscript{112} \textit{Lu} as a type of tree is included in many other major Chinese dictionaries\textsuperscript{113} 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 “華楓柟橘” (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、柙、檻、楀” ([As far as] those trees there [are concerned] . . . there are maples, xia trees [a fragrant tree], smoke trees, and oaks). Modern sources explain that lu belongs to a genus whose wood is a good material for making implements.

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](image-url)
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.\(^\text{116}\)

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, 曲直紈卷, 修竹映池, 高松植嶺。\(^\text{117}\) 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。\(^\text{118}\) 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. 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, “欒枠夭袅而交結” (Bracket arms, bending and extending [like branches], intertwine). The original meaning of *yaojiao* 交繚 refers to the appearance of crooked tree branches, which is extended to the appearance of projection and continuous extension. Sima Xiangru, in his “Shanglin fu,” writes, “夭軻枝格、偃蹇杪頡” ([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:

> 飛梁偃蹇以虹、揭蓬蓬而騰湧。層棟礫儃以岌岌、曲柉要紹而環句。芝楌攫羅以戢鬛、枝掌拄杙而斜娑。傍夭軻以横出、互顛糾而博負。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 雲糸 in this rhapsody mean the “appearance
of trees linking and intertwining” (夭橋、雲糸、林木相連繞).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 紫句 (or Ziju 緣句, Juzi 縁句) 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, “紫句、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:
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:

涿木，以材木相插，如林之多。區：院；域：牆也。言院皆相連，牆為隔絶，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, “榛桿森鬱以宏合”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
fl ying beams to rainbows, suspended floating posts to stars, 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.
Chinese architecture

“This fascinating and erudite study takes a fresh and original approach to the most significant document in Chinese architectural history. Taking the terminology and textual strategies of the Yingzao fashi as his starting point, and drawing both on literature and on the structures and aesthetics of surviving buildings, Jiren Feng develops a complex and sophisticated cultural analysis of the text and of Chinese historical traditions of architectural writing more broadly, demonstrating that matter and metaphor cannot be disentangled in Chinese architectural thinking and practice. As well as being an argument about architecture, this is a study of poetics and of sensibilities, and a history of the meaning of grand buildings in Chinese cosmology and politics.”

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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.

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