A Preliminary Study of the *Kaogong Ji* (The Book of Artificers)

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A PRELIMINARY STUDY OF THE KAOGONG JI (THE BOOK OF ARTIFICERS)

by

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A Thesis
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I would like to begin by thanking Dr. Victor C. Xiong, who introduced me to the field of pre-modern Chinese history and guided me through the whole process of this program. Thanks to his suggestion, I began the research of the *Kaogong ji* soon after I enrolled in the program and have been constantly under his direction from then on. Without his guidance and encouragement, this project would not have been possible.

I would like to thank Dr. Timothy Light for his solid support in my study and generous help in many other things. His deep insight and broad knowledge always brought inspiration, not only in this project, but also in the study of my field as a whole. I also owe great thanks to Dr. Takashi Yoshida, a member of my thesis committee, for providing invaluable advice on the thesis. I wish to thank Miss Robyn Page, who translated a number of passages of the records from French into English, and Miss Bethany Erhardt, who was able to check out those important reference books from her university. I would also like to thank Dr. Myron D. Colber, who had voluntarily helped me with my English writing during the last years with great patience.

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Hanmo Zhang
A PRELIMINARY STUDY OF THE KAOGONG JI (THE BOOK OF ARTIFICERS)

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Western Michigan University, 2005

The focus of this paper is on the ancient Chinese text of the Kaogong ji, which is now included in the Zhouli as one of its chapters. Through a careful comparison between the Kaogong ji and the rest of the Zhouli and through a synthetic analysis of academic discussions of the completion date and authorship of the Kaogong ji, this paper attempts to show that the Kaogong ji had been an independent text before its inclusion. It goes on to disprove the argument that the Kaogong ji was forged by the Han scholar Liu Xin as political propaganda.

From the perspective of two aspects of power—"power over" and "power to," the paper offers a textual reading of the Kaogong ji in its political and cultural contexts. It shows that not only did the manufacture recorded in the Kaogong ji participate in the formation of ideology, but provided it a certain form as well. A distinct aspect of the Kaogong ji is the ritual prescriptions it offers for the planning and construction of the city. Through a study of these prescriptions, in conjunction with other textual sources and archaeological finds, this paper examines the characteristics, functions, and the development of the classical Chinese city with a view to interpreting its political and cultural meanings. Considering the fact that no English translation of the Kaogong ji text (except for a few short passages) exists, a complete translation is appended to the paper, of which a select number of key passages are also fully annotated.
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INTRODUCTION

The Kaogong ji 考工記 (Book of Artificers) is an old text substituted for a missing chapter in the Zhouli 周禮 (Rites of the Zhou). Not only does it offer instructions for craftsmanship in wood, stone, jade and metal, and on tanning, dyeing and city planning, but also provides subtle information about Zhou (Western Zhou: ca. 1050-721 B.C.; Eastern Zhou: 721-256 B.C.) ritual, religion, and philosophy. The scholarship of the Kaogong ji has long been intertwined with that of the Zhouli, which was alleged to have been penned by the Duke of Zhou (Zhougong 周公), even though it is now considered a late pre-Qin 秦 (221-206 B.C.) text by most scholars. In this thesis, I will examine the authorship and completion date of the text and explore its content in its social and cultural contexts. I will end the thesis with an annotated translation of some selected passages of the Kaogong ji from Chinese into English.

The Kaogong ji has a history of over two thousand years of scholarship dating from the time of Liu De 劉德, the Prince Xian of Hejian 河間獻王, who presented to the court the Zhouli 周禮 (Rites of the Zhou), in which the Kaogong ji was inserted as the substitute for the missing chapter during the reign of Wudi of Han 漢武帝 (r. 140-87 B.C.), according to a passage in the “Jingji zhi 經籍志” chapter of the Suishu 隋書.
(History of the Sui). In the early days of the Kaogong ji’s textual history, the Eastern Han commentator Ma Rong 馬融 provided another version. It seems that Ma did not contest the date when the Zhouli was allegedly presented to the court. But controversy arose as a result of his version in regard to the time when the Kaogong ji was incorporated into the Zhouli, suggesting that it was Liu Xin who substituted the Kaogong ji in Chengdi’s 成帝 (r. 32-7 B.C.) time. Jia Gongyan 賈公彥, the Tang 唐 commentator to the Zhouli, supported Ma’s view.

The age-old question on whether The Kaogong ji was incorporated into the Zhouli during the reign of Wudi or the reign of Chengdi remains unanswered. Nevertheless, what we can be sure about is that the Kaogong ji became known as an ancient text only after its incorporation into the Zhouli. Furthermore, the Kaogong ji has attracted much attention from scholars since the Zhouli became one of the Confucian classics. In other words, the fate of the Kaogong ji has been intertwined with that of the Zhouli ever since its first appearance, and the study of the two texts has been inseparable.

One of the most common questions about the Kaogong ji in relation to the Zhouli is: Why was the Kaogong ji chosen over other works to take the place of the missing chapter in the Zhouli? To answer that question and in response to the modern scholar Xia Weiying’s contention that identifies the Kaogong ji with the lost chapter of the Zhouli, I

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3 Suishu 隋書 32.925. For the English translation of the passage in question, see Karlgren, 1931, 4.
4 Karlgren 1931, 4.
5 “Zhou li zhengyi xu 周禮正義” in Zhouli zhushu 周禮注疏, Shisanjing zhushu 十三經注疏 635-636. For the English translation, see Karlgren 1931, 3-4.
will examine the *Kaogong ji* and what might have been the content of “Dongguan sikong,” the lost *Zhouli* chapter, in terms of similarities and differences. The similarities between them—if there are any—can be used to explain why the *Kaogong ji* was chosen. Of course, logically, as an inserted part of the *Zhouli*, the *Kaogong ji* does not have to be similar to the missing chapter about which we do not know very much. But here I suppose that the insertion of the *Kaogong ji* was a conscious and rational activity in the compilation of the *Zhouli*. In other words, when the compiler(s) chose a text to replace the missing chapter, the one with the most similarity to the missing chapter was preferable. The question now is: “How do we know what the lost chapter was about?”

Information scattered in such early works as the *Zhouli*, the *Zuo zhuan*, and the *Guoyu* seems to indicate that the missing chapter of the *Zhouli* was “Dongguan sikong,” the name of the department in charge of works and craftsmanship during Zhou times. The reason the *Kaogong ji* was submitted as the substitute for the lost chapter may be that its content consists mainly of instructions for making things, such as carts, weapons, and percussion instruments; constructing hydraulic projects and cities, etc. In spite of their shared content with the missing chapter, however, the *Kaogong ji* is not the same as the missing chapter. In order to make it clear, it is necessary to compare the *Kaogong ji* and the five surviving chapters of the *Zhouli*.

Another problem we have to deal with before drawing any conclusion is the authenticity of the *Kaogong ji* itself at the time of its inclusion in the *Zhouli*. There is a

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6 Generally speaking, it was during the time of Liu Xin that the *Zhouli* began to be regarded as one of the Confucian classics.
record in the “Wenhui taizi zhuan 文惠太子傳” of the Nan Qi shu 南齊書 indicating that there was a Chu version of the Kaogong ji during the Warring States period. However, the reliability of this record is questionable. If the existence of the Kaogong ji as an independent text before it was incorporated into the Zhouli could not be proven, it brings into question the authenticity of the Kaogong ji and give rise to the possibility of it being a forgery.

The argument for or against the authenticity of the Kaogong ji is inevitably linked to that of the Zhouli. In fact, the Zhouli’s authenticity has been a contentious issue since the Eastern Han. The scholars on both sides usually base their arguments on two key aspects, the authorship of the work and the dates of its completion.

According to the commentary by Zheng Xuan 鄭玄, the text of the Zhouli was compiled by the Duke of Zhou at the beginning of the Western Zhou. This idea may have been widely accepted before Zheng Xuan. Zheng Xuan’s idea remained unchallenged during his time and continued to dominate the Zhouli scholarship in the following centuries until the Song period, when Hu Anguo 胡安國 asserted that the Zhouli was a forgery of Liu Xin. Hu’s argument resonated among his contemporaries, including such prominent scholars as Sima Guang 司馬光, Hong Mai 洪邁, and Su Zhe 蘇輦. His bold argument was influential enough to jeopardize the classic status of the Zhouli, which was eventually preserved thanks to the efforts of such great Song Confucians as Zhu Xi 朱熹.

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7 Space limitations preclude a comparison between the Kaogong ji and the first chapter of the Zhouli here. Such a comparison would indicate that differences between them imply that the Kaogong ji is a substitute for the “Dongguan sikong 冬官司空.” Their similarities may help explain why the Kaogong ji was chosen.
Zheng Qiao 鄭樵, and Ma Duanlin 马端臨. The work of the Song scholar Lin Xiyi 林希逸 advanced the Kaogong ji research by focusing on its date of completion. In his Kaogong ji jie 考工記解 (Explanation on the Kaogong ji), he traces The Kaogong ji to the pre-Qin period, and identifies its author as someone from the state of Qi, based on the study of the dialects used in the text.

Among the Chinese scholars the debate on the Kaogong ji continued to rage on down to the late Qing period. While Jiang Yong 江永 (1681-1762), Wang Niansun 王念孫, Yu Yue 俞樾, and Sun Yirang 孫詒讓 defended the Zhouli’s authenticity, Kang Youwei 康有為, among others, again raised the issue of forgery by Liu Xin. Liang Qichao 梁啓超 tries to reconcile these two opposing views in his The History of Chinese Political Thoughts by pointing out that the Kaogong ji is a mixture of the depiction of both Western Zhou govermental organization and the practices during the Spring and Autumn and the Warring States periods.10 Liang’s argument that the Zhouli was a work before the Warring States period is expanded by two famous modern Chinese scholars, Guo Moruo 郭沫若 (1892-1978) and Gu Jiegang 顧颉剛 (1893-1980), and they go further to identify the authorship of the Zhouli.

The Zhouli’s authenticity is also a controversial topic in western sinological circles. There are those who consider it authentic and those who do not. The latter argue that the Zhouli was a forgery by Liu Xin as part of the propaganda campaign in support of the

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8 “Qinding siku quanshu zongmu zhouli zhushu 欽定四庫全書總目周禮注疏” in Zhouli zhushu, 632; NanQi shu 21.398.
usurper Wang Mang, because what recorded in the Zhouli had never become reality. The pro-Zhouli scholar Maspero counters by suggesting that the fact that some of the details of the governmental system described in the text were not carried out does not necessarily prove the Zhouli to be a forgery. It is certainly possible that with the continued decline of the Western Zhou, its governmental system had, to a large extent, been abandoned and therefore could no longer be exactly duplicated even though such attempts were made in later times.  

Furthermore, Karlgren, in a meticulous study of ancient Chinese texts, concludes that the Zhouli was a work from no later than the 2nd century B.C.

The study by Karlgren is very important to the study of the completion date of the Kaogong ji, especially in view of the fact that he examines the extant Zhouli text with the inclusion of the Kaogong ji in its entirety. Before he proceeds to date the Zhouli, he first establishes a frame of reference, using such ancient works as the Maoshi, Erya, Li, and Shiji. He then identifies Zhouli passages quoted in these works. Karlgren’s dating of the Zhouli (including the Kaogong ji) to a pre-Han period disproves the argument that the Kaogong ji was a Han forgery.

In the modern scholarship of the Kaogong ji, Guo Moruo’s study has long been regarded as the authority in this field. In his influential study on the date and authorship of the Kaogong ji, Guo concludes that the Kaogong ji may have been officially compiled

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10 Liang 27; Translated by Karlgren (1931, 5).
11 Karlgren 1931, 6-7.
12 Karlgren 1931, 33.
13 This idea is advanced by W. Percival Yetts, in Catalogue of the George Eumorphopoulos Collection of Chinese Bronze (I), 1929, 34, “The main body is suspected of being a Han attempt to construct an utopian scheme of administration, and the K’ao gong ki [Kaogong ji] section may be even later than the Han.” See Karlgren 1931, 6.
by the scholar(s) of the state of Qi in the late Spring and Autumn period.\footnote{Guo 1951, 30; Guo 1954, 605.} Two decades after Guo put forward his argument, Chen Zhi 陳直 found that, besides the Qi dialect, the Chu 楚 dialect is also used in the \textit{Kaogong ji}.\footnote{Dai Wusan 2003, 1, 131-132.} In his \textit{Science and Civilisation in China}, Joseph Needham also confirms Guo’s view by citing Yang Liansheng’s 楊聯陞 study on Qi expressions in the \textit{Kaogong ji}.\footnote{Yang 1950, 542.}

Wen Renjun, in his attempt to solve the question about the date and authorship of the \textit{Kaogong ji} once and for all, divides its main text into 36 sub-units and gives dates of completion to 32 of them. He believes that the of the text was completed in the State of Qi during the late Spring and Autumn and early Warring States periods.

Through comparison of different views on the authorship and date of both the \textit{Zhouli} and the \textit{Kaogong ji}, I tend to accept that \textit{Kaogong ji} was not a text forged by Liu Xin in the 1st century, even though its author and completion date cannot be conclusively ascertained. The authentication of the text is important, because, without it, any attempt at studying its social and cultural contexts would be groundless.

The study of the \textit{Kaogong ji}’s content can be divided into two categories: (1) scientific and technological contributions, and (2) cultural and social meanings, as coded in the text.

The technological aspects of \textit{The Kaogong ji} have attracted much scholarly attention from the very beginning. For example, Zheng Xuan in his commentary already deals substantially with the mathematic concepts of the \textit{Kaogong ji}, although his
meticulous interpretations were challenged by later scholars. In Qing times, Dai Zhen and Cheng Yaotian, eminent scholars in this field, made laborious but judicious efforts at explaining the *Kaogong ji*’s technological concepts and methods. Dai Zhen’s *Kaogong ji tu* (Illustrations of the *Kaogong ji*), \(^{18}\) and Cheng Yaotian’s *Kaogong chuangwu xiaoji* (Notes on Making Things in the *Kaogong ji*) \(^{19}\) are two very influential works. They are inspiring to both their contemporaries and later generations of scholars. From the beginning of the 20\(^{th}\) century, a number of works of Chinese, Japanese, and western scholars have been dedicated to researching the chemical, metallurgical, and manufacturing aspects of the *Kaogong ji*. They engage in the textual analysis of *The Kaogong ji* in comparison with archaeological data.

This thesis, however, mainly focuses on the second category—its cultural and social contexts, a topic that has not yet been sufficiently explored in the long history of *Kaogong ji* scholarship. To be sure, in this area, although there are relevant notes and explanations scattered in commentaries spanning almost two thousand years, there is hardly anything about the whole picture. Therefore it is not surprising that we encounter only sporadic views in the commentaries. \(^{20}\)

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\(^{17}\) For example, on the discussion of the mathematical concept “qingzhe 確折,” Zheng Xuan thinks it is about length instead of angle. See Dai Wusan 2003, 146.

\(^{18}\) Dai Zhen 1955. Shanghai: Shangwu yinshuguan.

\(^{19}\) Cheng Yaotian, 1995.

\(^{20}\) For example, the topic of the association between the well-field system and the King’s city’s planning. Even Sun Yirang, a prominent Qing scholar who epitomizes the achievement of *The Kaogong ji* scholarship in his *Zhouli zhengyi* (Orthodox Explanations on the *Zhouli*) only succeeds in producing over-detailed textual criticism.
Wen Renjun,\textsuperscript{21} who had spent decades studying the \textit{Kaogong ji}, touches on its cultural and social background when he employs the archaeological information for textual interpretation. However, his emphasis is on scientific and technological matters instead of cultural and social issues. Among western scholars, to the best of my knowledge, only Sven Broman systematically examines the Zhou governmental system recorded in the \textit{Zhouli} in his \textit{Studies on the Chou Li}. Nevertheless, the \textit{Kaogong ji} is not the focus of his study.

To place the \textit{Kaogong ji} in its cultural and social contexts, this study first turns to the works on the Shang and Zhou civilizations published in the West in recent decades, including \textit{Shang Civilization} by K.C. Chang, \textit{Western Chou Civilization} by Cho-yun Hsu and Katheryn M. Linduff, \textit{Eastern Zhou and Qin Civilizations} by Li Xueqin 李學勤, \textit{Monumentality in Early Chinese Art and Architecture} by Wu Hung, and \textit{The Pivot of the Four Quarters} by Paul Wheatley. These book-length studies provide numerous pieces of evidence that link pre-modern Chinese civilizations to what is recorded in the \textit{Kaogong ji}. Starting with these data, and supplementing them with further textual information, I will do a general survey on the social and cultural aspects of the \textit{Kaogong ji}, paying special attention to ritual, city construction, warfare, and music. It is my hope that this will allow a reassessment of the \textit{Kaogong Ji} against the background of a long-lasting early tradition.

A substantial and complete English translation of the \textit{Kaogong ji} is justified by the fact that, except for short passages, no English translation of the text has been attempted. I am presenting a full translation of the text; the annotation, however, has to be limited to

\footnote{\textsuperscript{21}See Wen 1990 and 1993.}
a few passages because of the limitation of time. My translation and annotation are based mainly on the *Zhouli zhushu* 周禮注疏 (Commentary and Sub-commentary to the *Zhouli*), in the *Shisanjing zhushu* 十三經注疏 (Commentaries and Sub-commentaries of the Thirteen Classics) edition by Ruan Yuan 阮元, Lin Yin 林尹’s *Zhouli Jinzhu Jinyi* 周禮今注今譯 (Modern Notes and Translation to the *Zhouli*), and Wen Renjun’s *Kaogong ji Yizhu* 考工記譯注 (Notes and Translation to the *Zhouli*), also with consultation with Biot’s French translation and other traditional and secondary sources. I will attempt to include in the annotations not only the latest archaeological information, but also differing opinions of modern scholars.

The *Kaogong ji*, as the most controversial chapter of the *Zhouli*, achieved canonical status over time. Take for example, its “jiangren yingguo” (The craftsmen build the capital) passage. It embodies the crystallization of the early traditions, rich in religious and ritual meanings, and the principles prescribed therein became the *locus classicus* for Chinese capital city building. As in the case of city-building, the *Kaogong ji* provides the standards for craftsmanship and traditional manufacturing as well. As such it has exerted tremendous influence on traditional Chinese art and architecture. It is my hope that my research and annotated translation, based on the results of previous scholars, will help unravel the meaning of this important but poorly understood text.
CHAPTER ONE

THE KAOGONG JI AND THE MISSING CHAPTER OF THE ZHOULI

The textual ancestry of the Kaogong ji (Book of Artificers) traces to the time of the Western Han dynasty when Liu De, Prince Xian of Hejian, presented to the court the book Zhouli, in which the Kaogongji was inserted as a substitute for the missing chapter during the reign of Emperor Wu of Han (r. 140-87 B.C.). This event is recorded in the “Jingji zhi” chapter of the Suishu (History of the Sui) as follows:

In Han [Western Han: 202B.C.-9 A.D.; Eastern Han: 25-220] times, a certain Mr. Li obtained a copy of the Zhouguan (Officials of Zhou). The Zhouguan is probably a [book] of government institutions as set up by the Duke of Zhou. [Mr. Li] presented it to Prince Xian of Hejian. Only the “Dong guan (Winter officials)” chapter was missing. Prince Xian offered 1,000 pieces gold to purchase it, but in vain, so he substituted the Kaogong ji to fill the lacuna. There were now six chapters in the Zhou guan, which he then presented to the court.  

Not long after the Kaogong ji surfaced from obscurity, the Eastern Han commentator Ma Rong provided another version, a fact substantiated by Jia Gongyan, the Tang (618-907) commentator on the Zhouli:

In (the feudal kingdom) Ts’in [Qin], from Hiao kung [Xiao gong, the Duke of Xiao] and downwards, they used the methods of Lord Shang. Its rule was cruel and contrasting with the Chou kuan [Zhou guan]. Therefore, when Shi huang [始皇 the First Emperor] forbade the keeping of books, he especially detested and wanted to exterminate this one. He searched out and burned it completely. Therefore it was hidden for a hundred years. Hiao Wu [孝武 Xiao Wu, Emperor Wu; it was in reality Hui di 孝惠 Emperor Hui.] first abolished the law against the keeping of books

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22 Suishu 32.925. For a somewhat different translation of the passage, see Karlgren, 1931, 4.
23 Also called the Emperor Wu of the Han.
and opened the way for (encouraged) the presenting (to the emperor) of books. When it had thus been brought out from the wall of a house in the mountains, it was again put into the secret store (Imperial archives). The scholars of the five schools were not allowed to see it. When the emperor Hiao Ch’eng [Xiao Cheng 孝成] (32-7 B.C.) brought forward (promoted) talented men, the son of Liu Hiang [Liu Xiang 劉向], Hin [Xin 敬], examined and arranged the secret books (books of the archives), and it was he who first got hold of it and arranged it and put it on the list (the Ts’i lüe [cilue]). But they had lost one book of it, the Tung kuan [Dongguan 冬官] (“winter officers”), and so he completed it by the K’ao gong ki [Kaogongji].

Karlgren is obviously right to suggest that “Emperor Hui” should replace “Emperor Wu” in the passage. It was under Emperor Hui (r. 194-188 B.C.) that the ban on the Zhouli was lifted but it was under Emperor Wu (r. 140-87 B.C.) that the text of Zhouli was presented. The error Ma Rong and Jia Gongyan made was that they had associated both events with the reign of Emperor Wu. Nevertheless, Jia Gongyan's claim does not seem to contest the Suishu record about the time when the text of Zhouli was first presented. The two records differ only in regard to the time when the Kaogong ji was incorporated into the Zhouli: according to the “Jingji zhi” of the Suishu, it took place during the reign of Emperor Wu, but Jia attributed it to Liu Xin in the time of Emperor Cheng.

The age-old question on whether the Kaogong ji was incorporated into the Zhouli during the reign of Emperor Wu or the reign of Emperor Cheng remains unanswered. Nevertheless, what we can be sure about is that the Kaogong ji became known as an ancient text only after its incorporation into the Zhouli. Furthermore, after the Zhouli became one of the Confucian classics, the Kaogong ji began to attract much attention.

from scholars. In other words, the fate of the *Kaogong ji* has been intertwined with that of the *Zhouli* ever since its first appearance, and the study of the two texts has been inseparable.

One of the most common questions about the *Kaogong ji* in relation to the *Zhouli* is: Why was it chosen over other works to take the place of the missing chapter in the *Zhouli*? But before answering this question, we should not ignore the view put forward by the modern scholar Xia Weiying 夏偉英. He goes so far as to contend that the *Kaogong ji*, instead of being a substitute chapter, should be regarded as an integral part of the *Zhouli*. In other words, Xia identifies the *Kaogong ji* with the so-called “Dongguan sikong 司空.”

Xia bases his argument on the following pieces of evidence: (1) The author of the *Kaogong ji* states at the beginning of the text, “The State has six (underlined by me) types of workers, and the hundred artisans form one of them.” The number “six” here, according to Xia, suggests linkage with the six chapters in the *Zhouli*, and “the hundred artisans” smacks of a *Zhouli* chapter [the chapter of *Kaogong ji*]; (2) Some passages in the *Kaogong ji* (for example, the one on *hua hui zhishi* 畫繪之事 or the painter’s and colorist’s affairs) contain the notion of the Two Forces (Yin and Yang) and Five Virtues/Elements/Phases, which is consistent with other chapters in the *Zhouli*; (3) The content of the *Kaogong ji* to some extent conforms with records about the “Dongguan”

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25 Generally speaking, it was during the time of Liu Xin that the *Zhouli* began to be regarded as one of the Confucian classics.
elsewhere in the Zhouli, especially, its first chapter “Tianguan zhongzai 天官冢宰,” and in other sources like the Shu jing 書經 (Book of Documents). 27

Xia’s contention is inspired, but neither his evidence nor his reasoning is beyond question. First of all, it is impossible to establish any correlations between the “six types of workers” in the Kaogong ji and the six kinds of officials depicted in the Zhouli. 28 The argument about the Two Forces and Five Virtues is not that convincing because (1) the notion of the Two Forces and Five Virtues, as implied in the “Hua hui zhishi” section is not the main concern of the Kaogong ji, and (2) the combination of the affairs of the “huaren” (painter) and those of the “huiren” (colorist) strongly indicates a later interpolation. 29 The fact that the Kaogong ji and the "Dongguan" as recorded elsewhere share some common ideas does not necessarily support the idea that the Kaogong ji is indeed part of the Zhouli. These commonalities may have been the result of a later fabrication for the purpose of legitimizing the Kaogong ji or have been the reason why the Kaogong ji was chosen to replace the missing chapter in the first place.

Now let’s return to the question we posed above. Contrary to Xia Weiying’s view that the Kaogong ji was an original part of the Zhouli, some scholars argue that the Kaogong ji was simply selected at random to make the sixth chapter and the compiler(s), Prince Xian (and/or the scholars he sponsored) or Liu Xin was unconcerned about the content. This argument cannot be taken seriously either because: (1) It runs against

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27 Xia 1979, 7-10.
28 For a comparison between the structure of the Kaogong ji and that of the Zhouli, see below.
29 According to the beginning paragraph of the Kaogong ji, the work of huaren 畫人 should be different from that of huiren 繪人. The combination of the two obviously suggests later editing, which may have resulted from the partial loss of the original text concerning either huaren or huiren or both.
common sense that the compiler(s) must have intended to make the addition resemble the original as much as possible; (2) No matter who was responsible for the content of the book, he would have considered each part of it carefully before it was presented to the court; (3) There is evidence that the content of the Kaogong ji may be related to that of the missing chapter, as will be discussed below. In other words, here I suppose that the insertion of the Kaogong ji was a conscious and rational move in the process of the compilation of the Zhouli.

Rather than stressing the textual integrity of the Kaogong ji or ignoring its connections with the Zhouli, I would suggest that we should pay attention to both the similarities and discrepancies between the Kaogong ji and “Dongguan sikong.” For me, the discrepancies are of primary importance, because replacement can happen only when it concerns two different bodies of text. As for the similarities, if there are any, they can help explain why the Kaogong ji was chosen.

But the question still remains: “How can we know what a missing chapter is like?”

A passage in the chapter “Tianguan zhongzai” may shed some light on this question. It states:

The government should have six departments responsible for different duties. The first one is the Tianguan 天官, with the subordinates of sixty offices, in charge of general administration …; the second is the Diguan 地官, with the subordinates of sixty offices in charge of public education …; the third is the Chunguan 春官, with the subordinates of sixty offices, in charge of sacrifices and rites …; the fourth is the Xiaguan 夏官, with the subordinates of sixty offices, in charge of policies in a country…; the fifth is the Qiuguan 秋官, with sixty subordinates of sixty offices…; the sixth is Dongguan 冬官, with sixty subordinates of sixty offices, in charge of the things of a country. 30

There seems to be little doubt about the existence of the chapter “Dongguan,” which can even be deduced on the basis of the arrangement of the surviving five chapters. In view of the Chinese emphasis on symmetry, analogy, and integrity, the textual structure indicated above is almost perfect: “tian 天 (the heaven)” and “di 地 (the earth)” are a pair of well-matched spatial concepts, while the four seasons “chun 春 (spring),” “xia 夏 (summer),” “qiu 秋 (autumn),” and “dong 冬 (winter),” complete a year’s cycle.

If the first five chapters are arranged with the titles according to the order of “tian,” “di,” “chun,” “xia,” “qiu,” it is almost a must that there should have been the sixth chapter and its title should be “dong;” or at least the “dongguan” chapter had been planned if the Zhouli was not a completed book at all.

Then what were the “things” of which “Dongguan” was in charge of in this context? To answer this question, we may turn to the following passage from the previous citation:

[The responsibility of “Dongguan” is] to make the country rich 扶邦國, to support ten thousand (the masses of) people 以養萬民, and to produce one hundred things 以生百物.31

In order to avoid confusion, we must interpret these words with caution since they are not referring to equally weighted three charges of the “Dongguan.” Instead, it seems to be more reasonable to interpret the responsibility of “Dongguan” as “producing one hundred things in order to make the country rich and to support ten thousand people.” In other words, the primary responsibility of the “Dongguan” is not wealth creation (“to

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make the country rich") or food supply ("to support ten thousand people") but
craftsmanship and manufacturing ("to produce one hundred things"). This style of
expression is not uncommon in the grammar of Chinese language, especially during the
Eastern Zhou and Han times.

Now let us turn to the term “Sikong 司空." The Chinese character “si,” which was
very important in naming a certain class of officials, means “to have charge of” or “to
direct.” In this sense Creel translates the official titles beginning with the character “si”
into “Director of Such and such.” The second character “kong,” written as “gong 工” in
bronze inscriptions, implies artifice, labor, work, project, and so forth. So Creel interprets
it as the “Director of Works.” He goes on to suggest that positions bearing the title
“Sikong (Director of Works)” had a long history that can even be traced back to the pre­
dynastic Zhou. For instance, in the Shijing 詩經 (Book of Ode), when King Wen’s
(Wenwang 文王) grandfather built a city in the Plain of Zhou, the commissioners in
charge of the project were the “Director of Works” and the “Director of the Multitude
(司徒).” 32 Another record in the Zuo zhuan 左傳 (Commentary on the Spring and
Autumn Annals by Master Zuo) tells us that King Wu, the founding father of Zhou,
appointed one of his brothers as the “Director of Works.” Based on these pieces of
evidence, Creel suggests that the position “Sikong,” among other official posts prefixed
by the character “si," was set up in the royal court before the founding of the dynasty. 33

Broman’s study on the official system recorded in the *Zhouli* confirms Creel’s opinion. Based on such literary sources as the *Shijing*, the *Guanzi* (Book of Master Guan), the *Shijing*, the *Zuozhuan*, and the *Guoyu* (Discourses of the States), he points out that the “Director of Works” was called “Sikong” in early Zhou and during the middle and late Zhou, it was also labeled as “Da sikong 大司空”.

According to Needham, the word “kong 空” means “empty time, i.e. ‘leisure’ of the people, a surcease from their agricultural employments,” during which they were to be mobilized for other purposes, e.g. large-scale public construction. Such mobilization was supposed to be carried out in the winter season when farmers had more “leisure time,” so the “Director of Works” who had charge of such mobilization was also called the “Dongguan (Winter Officer).”

Such a connection between the Director of Works and the Winter Officer, although supported by some traditional exegetes, especially Jia Gongyan, is questioned by some modern scholars. For example, Creel contends that so tidy a governmental system of Western Zhou as recorded in the *Zhouli* is definitely doubtful since such a governmental scheme and the patterns in which the scheme is organized never appears in other sources dating before the Warring States period. The most glaring anomaly is the arrangement of the six Directors according to heaven, earth, spring, summer, autumn, and winter.

Arthur Wright, on the other hand, speculates on the reign of Emperor of Wu of Han as

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35 Needham 1965, 11.
the time when the Zhouli was written on the evidence of the numerical and cosmomagical symbolism coded in the basic structure of the Zhouli.

Both Creel and Wright touch on the issue of the authenticity and the completion date of the two texts in question, which is the focus of the next chapter of this paper. Here I focus only on the main characteristics of the Kaogong ji and the missing chapter of Zhouli, as well as on the relationship between them. In my view, both of the texts are normative and prescriptive rather than historical and descriptive. As Karlgren says, they "represent the endeavors of the Confucian school to determine what the belief and rites should properly be."37

In short, by connecting the information provided by the literary works, we see a common thread in the argument that the missing chapter of the Zhouli should be the description of the function of "Dongguan sikong," which was in charge of manufacture and craftsmanship. The reason that the Kaogong ji was submitted as a substitute for the lost chapter is mainly because its content consists of instructions for making things and constructing hydraulic projects, cities, etc. Meanwhile, however, we should also remind ourselves that we should not treat the Kaogong ji as the missing chapter itself even though the two texts possibly share some similar content. This point becomes clear as we compare the Kaogong ji and the surviving five chapters in the Zhouli.

The passage from the first chapter of the Zhouli we have cited above as evidence of the existence of the "Dongguan" truthfully records the actual arrangement of the content.
of the *Zhouli* in its extant version. Since with the exception of the *Kaogong ji* the other chapters of the *Zhouli* are almost identical both in structure and narrative style, we need only one of them for comparison purposes. Let us look at the first chapter “Tianguan Zhongzai.”

The main body of the “Tianguan zhongzai” can be divided into two parts. The first part lists a total of sixty-three offices, providing brief information (such as ranks and titles) about the leaders of each office and their staff. The second part is about the regulations and functions of all offices listed in the first part, as shown in Table 4.

Likewise, the *Kaogong ji* can also be roughly divided into two parts, a short opening introduction, followed by the part of itemized explanations, as shown in Table 5. The discrepancies of the two chapters revealed in the two tables are as follows:

1. The *Kaogong ji* provides no suggestion on the hierarchical positions of Zhou imperial administration as does the “Tianguan zhongzai” chapter.

2. Chapter One essentially observes the principle of organizing government offices in multiples of six while the *Kaogong ji* ignores it. In the *Zhouli* there are a total of six departments, each one of which is alleged to have under it 60 offices; so there

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38 See Table 3.
39 But we must bear in mind that between the time of its initial compilation and its incorporation into the *Zhouli*, the *Kaogong ji* may have been revised by different compilers in different states. According to Wen Renjun 聞仁軍, the opening paragraph was completed in the middle or late Warring States period (see Table 6), while the main body of the text had been completed in the early Warring States period. If Wen’s hypothesis is true, the earliest text of *Kao gong ji* may not contain the opening paragraph.
40 Dai Wusan argues that terms like ren 人 (man), shi 氏 (surname/clan), and shi 師 (master) in the *Kaogong ji* refer to different levels of officers. See Dai, 2003, 2. However, there is not clear textual evidence supporting his argument. According to the *Kaogong ji* text, ren and shi 氏 both mean workers, while “shi 師” probably means the "teacher of the workers," or one who excels in craftsmanship.
should be a total of 360 offices. 41 The Kaogong ji, on the other hand, lists only 30 kinds of artisans in its opening paragraph of Kaogong ji, 42 although it is possible that originally 100 kinds of artisans had been designated. 43

(3) Unlike the“ Tianguan zhongzai” which gives detailed information on different officials in charge of various duties, the Kaogong ji emphasizes the principles of craftsmanship and process of manufacturing.

(4) Oftentimes, Chapter One follows the narrative pattern “A is in charge of (zhang 掌) X.” In corresponding sections, the Kaogong ji uses the “A makes (wei 為) X” pattern instead, which is followed by the depiction of manufacturing process and product standards.

Moreover, it is necessary for us to distinguish between the“ six types of workers (or professions)” recorded in the Kaogong ji and the six Directors (or Ministers) in the Zhouli. The Kaogong ji classifies the population into liuzhi 六職 (six professions)”: wanggong 王公 (princes and lords), shidafu 士大夫 (ministers and officials or knights and grand masters), baigong (hundred artisans), shanglu 商旅 (merchants and travelers [traders]), nongfu 農夫 (farmers), and fugong 婦功 (women workers). This system of six professions is obviously different from the classification system in “Tianguan zhongzai,” which is organized under the six royal ministers (namely, zhongzai, situ, zongbo, sima, sikou, and sikong). In other words, the so-called six royal ministers in the

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41 This model is reconstructed from a record in the “Tian guan” section. See Zhouli zhushu, 653. However, according to Sven Broman, the number of offices in each chapter is somewhat larger than sixty: Tianguan, 63 offices; Diguan, 79; Chunguan, 69; Xiaguan, 70; Qiuguan, 66. See Broman 1961, 59-66.
42 The 31st kind “Zhouren” only appears in the main body of the text.
Zhouli probably should be classified under the "Ministers and Officials" category of the Kaogong ji. In this area, the Kaogong ji with its main focus on the "hundred artisans" obviously deviates from the other five chapters of the Zhouli.

The discrepancy of the text of the Kaogong ji from that of the Zhouli can be proved further by sorting and comparing some key words in these two texts. This method combines the understanding of specific text and the quantitative analysis of its linguistic elements, e.g. the frequency of some key words, and may disclose what is hardly penetrated in other ways. Providing relatively direct proof, the Zhouli yinde (the Index of the Zhouli) is a result of such kind of study. Take, for example, the word wanghou (queen consort) 王后, which, appearing in the first five chapters with high frequency, never shows itself in the Kaogong ji but is rendered with the word zonghou 宗后 or furen 夫人. Many other words, such as nu (crossbow) 弩, tu (person) 徒, bang (country) 邦, zheng (policy) 政, qing (minister) 卿, and wei (position) 位, are used frequently and glaringly in the first five chapters but never in the Kaogong ji text. This, from the aspect of linguistics, no doubt speaks against the point that the Zhouli (the Kaogong ji included) was a forgery by Liu Xin for the purpose of legitimizing Wang Mang's usurpation of Han royal power.

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43 Bai 百 or "one hundred" cannot be taken literally. It may only mean "many", not necessarily "one hundred kinds of professions."

44 Based on the Sibu congkao 四部叢刊 version, with Ruan Yuan's Zhouli zhushu jiaokan ji 周禮注疏校刊記 as reference, this index was compiled by the Yanjing 燕京 Institute and published in 1940. It is a valuable index in the study of the Zhouli and Kaogong ji. However, we must use it cautiously considering there are various errors included. Wen Renjun categorizes these errors into five kinds. See Wen 1991, 171-2.
Having refuted the assumption that the Kaogong ji was the missing chapter in the Zhouli, let us turn to the question of the authenticity of the Kaogong ji itself at the time of its inclusion in the Zhouli. There is a record in the “Wenhui taizi zhuan 文惠太子傳” of the Nan Qi shu 南齊書 indicating that there was a Chu 楚 version of Kaogong ji during the Warring States period:45

At that time in Xiyang 襄陽 some grave robbers robbed an old tomb, believed to the burial of a certain king of Chu. They dug out quite a few old treasures, including jade shoes and screens, texts on bamboo strips, and silk textiles in green. Among these the bamboo slips were [especially noteworthy]. Two chi 尺 long and several fen 分 wide, they were like new. The robbers [did not know how valuable these slips were and] burned them as torches [when they robbed the tomb]. Afterward there was a man who got hold of more than ten slips and showed them to the fujun 撫軍 (the General of the Pacification Army) Wang Sengqian 王僧虔. [After a careful examination,] Wang recognized that the inscriptions on those slips were part of the Kaogong ji in tadpole script, the substitute of the missing chapter of the Zhouguan.46

General Wang (426-485), a well-known calligrapher in the Southern Dynasties, had the necessary knowledge to recognize the tadpole script, which had been popular in Chu and some other eastern states in the Warring States period.47 Furthermore, if the record turns out to be believable, the text of Kaogong ji may have been widely circulated among the states and may have had several editions during the Warring States period. Nevertheless, there is no evidence to show whether or not the robbed tomb really belonged to a Chu King. If the occupant of the tomb was a Chu king, which king was it? What text did General Wang see on the bamboo slips? Was it part of the current version of Kaogong ji, or was it that part of the Kaogong ji text the current version failed to record? It is still possible that the bamboo text in question dealt with a similar range of

45 Zhouli zhushu, 632; Wen, 1990, 111-112.
subjects as the *Kaogong ji* but belonged to a completely different title. At any rate, this *Bei Qi shu* record cannot prove the availability of the *Kaogong ji* as an independent text before it was incorporated into the *Zhouli*. If the existence of *Kaogong ji* as an independent text before it was incorporated into the *Zhouli* could not be proven, it will bring into question the authenticity of the *Kao* and give rise to the possibility of it being a forgery.

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46 *Zhouli zhushu*, 632. Translation by author.
47 Wen 1990, 112.
CHAPTER TWO

THE AUTHORSHIP AND THE DATE OF THE KAOGONG JI

The argument for or against the authenticity of the Kao is inevitably linked to that of the Zhouli. In fact, Zhouli’s authenticity has been a contentious issue since the Eastern Han (25-220). The scholars on both sides usually base their arguments on two key aspects, the authorship of the work and the dates of its completion.

According to the commentary by Zheng Xuan (127-200), the text of the Zhouli was compiled by the Duke of Zhou at the beginning of the Western Zhou (ca. 1050-771 B.C.). This idea may have been widely accepted before Zheng Xuan. Liu Xin (46 B.C.-A.D.23), for example, had been a strong advocate of the Zhouli and promoted it to classic status. Although He Xiu 何休 (129-182), a contemporary of Zheng Xuan, contended that the Zhouli was a work completed at the end of the Warring States period (as late as the 3rd century), Zheng Xuan’s idea remained unchallenged during his time and continued to dominate Zhouli scholarship in the following centuries until the Song period (Northern Song: 960-1127; Southern Song: 1127-1279), when Hu Anguo 胡安國 (?-1138) asserted that Zhouli was a forgery of Liu Xin. Hu’s argument resonated among his contemporaries, including such prominent scholars as Sima Guang 司馬光 (1019-1086), Hong Mai 洪邁 (1123-1202), and Su Zhe 蘇轍 (1039-1112).48 Hu’s bold argument was influential enough to jeopardize the classic status of the Zhouli, which was eventually

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preserved, thanks to the efforts of such great Confucians as Zhu Xi 朱熹, Zheng Qiao 鄭樵, and Ma Duanlin 馬端臨.

The debate on the *Kaogong ji* continued to rage on down to the late Qing period (1644-1912). While Jiang Yong 江永 (1681-1762), Wang Niansun 王念孫, Yu Yue 俞樾, and Sun Yirang 孫詒讓 defended the *Zhouli*’s authenticity, Kang Youwei 康有為, among others, again raised the issue of forgery by Liu Xin. The pro-*Zhouli* group argued that (1) numerous forms of Chinese characters and names of things used in the *Zhouli* text remained unknown in the Han period, which strongly suggested the pre-Han existence of the text; 49 and (2) supporting references in such sources as the *Shi ji* and the *Han shu* add credence to its authenticity. Jiang Yong in particular lent support to Lin Xiyi’s argument, and identified the author of *Kao* as a well-informed scholar of the late Eastern Zhou period, who was good at both making artifacts and writing articles. 50

The skeptics’ view is generally based on the following arguments: (1) The governmental system recorded in the *Zhouli* text is divergent from what other sources prescribe; 51 (2) Some concepts in the text can be traced to the much later late Spring and Autumn and the Warring States periods; (3) Linguistically, the *Zhouli* was written in the classical Chinese of the late Spring and Autumn and the Warring States periods, which is different from the pre-classical language used in the Western Zhou. 52 Liang Qichao

51 Karlgren, 1931, 5.
52 Boltz, 1993, 27.
梁啓超, a student of Kang Youwei, tries to reconcile these two opposing views in his *The History of Chinese Political Thoughts:*

It is probable that Zhou gong [Duke of Zhou] was not its [*Zhouli*’s] author, nor is it entirely the fabrication of Han scholars. It seems that it is partly a description of the political organisation of the emperors Li and Hsuan [Xuan] of the west Han dynasty (misprint for west Zhou: Li and Sūn [Xuan] ruled 878-782 B.C.), and partly a description of the practices during the Ch’un ts’iu [Chunqiu 春秋, Spring and Autumn] and Chan kuo [Zhanguo 戰國, Warring States] periods. To this mixture the scholars added their own ideas. This is only a conjecture which ought to be verified.  

Liang’s argument that the *Zhouli* was a work before the Warring States period is expanded by two famous modern Chinese scholars Guo Moruo 郭沫若 (1892-1978) and Gu Jiegang 顧頡剛 (1893-1980), the leader of the Doubting Antiquity school in the 1920s. Both of them accept the *Zhouli* as an authentic text but argue in favor of the late Warring States period as its time of completion. Furthermore, they both attempt to identify the author. Guo concludes that the *Zhouli* was compiled by a certain disciple of Xun zi 荀子 living in the state of Zhao 趙 through a long study of Zhou inscriptions. Gu, on the other hand, without linking the author to any particular individual, implies that the compiler might have been living in the state of Qi 齊. Generally speaking, their identification of the *Zhouli* as a pre-Han work is quite influential, although the question of authorship still remains open.

The *Zhouli*’s authenticity is also a controversial topic in western sinological circles. There are those who consider it authentic (such as Ed. Biot, Ed. Chavannes, A. Conradyk, B. Schindler, H. Maspero, and Bernhard Karlgren) and those who do not (such as O.

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53 Liang, 27; translation by Karlgren, see Karlgren, 1931, 5.
54 Boltz, 1993, 29.
Kümmel, W. Perceval Yetts, O. Franke, and C. Harlez). The latter argue that the *Zhouli* was a forged book by Liu Xin as part of the propaganda campaign in support of the usurper Wang Mang, because what is recorded in the *Zhouli* had never become reality. The pro-*Zhouli* scholar Maspero counters by suggesting that the fact that some of the details of the governmental system described in the text were not carried out does not necessarily prove the *Zhouli* to be a forgery. It is certainly possible that with the continued decline of the Western Zhou, its governmental system had, to a large extent, been abandoned and therefore could no longer be exactly duplicated even though such attempts were made in later times.\(^{55}\) Furthermore, Karlgren, in a meticulous study of ancient Chinese texts, concludes that the *Zhouli* was a work from no later than the 2\(^{nd}\) century B.C.. He summarizes:

> We have verified the existence of numerous passages out of the Chou li [*Zhouli*] and the Tso chuan [*Zuo zhuan*] before the time of Liu Hin [Liu Xin]:
> A. Extracts from Chou li [*Zhouli*] incorporated in Rituals that were current in Western Han time and which were formed into a collection in the middle of the 1\(^{st}\) c. B.C.
> B. Extracts from or references to both the Chou li [*Zhouli*] and the Tso chuan [*Zuo zhuan*] in Si-ma Ts’ien [Sima Qian]’s Shi ki [Shi ji], written about a century B.C.
> C. References to both the Chou li [*Zhouli*] and the Tso chuan [*Zuo zhuan*] in the Mao Shi [毛詩] commentary, written in the middle of the 2\(^{nd}\) c. B.C.
> D. References to both the Chou li [*Zhouli*] and the Tso chuan [*Zuo zhuan*] among the glosses of the Er ya [爾雅], glosses that were written at the latest in the 2\(^{nd}\) c. B.C., but probably in the 3\(^{rd}\) c. B.C.

If, in regard to the last point, we take the most cautious stand and reckon only with the 2\(^{nd}\) c. B.C., we have conclusively proved, at any rate, that the Chou li [*Zhouli*] and Tso chuan [*Zuo zhuan*] texts existed in the middle of that century.\(^{56}\)

\(^{55}\) Karlgren, 1931, 6-7.
\(^{56}\) Karlgren, 1931, 57.
Thirty years later, in a lengthy paper based exclusively on textual resources, Sven Broman went further to conclude that the governmental system elaborated in the Zhouli was rooted in late Shang and early Zhou times and had once prevailed during the mid- and late Zhou dynasty:

The Chou li [Zhouli] depicts a governing system which, in all essentials, prevailed in middle and late feudal Chou in the various states and had its roots in the system pertaining to late Yin and early Chou. This governing system continued to exist in a more or less modified form up to 221 B.C., when it was abolished and replaced by a centralized government system, created by Ts’in Shi Huang Ti [Qin shi huang di, the First Emperor of Qin] but based, partly at least, on the governing system already existing in the state of Ts’in.\(^{57}\)

Creel takes issue not only with Broman's conclusion, but his methodology as well. In drawing his conclusion, Broman relies on a comparison between the administrative organization depicted in the Zhouli and that of the pre-Han “free texts,” a term defined by Karlgren in an earlier paper.\(^{58}\) Creel points out that not all such free texts Broman adopts are older than the Zhouli itself, and almost all of them were written or compiled in the Warring States period. Instead of providing information on much earlier times, some of these texts only reflect the same state of affairs as the Zhouli. Moreover, according to Creel, the most regrettable point is Broman’s refusal to consider the bronze inscriptions,

\(^{57}\) Broman 1961, 73-74.

\(^{58}\) Broman 1961, I. The definition of the free texts and systematizing texts is given by Karlgren in his “Legends and Cults in Ancient China” (BMFEA 18, 201, Stockholm 1946): “On the one hand, there are sources like Shu King [Shujing] and Shi king [Shijing], Tso Chuan [Zuozhuan] and Kuo Yu [Guoyu] and Chan kuo ts’e [Zhanguo ce], Lun yu [Lunyu] and Mencius, Mo tsi [Moz1] and Chuang tsi [Zhuangzi], Liao and Tien wen [Tianwen]—they are what I shall call free texts of the pre-Han era. Their accounts of ancient men, happenings and cults are given *en passant*, either as occasional records of events or inserted in speeches of politicians and philosophers, who refer to current traditions in elucidating some moral or political theme. Of an entirely different character are those writings which I shall call systematizing texts. They are the products of scholars who deliberately tried to lay down laws or make a consistent whole of the ancient traditions and ritual ideas. Their goal was to work up and compile a diffuse and heterogeneous material, to create a system. To this class belong, in the first place, works such as the major part of the Li ki
which are “the best of all sources.” Besides, in some cases, the far-fetched connections between the titles recorded in the Zhouli and other texts inevitably mar his whole argument. Wheatley shares Creel’s opinion that it is unconvincing that such an convoluted and inflexible system portrayed in the text could have been set up in the Western Zhou period. He considers it most probable that the Zhouli reflects the administrative practice in the late Warring States period, but “the relative contributions of Western Chou [Zhou] ritualists and later systematizers is still unsettled.”

Essentially, the Kaogong ji is not the focus of Western scholarship on the Zhouli. As part of the extant text of the Zhouli, the Kaogong ji is often identified as (1) the substitute for the missing chapter and (2) “a work itself of some antiquity.” Because of the lack of information on its authority and date from early texts other than the Zhouli itself, Kaogong ji scholarship has been overshadowed by and inseparable from that of the Zhouli. A notable example is Karlgren’s study on the date of Zhouli we have mentioned above.

The study by Karlgren is very important to the study of the completion date of Kaogong ji, although he examines the extant Zhouli text including the Kaogong ji text in its entirety. Before he proceeds to date the Zhouli, he first establishes a frame of reference, using such ancient works as the Maoshi 毛詩 (Commentary of the Book of Odes by

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61 Wheatley 1971, 156.
Master Mao), the *Erya* (Dictionary of Chinese Classics), the *Li* (Books of Rites), and the *Shiji* (Records of the Grand Historian). He then identifies *Zhouli* passages quoted in these works.\(^{62}\) Karlgren cites six *Kaogong ji* passages in the *Maoshi* and four *Kaogong ji* passages from the *Erya*.\(^{63}\) Karlgren’s dating of the *Zhouli*, including *Kaogong ji*, to a pre-Han period disproves the argument that *Kaogong ji* is a Han forgery.\(^{64}\) Karlgren’s dating of the *Kaogong ji* is surely illuminating, but it virtually has not addressed the issue of authenticity and the completion date of *Kaogong ji* as an independent text.

The study of the authorship of the *Kaogong ji* and its date of completion as an independent text started as early as the Song dynasty, when the scholar Lin Xiyi argued that the *Kaogong ji* should be a pre-Qin text, written by someone from the state of Qi. He bases his argument on the fact that the Qi dialect is used in the narrative, which is reminiscent of the *Chunqiu Guliang zhuan*.\(^{65}\) Jiang Yong (1681-1762), a famous Qing scholar, confirmed Lin’s argument and identified the author as a well-informed scholar from the Eastern Zhou period (721-256 B.C.), who was good both at making artifacts and writing articles.\(^{66}\) Jiang’s notable contribution to the *Kaogong ji* scholarship is his unique focus on dialectal differences, which has exerted a tremendous influence on later scholars, including Guo Moruo and Chen Zhi.

In his influential study on the date and authorship of the *Kaogong ji*, Guo concludes that the *Kaogong ji* may have been officially compiled by the scholar(s) of the state of Qi.

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\(^{62}\) Karlgren, 1931, 33.
\(^{63}\) Karlgren, 1931, 36-38; 50-51.
\(^{64}\) See W. Perceval Yetts, 1929, 34; Karlgren 1931, 6.
\(^{65}\) *Yanzhai Kaogong ji jie* by Lin Xiyi, *shang*. See also Wen 1993, 138.
in the late Spring and Autumn period, relying on the following pieces of evidence: (1) While the *Kaogong ji* mentions some rivers between the states of Qi and Lu 魯, it never mentions the state of Qi by name; (2) Expressions of the Qi dialect appear in several places in the text; (3) The measures of weight, length, and capacity recorded in the text are Qi measures.  

Two decades after Guo put forward his argument, Chen Zhi 陳直 found that, besides the Qi dialect, the Chu dialect is also used in the *Kaogong ji*. Chen went on to speculate that while the *Kaogong ji* may have been written by some Qi person(s), some later Chu writer(s) must have been involved in its revision.

In addition to linguistic research, Guo has focused his attention on capacity measures, which proves to be useful in establishing the authorship and the completion date of the *Kaogong ji*. Guo argues that the “4 sheng makes up 1 dou (sisheng weidou 四升為立) pattern belonged to an old system used by the Jiang 姜 clan of Qi. After the Tians 田 displaced the Jiangs as leaders of the State of Qi from 386 B.C., the old standards of the Qi of the Jiangs (姜齊舊制) were changed into the new standards of the Qi of the Tians (田齊新制). Guo’s argument that the *Kaogong ji* was completed during the late Spring and Autumn period is mainly based on this finding. However, new archaeological evidence reveals that the “4 sheng makes up 1 dou” standard prevailed in Qi under both the Jiangs and the Tians. Moreover, if the Qi standards were changed, it could only take place during the Warring States period, no matter which year—403 B.C.,

67 Guo, 1951, 30; Guo, 1954, 605.
475 B.C. or 485 B.C.—we choose as the end of the Spring and Autumn period.\(^6\) This fact prompted some scholars to cast doubt on Guo’s conclusion on the completed date of the *Kaogong ji*. But most, Joseph Needham and Wen Renjun among them, still accept the *Kaogong ji* as a Qi work.

In his *Science and Civilisation in China*, Needham not only confirms Guo’s view about the *Kaogong ji*’s authorship by citing Yang Liansheng’s 楊聯陞 study on the Qi dialectal expressions in the *Kaogong ji*,\(^7\) but also points out that the *Kaogong ji* proves that Qi developed a high level of science and technology. He also places it in the context of the rise of the Jixia 稷下 scholars of Qi who reportedly compiled the *Guanzi*. Scholars like Hu Jiacong 胡家聰 even contend that both the *Kaogong ji* and the *Guan zi* were penned by the Jixia scholars.\(^8\)

In his attempt to deal with the authorship issue and date of completion, Wen Renjun expands the scope of research beyond textual analysis to archaeological finds, backed up by sophisticated discussions on historical-geographic nomenclatures, cart making, music instrument making, and various forms of bronze weapons including the *ge* 戈 halberds, *ji* 戟 halberds, swords, bows, and arrows.\(^9\) His contention that the *Kaogong ji* was completed in the early Warring States period is mainly based on a comparison of the archaeological data and the related content of the *Kaogong ji*.

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\(^7\) Yang 1950, 542.
\(^8\) Wen 1990 101.
\(^9\) Wen 1993 144-153.
In order to provide a definitive answer to the authorship and date of the *Kaogong ji* once and for all, Wen divides its main text into 36 subunits to subject them to a thorough exploration. He tries to provide for each subunit as much archaeological evidence as possible to reinforce his argument. With the exception of four subunits, which are not datable, Wen gives dates of completion to the remaining 32 subunits. Of these, 12 were completed during the late Spring and Autumn period, two during the late Spring and Autumn and Warring States periods, 11 during the early Warring States period, and seven during the middle and late Warring States periods. By and large, he believes, the bulk (25 out of 32 subunits) of the text was completed in the State of Qi during the late Spring and Autumn and early Warring States periods.\(^\text{73}\)

No doubt Wen should be applauded for pioneering a new way of researching the *Kaogong ji*, but his argument is not totally convincing. First, the archaeological information Wen heavily relies on is mostly from finds in South China, especially Hubei and Hu'nan provinces. It seems to suggest that when the *Kaogong ji* was being compiled, it was under the dominant influence of the Yangzi area. But in fact, Wen himself has never challenged the view that the compiler is from the State of Qi. Second, when comparing the archaeological data with the content of *Kaogong ji*, sometimes Wen seems to ignore the complexity involved. For example, the angle of the ancient L-shaped chime stone *Qing* 磬 (*qingzhe* 磬折) as recorded in the *Kaogong ji* contextually has two values: 135° and 150°.\(^\text{74}\) In his study, Wen only considers those unearthed chime stones with a 135° angle. And last but not least, since current archaeological information is far from

\(^{73}\) For details, see Table 6.
adequate for elucidating the things depicted in the *Kaogong ji*, his efforts to match archaeological finds with textual records often yield unreliable results, leaving in doubt the scheme he uses to date the three dozen separate subunits.

From the above survey we can discern a significant characteristic of *Kaogong ji* scholarship which sets it apart from the *Zhouli* studies. While there are always scholars asserting the *Zhouli* a forgery of Liu Xin, few lay the same charge at the feet of the *Kaogong ji*. To be sure, W. Perceval Yetts opines that the *Kaogong ji* was a post-Han work.⁷⁵ Scholars usually do not take his view seriously considering the solid fact that there are commentaries on the *Kaogong ji* left by several Han commentators. Another voice of skepticism is from the highly reputable Sui (581-618)-Tang (618-907) scholar Kong Yingda 孔穎達 (574-648). In his commentary on the *Zhouli*, while arguing in favor of the authenticity of the five surviving chapters of the *Zhouli*, he asserts that the *Kaogong ji* was fabricated during the reign of Emperor Wen:

Emperor Wen got the *Zhouguan*, in which the chapter "Dongguan" was not included. He thus asked the Erudite to write the *Kaogong ji* in order to make the book complete.⁷⁶

Scholars after Kong normally do not accept this assertion. For example, the Qing (1644-1912) scholar Sun Yirang refutes the idea of an Erudite getting involved in forging the text by pointing out that the position in question *Zhouli boshi* 周禮博士 (the Erudite of the *Zhouli*) was not yet established under Emperor Wen.⁷⁷

⁷⁵ Karlgren 1931, 6; note 48.
⁷⁷ Wen 1993, 142.
The study of the authorship of the *Kaogong ji*, as it is shown above, is mainly limited in Chinese academic circles and is based on the examination of the dialects used in the text. Initiated by Lin Xiyi, the argument that the *Kaogong ji* was compiled by certain Qi scholar(s) has long been accepted and developed by later scholars, such as Guo Moruo and Chen Zhi, who employ the same method that Lin Xiyi uses. Basically, I consider their argument reasonable, but it is by no means the final answer to the question. The evolution of the dialects was actually much more convoluted than expected. Take, for example, the “Zhouren” passage, which, according to Chen Zhi, should have been added into the *Kaogon ji* by some Chu author(s) because the term “Zhou” was a Chu word during the Warring States period. Nonetheless, other scholars throw the idea into doubt by contending that the word “Zhou” was by no means used exclusively by Chu people, but by Qin people at the same time, too.\(^78\)

As for the contention that the whole *Zhouli* text was forged to support the usurper Wang Mang, I disagree, because it fails to explain why the *Kaogong ji* is so different from the other five chapters. A forger would try to make his work convincing by maintaining a sense of uniformity. Having forged the first five chapters, why did he then fail to make up the sixth? Why did he instead choose a text as incongruent as the *Kaogong ji* as its replacement?

Also, based on what we have covered so far, we may conclude that in essence the *Kaogong ji* was a pre-Han work, even though we know neither its precise date of

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completion nor its exact authorship. This, in actuality, secures the authenticity of the Kaogong ji text. The authentication of the text is important, because, without it, any attempt at studying its social and cultural contexts would be groundless.
CHAPTER THREE

READING THE KAOGONG JI WITHIN ITS POLITICAL AND CULTURAL CONTEXT

The study of the Kaogongji, if we attribute the emergence of the Kaogongji to Prince Xian of Hejian, should have begun with the rearrangement of the book of Zhouli, which was supported by the prince, the famous aficionado of old texts. His interest in antiquity contributed not only to the saving of a number of ancient texts, but to the study of them as well, as indicated in his biography.\(^79\) The great probability of his organizing scholars to study the Kaogongji notwithstanding, solid textual evidence is still in need to support such a supposition.

It is Liu Xin who established a solid position for the study of the Zhouli with his “genius, learning, energy and enthusiasm we have to thank for most of what we know of China’s ancient bibliography.”\(^80\) His rearrangement of the Kaogongji provided the textual basis of the Kaogongji scholarship for later generations of commentators of the text. Actually, Liu Xin himself should be considered as a great initiatory commentator of the Kaogongji. Thanks to his introducing it to Du Zichun (ca. 58-30 B.C.) and Jia Hui 賈黙, the Kaogongji scholarship has come down generation after generation with illuminating commentaries added in it from time to time. Du Zichun and Jia Hui plus,

\(^79\) According to the “Hejian Xianwang Zhuan 河間獻王傳 (Biography of Prince Xian of Hejian)” in the Hanshu (Book of the Han), Prince Xian of Hejian was able to collect so many ancient books from the public as the library of the Han court because he offered good prices for them. He also supported the study of the texts he collected by establishing a special position—Jingxue boshi 經學博士, or the Erudite of the Classics—within his domain. For this reason, “Many Confucians from Shangdong 山東 followed him.”

\(^80\) Karlgren 1931, 59.
Zheng Xing, Zheng Zhong, Jia Kui, and Ma Rong were all influential figures in the study of the Zhouli and Kaogong ji in the Eastern Han (A.D.25-221) dynasty and thereafter, whose commentaries are fundamental to the Zhouli and Kaogong ji study by Zheng Xuan, another outstanding Eastern Han commentator. Zheng Xuan’s commentary of the extant Kaogong ji, twice as long as the main text, epitomizes the study of the Kaogong ji prior to and within the Eastern Han and is regarded as the earliest authoritative work of its scholarship.81 Thanks to his commentary, which adopts many ideas from the commentaries of the Zhouli and Kaogong ji by other earlier scholars, we have some clues to the Zhouli and Kaogong ji scholarship, which has partially survived time because of Zheng’s commentary.

Because the Kaogong ji is concerned mainly about the workmanship of “one hundred artisans,” the commentaries have regarded its scientific and technical achievements as the most significant aspects of its scholarship. Also, because the language the Kaogong ji uses had become strange even to Han scholars, the textual interpretation of the ancient text constituted another aspect of its scholarship. Take, for example, Zheng Xuan’s commentary. Zheng Xuan not only to some extant decipher many ancient terms on the basis of his predecessors’ works, but also pays considerable attention to the development of pre-Qin techniques in his commentary on the Kaogong ji. He knew quite well the achievement of Han science and techniques; he was also a master of the calendar and mathematics, which helped him deal substantially with the mathematic concepts of the Kaogong ji, although his meticulous interpretations were

81 The extant Kaogong ji contains about 7,000 Chinese words; Zheng Xuan’s commentary about 14,000
challenged by later scholars. The most glaring defect of Zheng Xuan’s commentary, however, is that he sometimes confuses the science and techniques of the Qin and Han as those depicted in the *Kaogong ji*. Also, in regard to the fact that he relies mainly on the etymological instead of the archaeological data, which was rare at that time, it is not surprising that he has twisted many a word in his interpretation.

Centuries after the Eastern Han, besides the obscurity of the meaning of the *Kaogong ji* text itself, the commentaries on it by the Eastern Han commentators also became gradually ambiguous. Therefore scholars began to add commentaries on the commentaries of the *Kaogong ji* by the Han commentators. Shen Chong 沈重 (A.D.500-583) was such a commentator in the Southern and Northern Dynasties. Based on Shen Chong’s *Zhouguanli yishu* 周官禮義疏 (The Commentary on the Commentaries of the *Zhouganli* (e.g. the *Zhouli*)) and Lu Deming’s *Jingdian shiwen* 經典釋文 (The Interpretation of the Words of the Classics), Jia Gongyan of the Tang dynasty compiled the *Zhouli yishu* 周禮義疏 (The Commentary on the Commentaries of the *Zhouli*), which has been regarded by later scholars as a continuation and improvement of Zheng Xuan’s study. Its broad coverage notwithstanding, some scholars, e.g. Ruan Yuan of the Qing Dynasty, pointed out that it was overloaded with details.

At the end of the Five Dynasties (A.D.907-960), Nie Chongyi 聶崇義 compiled the *Sanlitu jizhu* 三禮圖集注 (The Collecting Notes on the Illustrations in the Three Rites

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82 For example, on the discussion of the mathematical concept “qingzhe 磐折,” Zheng Xuan thinks it is about length instead of angle. See Dai Wusan 2003, 146.

83 See *Zhouli zhushu tiyao*周禮注疏提要, in *Sikuquanshu zongmu* 四庫全書總目, Zhonghuashuju edition.
(the *Zhouli*, *yili* 儀禮, and *liji* 禮記)) of twenty juan 卷, in which a number of vessels recorded in the *Kaogong ji* are included. This book, categorizing the vessels recorded in the *Zhouli*, *yiji*, and *liji* into sixteen kinds, inspired later generations of scholars, such as Dai Zhen and Cheng Yaotian of the Qing Dynasty, to interpret the *Kaogong ji* with illustrations. The advantage of Nie’s book is his inclusion of the vessels recorded in the *Kaogong ji* into the context of the ancient rites, however, many of the illustrations he depicted were the results of his imagination, which have been disproved by modern archaeological discoveries.

The study of the *Kaogong ji* as an independent text first appeared in the Song Dynasty (A.D.960-1279), when a number of monographic commentaries on the *Kaogong ji* came out one after another, among which the *Kaogong ji jie* 考工記解 (The Commentary on the *Kaogong ji*) by Wang Anshi 王安石 and the *Yanzhai Kaogong ji jie* 虢考工記解 by Lin Xiyi were the most noticeable. As a famous politician and reformer, Wang’s interpretation combines the *Book of Changes* with the *Kaogong ji*, which, he thinks represents the quintessence of the former. His interpretation, closely related to his political idea, is sometimes criticized to be far-fetched. Lin Xiyi, who first proposed that the author of the *Kaogong ji* was from the Qi State by recognizing the trace of the Qi dialect in the text, contributed to the scholarship of the *Kaogong ji* by his etymological study of the text. In order to help more readers understand the ancient text, he not only does textual research on the pronunciation of specific words but also compiles illustrations of the vessels depicted in the text based on Nie Chongyi’s work. The
disadvantage of Lin’s work, nevertheless, as Nie’s, is that some illustrations included are not correct.

There were more monographic commentaries on the Kaogong ji produced during the Ming Dynasty (A.D.1368-1644) than in the previous dynasties. Among them the Kaogong jiejie by Xu Guangqi 徐光啟, who, as the predecessor of Chinese modern science, dedicated himself to the study of mathematics, agriculture, irrigation works, and the calendar, was eminent for its original understanding of the text from its scientific and technological aspects. He regarded what was recorded in the Kaogong ji as the origin of Chinese science and technology. His commentary on the Kaogong ji, based on previous works but not confined to them, emphasizes its practical purpose, often providing an interpretation superior to others’. For instance, in the arrow-maker passage, Xu’s interpretation of the “yin” and “yang” of the arrow shaft differs from Zheng Xuan’s. It says in the text: “Float the arrow shaft on water to discriminate the side against the sun (yin) from the other side towards the sun (yang).” Zheng Xuan notes that the yang side will float on the water while the yin side will sink beneath the water. Xu’s interpretation is on the contrary of Zheng’s and he, furthermore, proposes that if the yin side is above the yang side when the arrow is shot, the arrow will fly steadily to the target. His practical concern of the making of things, e.g. the making of arrows, is obviously valuable in method. Xu’s commentary, nevertheless, includes some glaring errors; his misreading the sickling weapons, such as the ge halbert, as the thrusting weapons, such as the spear, serves as a negative example.  

84 Xu Guangqi 1983. Shanghai: Shanghai guji chubanshe.
Textology, the dominant academic method throughout the Qing times (A.D.1644-1912), makes *Kaogong ji* scholarship more productive. As a result, dozens of papers and monographs on the *Kaogong ji*, which cover the making of almost every thing recorded in the text, have been left to us. Dai Zhen 戴震 and Cheng Yaotian 程瑤田, eminent scholars in this field, made laborious but judicious efforts at explaining the *Kaogong ji*’s technological concepts and methods. Dai Zhen’s *Kaogong ji tu* 考工記圖 (The Illustrations of the *Kaogong ji*),\(^{85}\) and Cheng Yaotian’s *Kaogong chuangwu xiaoji* 考工創物小記 (Notes on Making Things in the *Kaogong ji*)\(^{86}\) are two very influential works. They are inspiring to both their contemporaries and later generations of scholars.

The *Kaogong ji tu*, including fifty-nine illustrations of things depicted in the *Kaogong ji*, has attracted people’s attention since its publication in 1755. Some of Dai’s ideas, those about the form and place of the dangtu 当兔 in carts and chariot, for instance, have been partially proven by later archaeological discovery.\(^{87}\) Yet the *Kaogong ji tu* is not a work

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\(^{85}\) Dai Zhen 1955. Shanghai: Shangwu yinshuguan.

\(^{86}\) Cheng Yaotian. In *Xuxiu sikuquanshu* 經修四庫全書 (85), Shanghai guji chubanshe 上海古籍出版社 edition 1995, 121-294. (add it into bib.)

\(^{87}\) For Dai Zhen’s illustration of dangtu, see Dai 1955, 32-33. Ruan Yuan, another famous Qing scholar who does a good job in his *Kaogong ji chezhi tujie* 考工記車制圖解 (The Illustration of Making Chariots Depicted in the *Kaogong ji*), also draws the illustration of dangtu, which he thinks should be bonded on the axle with cord or band. For its illustration, see *Kaogong ji chezhi tujie* in *Xuxiu sikuquanshu* 經修四庫全書 (85), Shanghai guji chubanshe 上海古籍出版社 edition 1995, 411. Sun Yirang 孫诒讓, the great Qing scholar who epitomized *Zhouli* study till his time, thinks highly of their illustrations in his *Zhouli zhengyi* 周禮正義. However, modern scholars, such as Japanese scholar 林已奈夫 and Chinese scholars Zhang Changshou 張長壽 and Zhang Xiaoguang 張孝光, throw Dai and Ruan’s illustrations into doubt, based on archaeological information of unearthed Western and Eastern Zhou chariots. For details see “Shuo futu yu huamin 說伏兔與畫 (On the futu and huamin)” by Zhang Changshou and Zhang Xiaoguang in *Kaogu* (4) 1980, 361-4.
without errors; the archaeological information shows that around one third of the illustrations deviate from the actuality of unearthed objects.\footnote{Wen 1991, 130.}

In comparison with the Kaogong ji tu, Cheng Yaotian’s study relies much more on archaeological discovery and his conclusion, as a consequence, seems more solid than Dai’s. For example, he depicts the correct forms of the ge halberd and sword on the basis of those twelve ge halberds and twelve swords of antiquity. He was also the first person who synthesized the set of definitions about angles in the chariot-maker passage and recognized the discrepancy of the definitions of the two qingzhe angles appearing in both the chariot-maker and chimestone-maker passages. Guo Moruo even considers him as one of the predecessors of modern Chinese archaeology.\footnote{Wen 1991, 130.}

To be sure, Cheng Yaotian paid much attention to the objects of antiquity in his study of the Kaogong ji; nonetheless, modern archaeology did not exert significant influence in Chinese academic circles until the first decades of the twentieth century. In comparison to previous scholars, modern scholars have relied tremendously on the prosperity of Chinese archaeology in the scholarship of the Kaogong ji. Such archaeological discoveries as the remnants left by the Shang people at Anyang 安陽 and Hui County 輝縣 of Henan 河南 Province and by the Zhou people in Sui County 隨縣 of Hubei 湖北 Province, shed great light on the study of the forms of vessels and techniques of how to make them recorded in the Kaogong ji. On such greatly improved methodology and combined with the textual study, modern scholars manage to reconstruct certain objects and discuss the ancient craftsmanship in a more scientific way. The
reconstruction of the ancient chariot based on the archaeological information in Liulige 琉璃閣 of Hui County in 1950s and that of the chime-bell set based on the archaeological discovery in the tomb of Marquis Yi of the Zeng State 曾侯乙 in Sui County are among the most famous examples. In short, modern scholars generally concentrate on the scientific and technical research of the *Kaogong ji* in the light of new archaeological data.

Modern scholarship of the *Kaogong ji* covers all subjects related to the text, which are categorized into eighteen fields, e.g. the techniques of making chariots and carts, the technique of bronze smelting, the art of dyeing, the art of decoration, etc., by Wen Renjun in his *Kaogong ji daodu tuyi* 考工記導讀圖譯 (The Illustration and Translation for the Reading of the *Kaogong ji*).\(^{90}\) About one hundred articles published between 1910 and into the 1980s appended to this book also indicate such an academic tendency.\(^{91}\) The main focus of the majority of the articles pertain to the aspects of scientific history, of construction of classical royal cities, and of the techniques of making chariots, weapons, and musical instruments. Furthermore, such a tendency is not confined to Mainland Chinese academic circles but parallels with Japanese and Western scholarship of the *Kaogong ji* as well. In regard to the Japanese scholarship of the *Kaogong ji*, a number of Japanese scholars, such as Harada Yoshito 原田淑人,\(^{92}\) Mizuno Seiichi 水野清一,\(^{93}\)

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92 His article “The Discussion on the Kaogong ji in the Zhouguan (Zhouli) from archaeological perspective” (周官考工記的考古學的檢討) was published in 1936. Also see Wen 1991, 144.
93 His article “On the Bronze Sward made by Taoshi” (桃氏的青銅劍) was published in 1940. Also see Wen 1991, 144.
Komai Kazuchika 駒井和愛, 94 Kondō Mitsuo 近藤光男, 95 Yoshida Mitsukuni 吉田光邦, 96 and Hayashi Minao 林已奈夫, 97 to list a few, have been dedicated for decades to researching the chemical, metallurgical, and manufacturing aspects of the Kaogong ji. Honda Jirō 本田二郎 translated the Zhouli into Japanese and also offered a full annotation of it in the 1970s. 98 As to the Western scholars, Joseph Needham is among the most prolific in Kaogong ji scholarship after Édouard Biot, who translated the Zhouli from Chinese into French in the first half of the 1800s. 99 Generally speaking, Needham treats the Kaogong ji as a compilation of the origin of Chinese craftsmanship and presents this in his voluminous work, the Science and Civilization in China. By contextualizing the content of the Kaogong ji into the history of Chinese science and technology, Needham’s discussions relate to making chariots, carts, weapons, musical instruments and the construction of cities and water projects. With the help of his assistants, Lu Guizhen 魯桂珍 and R.A. Salaman, Needham also translated a few passages of the Kaogong ji from Chinese into English. 100

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94 His article “The Study of the Ge Halberd and Ji Halberd” (戈戟考) was published in 1941. Also see Wen 1991, 144.
95 His Tai Shin no Kōkōkizō ni tsuite 戴震的考工記圖 (On Tai Zhen and His Kaogong ji Tu) was published in 1955. Also see Needham 1965, 638.
96 His Shūrei-Kōkōki no Ikkōsatsu 周禮考工記一覧察 (Notes on Some Aspects of Technology in the “Book of Artificers” of the Zhouli) was published in 1959. Also see Needham 1965, 647.
97 His Chūgōgū Senshin-jīfai no Bashı 中國先秦時代的馬車 (Chariots and Horses in the Shang and Chou periods) and Shūrei-Kōkōki no Shasei 周禮考工記的車制 (Chariot Construction in the Book of Artificers of the Zhouli) were published in 1959. Also see Needham 1965, 637.
100 Two passages of the Kaogong ji have been translated into English by Needham and others: (1) The opening paragraph “guo you liu zhi,” in Science and Civilisation in China, Vol. 4, Part 2, Section 27, 12-13. By Joseph Needham. Cambridge: the Cambridge University Press, 1965. (2) The lun ren, or
Concerning the hypothesis that the *Kaogong ji* is a text mainly about making things, I would say that the academic attention to its scientific and technological aspects is a critical feature of its longtime scholarship. Nonetheless, “making things,” as described in the *Kaogong ji*, has never been an isolated issue confined merely to the field of scientific technology; on the contrary, it always carries and conveys certain meaning within its specific social and cultural context.

A passage in the *Zhouli zhushu* provides the same concern, implying that there should be some information beyond the workmanship offered in the *Kaogong ji* about the importance of making “qi 器 (things)” in ancient times:

Although the *Kaogong ji* is not the *Dongguan* (therefore cannot convey as much as the *Dongguan* does), “Baigong 百工 (one hundred kinds of workers)” is recorded in one of the nine classics and Gonggong 共工 is one of the nine officials. The kings in ancient time always treated making qi as a significant thing, though (underlined by author). We may glimpse parts of the old system and principles by studying them (i.e. the *Kaogong ji*).101

Why did the ancient kings regard making things significant? No doubt the reasons are multifold, among which the consideration that it is to “make the country rich 以富邦國, to support ten thousand people 以養萬民, and to produce one hundred things 以生百物” may be the commonest.102 Nevertheless, besides its material function there is more we should be concerned about, which may be represented in the new interpretation of a stanza of the verse “Zhengmin 燕民” in the *Book of Odes*:

Heaven, in giving birth to the multitudes of the people (天生烝民),
To every faculty and relationship annexed its law (有物有則).
The people possess this normal nature (民之秉彝),
And they [consequently] love its normal virtue (好是懿德).

James Legge’s translation, suggested by Wu Hung is that the result of following an age-old Confucian exegetical tradition initiated by Mencius, may have buried some meaning carried in this stanza that has been reasonably reinterpreted in another way by Liu Jie 劉節. Liu’s main contribution here is his reinterpretation of three key Chinese characters—wu (物), ze (則), and yi (彝), which, respectively, become “inscription” instead of “faculty and relationship,” “totem” instead of “law,” and “ritual vessels” instead of “normal nature.” This convinces Wu Hung to believe that the verse may contain a certain meaning much older than that presented in Confucian exegesis, and further, that “It teaches that when Chinese civilization had just appeared, what supported it were not abstract laws but concrete ritual vessels engraved with images and words; only by treasuring these ritual objects could people ‘appreciate fundamental virtue’.”

Liu’s explanation of the three Chinese characters seems too literal to be accepted unconditionally. Nonetheless, it inspires us to rethink ancient laws of living and governing, which, if stripped from layers of Confucian dresses, were not abstract at all, but portrayed by concrete “things.” Within such a context, “things” were actually “laws,”
and consequently, the “making of things” became the “making of laws.” This is why the ancient kings were so concerned about making things. This is also why we must put the Kaogong ji into such a context if, for any sake, we believe it is an old text depicting certain reality. In this sense, we must cast aside the assumption that, because they have been dealing mainly with technology, the artisans were marginal in the development of law and ideology; on the contrary, they offered them forms.\textsuperscript{107}

More words are needed to explain the qi, translated by me into “things” above, which may be the broadest definition among its various definitions. This ambiguity results not only from the complexity of its connotation and denotation, but from the variety of its constantly changing cultural meaning as well. According to the Han dictionary, \textit{Shouwen jiezi} 說文解字 (Dictionary of Terms and Words), “qi 器 means containers.”\textsuperscript{108} Nonetheless, practically, it denotes much more than “containers,” as Duan Yucai 段玉裁, the prominent Qing scholar and commentator of the \textit{Shuowen jiezi}, points out that “qi 器 is the general term for all manmade objects.” The definition of qi in a certain philosophical sense appears in the \textit{Huangdi neijing} 黃帝內經 (The Yellow Emperor’s Inner Classic), in which it is defined as “all forms that are empty inside and

\textsuperscript{107} This view inevitably links to the social and cultural study of the Kaogong ji, a topic that has not been sufficiently explored in the long history of its scholarship. To be sure, in this area, there are relevant notes and explanations scattered in commentaries spanning almost two thousands years, yet there is hardly anything about the whole picture. Therefore it is not surprising if we encounter only sporadic views in the commentaries.\textsuperscript{107} Even Sun Yirang, the prominent epitomizer of the achievement of the Kaogong ji scholarship in his \textit{Zhouli zhengyi} 周禮正義 (Orthodox Explanations on the Zhouli), only succeeds in producing over-detailed textual criticism. Wen Renjun, who had spent decades in studying the Kaogong ji touches on its cultural and social background when he employs the archaeological information for textual interpretation. However, his emphasis is on scientific and technological matters instead of cultural and social issues. Among western scholars, to the best of my knowledge, only Sven Broman systematically examines the Zhou governmental system recorded in the Zhouli in his \textit{Studies on the Chou Li} (Zhouli). Nevertheless, the Kaogong ji is not the focus of his study.
thus able to contain things.”109 In terms of the context of the *Huangdi neijing*, qi does not point to those “manmade objects” but the human body, which, container as its configuration, contains invisible vital energy. It is in the *Yingjing* (Book of Changes) that the most generalized definition of qi is given, which is that “form is called qi.”110 The following quotations from the *Yijing* and *Liji* may represent the diversity of the meanings of qi:

- Qi are (things) that can be handled and used.111
- (The sages) made qi to present Symbols.112

It is only the qi and the title of a ruler that cannot be granted to others, because these are what enable him to govern. It is by his title that he secures the confidence (of the people); it is these qi that conceal li; it is li that is essential to the practice of righteousness; it is righteousness that contributes to the advantage (of his state); and it is that advantage which secures the quiet of the people. These are the principles of politics.113

What is above Form is called Principle; what is within Form is called qi; what transforms things and fits them together is called Changes; what stimulates them and sets them in motion is called Continuity; what raises them up and sets them forth before all people on earth is called Action. Therefore, with respect to Symbols: the sages were able to see those hidden in all the things under heaven; they provided them with forms to present their manifestations. These are called Symbols.114

Although intricate, these quotations are not leading us to the mystery; on the contrary, they indicate a certain relationship between “things” and “those hidden” in the things, or in other words, the interrelations among qi, symbols, and “politics.” To be sure, a container “contains” its function as a daily used item, meanwhile it may serve as a

110 *Yijing* 83. Shisanjing zhushu edition.
112 *Yijing* 81.
certain symbol of political purpose. However, we cannot relate any daily utensil to specific political power, even though some utensils that do carry certain political connotation imitate the form of the daily-used things and could take on that function.

Take, for example, first, a Liangzhu 良渚 jade axe, which, imitating the shape of a daily-used stone axe but seeming too delicate to be used in daily life, most probably served as a ritual item and a symbol of power. As a second example, a bronze ding 鼎 tripod exclusively serving as a ritual vessel in the ancestral temple of the Western Zhou royal family, so far as its shape and quality are concerned, could no doubt be employed to cook food. Therefore, only those special items distinctive from daily-used utensils could express particular ritual and/or political meanings. Such special qi, for they “conceal li (rite),” represent “righteousness,” “contribute to the advantage” of the state and “secure the quiet of the people,” are called liqi 礼器, ceremonial paraphernalia, “which embody essential ritual codes and political power” and “cannot be granted to others” or sold at market as yongqi 用器 (the daily-used utensils), the other part of the dichotomy of qi.\footnote{115}

The paradox of a liqi both as a symbol, which should be distinguishable to a yongqi, and as a physical utensil, which is the same as a yongqi in typology, implies a separation of liqi from yongqi. When did such a separation happen? A liqi served as the expression of political power usually in the occasion of particular ritual, which generally represented a certain religion; in this sense, religion was or provided the front stage, behind which political power was wielded. Liqi became distinctive, in material, form, or

\footnote{113} Legge 1967 (2), 323-24.  
\footnote{114} Yi\textit{jing} 83. These four quotations are from Wu 1995, 21.  
\footnote{115} The discussion about the liqi and yongqi owes much to Wu Hung. See Wu 1995, 21-23.
decoration, and whatsoever, from the daily-used utensils only when those who held power intended to distinguish themselves from the commoners. Such a special group was portrayed by K.C. Chang as those with “great authority” who “were born into the right clans and (especially) lineages, married the right partners, sat at the central places, were associated with the right myths, behaved in ways deserving popular support, and last but not least had access—at best, exclusive access—to the ancestral wisdom and foresight derived from ritual, art, and writing.”

How could they gain such access? K.C. Chang suggests that the answer was “By controlling a few key resources,” such as bronze, and “by amassing the means to control them.” Overall, liqi, special and costly in comparison with yongqi, expressed and also shaped power in certain historical and social contexts.

Now it is necessary for us to clarify what “power” is. Marx and Foucault’s theories, which have influenced academic circles for decades, may shed light on two intertwined senses of power. Power, in Marxist terms, originating from the control of the means and forces of production, is the expression of the exploitation and oppression by a (ruling) class against another (i.e. the ruled class). Foucault basically discards such a Marxist approach to power in the negative and repressive sense and contends that “Power is not something that is acquired, seized, or shared, something that one holds on to or allows to slip away; power is exercised from innumerable points, in the interplay of nonegalitarian and mobile relations.”

With obvious intention to depoliticize power relations and class

117 Chang 1983, 95.
118 Foucault 1981, 94.
struggles, Foucault attempts to interpret power as a general force instead of the political relations between antagonistic groups or classes in terms defined by Marxism.

M. Benton names the above two senses of power as “power to” and “power over.”

“By power to we refer to power as an integral and recursive element in all aspects of social life. Power over, by contrast, can be specifically related to forms of social control.” To explain it further, “power to” is regarded as “a component of all social interaction and as a feature embedded in all social practices. This power draws upon and creates resources. Viewed at perhaps the most abstract level it can be regarded as a dispositional capability, neither possessed nor exercised or controlled by any particular agent or collectivity, but as a structural feature of social systems, which is only manifested through its effects on individuals, groups and institutions.” Nonetheless, “power over” means from another standpoint “the accomplishment of effects which can only be realised by an agent (individual or collective) through the agency of others.” In other words, “Power over, except in the limiting case of a bound prisoner, always involves a dialectical relationship between the power ‘holder’ and those upon whom power is exercised, as agents always have some resources, mental or material, to resist the exercise of power. Power relationships thus exhibit a dialectical asymmetry and will always be contingent.”

An ancient Chinese dictum that “The principal affairs of the state are sacrifices and military actions,” employed by K.C.Chang to interpret the use of bronze in making ritual

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119 Benton 1981, 176.
120 Miller and tilley 1984, 5.
121 Miller and tilley 1984, 7.
122 Miller and tilley 1984, 7.
vessels and weapons in ancient China, actually relates to these two senses of power—“power to” and “power over.”123 So far as the function of weapons is concerned, the close relationship between weapons and “power over” speaks for itself. Weapons, as violent media, are necessary both for the power “holder” to secure his controlling position and for the power “receiver” to “resist the exercise of power” and therefore change his servile status. Consequently, weapons are not only the tools to secure a political power, but also the means to realize the transition of it. Ritual vessels, by contrast, are in association with “power to,” “which is not necessarily ‘political’ in a strict sense.”124 The power of ritual vessels, beyond its physical possession, results from li, ritual, a whole set of social codes and restrictions, which can only be observed by all social members and can never be possessed by any individual. Likewise, “Ritual vessels were neither functional in a practical sense nor static symbols of social status; they became ‘powerful’ only when they were made and used properly by proper persons for proper purposes at proper times in proper places and in proper ways.”125

To distinguish the two aspects of power, however, does not mean to split them into isolated parts. On the other hand, they were never separated in any specific society. For instance, a jade axe, as a component of a certain set of ritual paraphernalia on certain ritual occasion, though not necessarily exercising its violent function, was a violent insignia and did carry military meaning in that specific milieu. Another example is the legendary Nine Tripods, which has long been the locus classicus in the study of the operation of ancient political power. The following is K.C. Chang’s translation (based on

the translation by James Legge) of the legend of Nine Tripods recorded in the *Chunqiu zuoshi zhuan* (Commentary on the Spring and Autumn Annals by Master Zuo):

In the past when the Hsia (xia) dynasty was distinguished for its virtue, the distant regions put into pictures their distinctive *wu* [物], and the nine pastors sent in the metal of their provinces. The ting-tripods [ding-tripods 鼎] were cast, with representations on them of those *wu* ... Hereby a harmony was secured between the high and the low, and all enjoyed the blessings of Heaven. When the virtue of Chieh [Jie 菽] was all-obscured, the tripods were transferred to Shang, for 600 years. Chou [Zhou 綏] of Shang proved cruel and oppressive, and they were transferred to Chou [Zhou 周]. When the virtue is commendable and brilliant, the tripods, though they were small, would be heavy; then it gives place to its reverse, to darkness and disorder, though they were large, they would be light. Heaven blesses intelligent virtue; —on that its favour rests. King Ch'eng [Cheng 成] fixed the tripods in Chiaju [Jiaru], and divined that the dynasty should extend through 30 reigns, over 700 years. Though the virtue of Chou [Zhou] is decayed, the decree of Heaven is not yet changed. The weight of the tripods may not yet be inquired about.¹²⁶

What is imparted to us in the above story is twofold: on the one hand, as ritual vessels, the Nine Tripods cast in the Xia Dynasty symbolized certain relationship among peoples of different regions and were to some extent the “containers” of power; on the other hand, the change of the owner of the tripods indicated the transition of political power from the Xia to the Shang, then to the Zhou. On this point, the tripods conveyed the political power from one clan to another on the basis of military conquest. In other words, while the transition of the tripods was a result of military force (*power over*), the symbol of the them could not be owned by the new conquerors, because the power the tripods conveyed was from the Heaven and only favored those who had virtue, which represented itself by means of the li, a whole set of ritual codes (*power to*). This is to say, within the context, that a new conqueror could not continue the “blessings of Heaven”

¹²⁴ Wu 1995, 70.
¹²⁵ Wu 1995, 71.
when he deviated from virtue, even though he might still physically retain the symbols. In short, the tripods served as “objects whose acquisition conferred status on the individual either within a particular group or vis-a-vis other groups” and also “act(ed) as the concrete confirmation of acquired power” but all this could be changed.\footnote{Clarke et al. 1985, 4-6.} Viewed from this standing point, the ancient artisans did participate the formation of social and political power because they secured the form of power by their craftsmanship in making weapons and ritual vessels, which functioned as the connection of the two aspects of power—“power over” and “power to.”

Based on the above argument, the study of the *Kaogong ji*, first, turns out to be the examination of the categories of the craftsmanship depicted in the text, as shown in Table 12. Table 12 evolves on the basis of Table 5, in which the 30 artisans recorded in the *Kaogong ji*, as its author does in the beginning passage, are divided into six classes in terms of the materials they worked with, i.e. gongmu zhigong (wood-working workers), consisting of 7 operations, gongjin zhigong (metal-working workers), 6, gongpi zhigong (workers who treat skins and furs), 5, shese zhigong (painting workers), 5, guamo zhigong (polishing and carving workers), 5, and tuanzhi zhigong (workers who model in clay), 2.\footnote{The translation of the terms about the 30 artisans follows Needham. See Needham 1965, 16-17. In addition, the “Zhouren” passage, which is included in the main text but not listed in the beginning passage, is also part of the depiction on how to make a chariot. Therefore, there are 31 names of artisans that appear in Tables 5 and 12.} Table 12, however, unlike Table 5, which is mainly designed to reflect the structure of
the extant *Kaogong ji* text, shows us three other categories that include all of the workmanship of the six classes in terms of their social and cultural meanings. So far as the word counting is concerned, the making of weapons (54%) and ritual vessels (27%) constitute the majority of the text (81%), which corresponds to the political concerns about "making things" in ancient China. Nevertheless, before we discuss the details of each category, we must bear in mind that, within this context, any conclusion based on word counting cannot be considered to exactly capture but only approximates the truth. The reason is multifold—(1) the *Kaogong ji* is probably an incomplete text considering the inconsistencies concerning the number of different artisans recorded in its beginning passage and its main body; (2) the inconsistencies may also suggest some loss of content during its circulation; (3) the "zhouren" passage appearing in the main body of the text but not recorded in the beginning passage implies its being a later addition; (4) the phenomenon that some artisans included in certain category in the beginning passage speak for another or one that can be categorized into none of the six classes strongly indicates that an erroneous entry existed misinput during its arrangement or rearrangement; (5) the assignment of words to different artisans is far from even. For example, the wood workers are only one of the six classes, but the proportion of the total workforce was 61%, as illustrated in Table 7.\(^\text{129}\) With all of the limitations, the text is still our basic data and serves as the only material we can rely on.

There are altogether 36 classes of artisans sorted into three groups working on weapons, ritual vessels, and things for the purpose of daily use, respectively, according to

\(^{129}\) Table 7 shows us what proportions the contents about the six classes of artisans have. If only the word
Table 12. The six other types of artisans recorded in the beginning passage include the
zhouren, two more types of ziren,\textsuperscript{130} two more types of jiangren,\textsuperscript{131} and one more type
of cheren.\textsuperscript{132} The “textile, dyeing, and embroidery workers” actually include two kinds of
artisans—huaren and huiren, according to the beginning passage, but they are merged
together as “huahui zhishi” (things about the huaren and huiren) in the main body of the
text probably for the purpose of later rearrangement between the two specialities.\textsuperscript{133}

Ten kinds of artisans are related to making weapons in Table 12. Take, for instance,
the chariot makers (wheelwrights, chariot body makers, and chariot shaft and axle makers
included)\textsuperscript{134} and the high-alloy founders (arrowhead makers, ge halberd makers, and ji
halberd makers included).\textsuperscript{135} The jieren, appearing in the beginning passage as one of the
counting was regarded, we would have drawn the conclusion that the wood workers are no doubt the main
concern of the text. This is a somewhat misleading impression.

\textsuperscript{130} Three kinds of ziren—chime-bell beam and holder makers, drinking vessel makers, and target makers—
suggests that their work was the making of musical instruments and cups, but he translates the term into
“cabinet makers in valuable woods,” which may be a literal translation based on his understanding of the
word \textit{zi}, a kind of valuable wood. See Needham 1965, 16-7.

\textsuperscript{131} Three kinds of jiangren—surveyers, builders and carpenters, city builders, and hydraulic workers—

\textsuperscript{132} Two kinds of cheren—agricultural implement handle makers and cartwrights—appear in the main body

\textsuperscript{133} It is hard to say why the two kinds of artisans are merged together in the text; the reason could be that
when rearranging the text, the compiler could not recognize what their responsibilities were exactly; or it
could be that the compiler knew the names of the two but could not grasp the words about them, therefore
added relative content to fill up the blank.

\textsuperscript{134} This kind of chariot was obviously used in war on account of its measurement and dimensions being
designed according to the lengths of different weapons. By contrast, the passage about cartwrights mainly
focuses on whether or not a loaded carts could run well; therefore I categorize it into making things for the
purpose of daily use.

\textsuperscript{135} The translation of the “yeshi” follows Needham. See Needham 1965, 16. In the “jinyou liuji” passage,
the “yeshi” is told to be responsible for making “shangji,” opposite to “zhushi,” who is responsible for
making “xiaji.” Due to the fact that the main concern of the “liuji” passage is about the ratios of bronze and
tin in six kinds of alloy, it is suitable to translate qi into “alloy.” Meanwhile, literally, shang and xia mean
“high” and “low,” which may indicate the proportion of bronze in a certain alloy. According to the “liuqi”
passage, the alloy with the ratio (bronze to tin) of 3:1 is suitable to make ge and ji, while that with the ratio
(bronze to tin) of 3:2 is suitable to make xue (knife) and shashi (arrow head). The ratio of 3:2 should be
considered as that of the low alloy because the zhushi (low alloy founders) were responsible for making
knives, while that of 3:1, of the high alloy, with which the yeshi (high alloy founders) dealt. On this point
classes of artisans related to carving, are translated by Needham into arrow makers without any reference. It could otherwise be a printer’s error with their neighboring position to the shiren (arrow makers) in the table considered. Nonetheless, the jieren will bring about no change of the counting result due to the complete loss of the depiction for them. With the proportion more than half in the *Kaogong ji*, the content of workers making weapons obviously weighs much heavier than that of others. Because of the dominant proportion of wood workers over others and the dominant proportion of chariot and bow makers within the category of “wood workers” itself, this result must be examined from another dimension, that is, to examine the proportion of thode about making weapons in the context of each class of artisans, as illustrated in Tables 8-11.

These four tables are designed according to the six classes of artisans recorded in the beginning passage, although there exist some items that belong to certain categories in the beginning passage but speak for another in the main body of the text, as shown in Table 12. Three kinds of weapon makers are listed in Table 8, including the chariot makers (consisting the wheelwrights, the chariot body makers, and the shaft and axle makers), the weapon handle makers, and the bow makers, with an accumulated proportion of 67.4%. The depiction on the making of chariots is the lengthiest among all kinds of artisans recorded in the *Kaogong ji*. It provides not only meticulous information

contradiction arises—the making of arrowheads made from low alloy is the responsibility of the high alloy founders, according to the text. If we accept Needham’s understanding, we will have to attribute the contradiction to later misarrangement of their depiction. About the discussions on the different ratios of bronze to tin in the “liuqi” passage, see “Kaonggong ji liuqi chengfen de yanjiu 考工記六齊成分的研究” by Zhou shimin 周始民, in *Huaxue tongbao 化學通報* 1978 (3), 54-7.

136 Needham 1965, 16.
on the making of every wood part of a chariot, such as their size, position, and requirement of quality, but also states a necessary and reasonable explanation on why they have to be made like that, such as the author does in the part of making a chariot shaft. No line in these passages indicates a concrete military scene in which the chariots played a significant role. But I still add it into the weapon group since the lengths of some standard weapons are the measurements and dimensions for the making of a chariot, as described in the so-called “liudeng zhishu 六等之數” (six proportional numbers). In reality, rather than functioning as vehicles in ancient Chinese weapon kit, the use of chariots were involved in more historical and social rituals during the Shang and Zhou dynasties.

Remnants of Shang chariots unearthed in various archaeological sites picture that a Shang chariot consisted of five major components, i.e. wheels, axle, chariot body, pole, and yoke, and was pulled by two or four horses.\textsuperscript{138} The basic structure of a Western Zhou chariot was almost identical with a Shang chariot, chronologically as the predecessor of the former, as demonstrated by the archaeological remains.\textsuperscript{139} The Zhou people probably knew how to make chariots before their conquest of the Shang, but the perfection of its workmanship would have been achieved by using construction innovations from the Shang after the conquest. But in any case, it seems that the chariots did not bring about any military advantage for the Zhou. What pushed the Zhou clan and its allies ahead into

\textsuperscript{137} Due to the workmanship the dyeing workers (4%) and the ceramic workers (1%) had little direct relationship with weapons and ritual vessels, it is not necessary to make tables for them here. For the proportion of their content in that of the six classes of artisans, see Table 7.

\textsuperscript{138} Chang 1980, 198.
the heartland of the Shang was in actuality their infantry force.\textsuperscript{140} During the Western Zhou period, the numbers of chariots had increased considerably in battles, the ratio of man to chariot sometimes even amounted to 10:1.\textsuperscript{141} Nonetheless, the chariot was still not the key element that could determine a battle. Creel investigates the effect of employing chariots in the battles of the Zhou people against the “barbarians” recorded in the \textit{Zuozhuan} and concludes that the lack of chariots had never been the reason for the barbarians’ defeats.\textsuperscript{142} In these circumstances, why did the chariot still play an important role in the Zhou dynasty?

This must be explained from another aspect indicated by some accounts recorded in the \textit{Zuozhuan}. In the fourth year of Duke Ding 定, several vassals, such as the Duke of Kang and the Duke of Lu, were enfeoffed and bestowed with “precious items.” Among the precious items—chariots, flags, bows, and bronze bells, for instance—they received from the King, chariots were the most noticeable.\textsuperscript{143} Creel gives another example from a bronze inscription recording that once King Mu 穆 (956-918 B.C.), the fifth king of the Zhou after the conquest of the Shang, bestowed an Earl with twelve gifts, among which eleven pertain to the chariot.\textsuperscript{144} Creel correctly suggests that such gifts cannot be merely understood physically and “It appears probable that the King gave to the recipients not

\textsuperscript{139} See fig. 48 that presents the remains of a Shang horse chariot in the \textit{Shang Civilization} by K.C. Chang and fig. 3. 17 that shows Western Zhou chariots in the \textit{Western Chou Civilization} by Choyun Hsu and Katheryn M. Linduff. K.C. Chang 1980, 199; Hsu and Linduff 1988, 84.

\textsuperscript{140} Hsu and Linduff 1988, 85-88; Creel 1970, 284-93.

\textsuperscript{141} Creel 1970, 283.

\textsuperscript{142} Creel 1970, 284. Creel’s presupposition is that the “barbarians” did not use or rarely used chariots in the battles against the Zhou troops. But according to the beginning passage of the \textit{Kaogong ji}, “To say that either making bows or chariots is not a special job in the (nomadic) Hu area does not mean that there is no bow or chariot there, but means that everyone there knows how to make them.” If this saying is right, the effect of using chariots in the battles must be reevaluated.
only these tangible things, but also the right to use such distinctive trappings as he conferred."\(^{145}\) “It seems likely, therefore, that the war chariot of a Western Chou [Zhou] officer was somewhat comparable with the military dress uniform of our day, with its ribbons showing honors that have been conferred.”\(^{146}\) Such largess from the King might have carried more significance than just a common kind of honor. If it is true that the chariot could be bestowed by nobody but the King, as proposed by Creel, we must consider this kind of generosity to be a performative enactment of power, which tinted the bestow and, on the basis of it, the mutual relationship between the King and his vassals, with the color of sort of ritual sense. The chariot, although categorized as a weapon kit, now became a symbol coded in the narrative of social status and showiness of wealth and prestige. With this tendency reached its peak towards the end of the Western Zhou, “Concomitantly the men of power who were vassals of the Chou [Zhou] came to compose an aristocratic class, and developed a code of that class. Their power and wealth increased, and so—aided by polygamy—did their offspring. As the chariot became a preeminent symbol of aristocratic status, every man of pretensions must have his own. And not only the rulers and their relatives but, as commonly happens, their close attendants and even their servants became elevated in status. This elevation must have seemed particularly appropriate for those who were closely associated with that symbol of majesty, the chariot. Thus we find that in the Spring and Autumn period, a yu [駕], a charioteer, is no longer a menial. By that time it appears that all aristocrats rode in

\(^{143}\) Legge 1960 (5), 754.
\(^{144}\) Creel 1970, 281. For the absolute chronology of the reign of King Mu, see Shaughnessy 1991,248-54.
\(^{145}\) Creel 1970, 281.
chariots, and all those who rode in chariots were considered aristocrats."\textsuperscript{147} This phenomenon, by sketching the change of status of the charioteer, portrays vividly how power and wealth radiated with the instrumentality of the chariot during the Zhou periods like spokes extending from the hub to the felloe.

The making of bows is also very well written, relating such details as the choice of raw materials, the preparation of them, the process of operation, the examination of workmanship, the conservation, and the usage. Archaeological data disclose that the bow and arrow have been used as weapons probably from the late paleolithic period.\textsuperscript{148} Most of the archaeological remains of weapons during the Shang time have been found in the chariot burials and the bow is among them.\textsuperscript{149} According to Shi Zhangru 石璋如’s construction of the Shang weapons, cattle sinews and horns had been used in the making of bows by that time, while the various kinds of materials, including stone, bone, antler, shell, and bronze, were employed in the making of arrows.\textsuperscript{150} But like the chariot, the bow carried ritual significance in certain circumstances as well. On this point, the "gongren" passage speaks for itself as we notice towards the end of the text on how to make the bow—the degree of its curve and size, combining the mystery of numerology, are glaringly set up for the purpose of discriminating the users’ status. Textual evidence also shows that the bow was among the items in such important bestowal as happened in the fourth year of Duke Ding, when the Duke Lu was enfeoffed land, people, and

\textsuperscript{146} Creel 1970, 281.
\textsuperscript{147} Creel 1970, 283. About the identification of the status of the charioteer in the beginning Western Zhou dynasty, see Creel 1970, 276-80.
\textsuperscript{149} Chang 1980, 197.
precious things. It was said that those specific gifts included “a great bow from an ancient state,” together with “a grand chariot,” “a flag with a dragon design,” and “six clans of the Yin people.”\textsuperscript{151} In fact, shooting had become both one of the required skills for a gentleman as listed in the Confucian “six arts” and a necessary performance at various ritual occasions. For example, in the \textit{Kaogong ji} we have the example of “shehou 射侯” in “ziren weihou” passage which I will discuss later. Another famous example happened immediately after the defeat of the Shang, when King Wu of the Zhou was welcomed into the capital of the Shang and, standing on his chariot, shot the Shang king Zhou 王, who had committed suicide earlier, and his beloved concubines three times.\textsuperscript{152} Each of the above examples indicates the subtlety of the ritual and political meaning vested in the bow, which concurrently was used widely in military service.

Two kinds of weapon makers are listed in Table 9, including the high alloy founders (consisting of the arrowhead makers, the ge 戈 halberd makers, and the ji 戟 halberd makers) and the sword smiths, with the proportion of 25%.\textsuperscript{153} The form and structure of the ge halberd and ji halberd have been discussed in great length in recent decades.\textsuperscript{154} Generally speaking, scholars have reached the agreement that the ji halberd was a kind of improved weapon both in form and function from the ge halberd, which

\textsuperscript{\textit{150}} See “Xiaotun yindai de chengtao bingqi” by Shi Zhangru, in \textit{Bulletin of the Institute of History and Philology}, Academia Sinica, 1950 (22), 19-84.
\textsuperscript{\textit{151}} Legge 1960 (5), 754.
\textsuperscript{\textit{153}} The summary passage “workers who work on metal” listed in Table 9 with the proportion of 16% is mainly about the alloy with different ratios of bronze to tin. With this passage subtracted, we get 84% of the content on the metal workers participating in the comparison among the three categories in Table 12.
\textsuperscript{\textit{154}} Take, for example, “yeshi wei ge ji kao 治氏為戈戟考” by Cheng Yaotian, “shuo ji 說戟” by Guo Moruo (1954), “ji bian 戟辯” by Hu Zhaochun 胡肇春 (1932), “ge ji yulun 戟戟論” by Guo Baojun.
had been listed in the widely-used weapon set from the Shang dynasty.\textsuperscript{155} The evolution of the ge and ji halberds from the Shang through the Western Zhou to the Spring and Autumn and Warring States periods might have reflected the increasing severity of war. Wen Renjun suggests that the workmanship of metal workers depicted in the \textit{Kaogong ji} represents the development of weapon making towards the end of the Chinese Bronze Time. He assumes that the completion date of the \textit{Kaogong ji} was roughly the same as the time of Marquis Yi of Zeng, which was around the second half of the 5\textsuperscript{th} century B.C.\textsuperscript{156} Meanwhile, he accepts that the ji halberd, as more advanced weapon than the ge halberd, had appeared during the Western Zhou period.\textsuperscript{157} However, from the context of the passages on metal workers, we find no clue to their completed date. The measurements of the ge and ji halberds recorded in the \textit{Kaogong ji} is not identical with those of the unearthed ge and ji halberds during the Warring States period, even though the ratios of the width of its nei\text{[內]} to other parts of the ge halberd seem similar to those recorded in the \textit{Kaogong ji}.\textsuperscript{158}

Moreover, according to the archaeological data, during the Warring States period, the use of iron in the making of weapons and implements had become more extensive than before, as Lei Congyun 雷巖云 points out: “Among all the iron implements found

\textsuperscript{155} The set seems to include arrows, ge halberd, shield, small knife, and sharpening stone, according to Shi Zhangru. See “Xiaotun yindai de chengtao bingqi” by Shi Zhangru, in \textit{Bulletin of the Institute of History and Philology, Academia Sinica}, 1950 (22), 19-84.

\textsuperscript{156} For Wen’s suggestion about the completed date of the passages on metal workers, see Wen 1991, 26. For the date of the time of Marquis Yi of the Zeng state, see Li 1985, 176. According to the inscription on a bronze bo-bell from the tomb, the bell was manufactured in the 56\textsuperscript{th} year of King Hui of the Chu (433 B.C.) and was presented to the Marquis Yi of the Zeng as a gift.

\textsuperscript{157} Wen 1993, 39.
so far, the overwhelming majority of the iron artifacts came from the middle and late Warring States.\textsuperscript{159} Such iron weapons as ji halberd, sword, spear, arrowhead, and armor, along with iron agricultural implements, handicraft implements, everyday utensils, and even the iron objects used for coffin nails and shackles constitute the overwhelming majority of the iron artifacts. Towards the end of the Warring States period, iron items had been pervasive in all the aspects of social life, as shown in the excavated Tomb no. 44 at Xiadu of the Yan State. In addition, “they have disclosed that at the time ironsmiths were able to manufacture high-carbon steel and use the technique of quenching. Steel irons, spears, and ji halberds at this time were no longer rare weapons. The steel and iron weapons found in tomb no. 44 at Yanciadu are often large in size and very powerful…”\textsuperscript{160} This tells us that, if the passages on metal artisans in the \textit{Kaogong ji} were compiled by the middle of the Warring States period for practical purpose, as Wen contends, in any case, the making of iron artifacts should be included in it. The same thing happens with the making of cuirass: no information about iron armor is given, although the making of cuirass is one of the main topics in the text. The absolute absence of information on the making of iron items should not be viewed as intended ignorance (if it had not been lost as some other passages, the “Jieren” and “Kuangren” passages, for instance, during its circulation) but a hint to the characteristics of a certain society that should have dominated in the time before the aggressive expansion of iron.

\textsuperscript{158} “ge ji zhi zai bian” by Guo Dewei 郭德維, in \textit{Kaogu} 1984 (12), 1109-13.
\textsuperscript{159} Li 1985, 323.
\textsuperscript{160} Li 1985, 323-25.
The Cuirass and arrow shaft makers are listed in Tables 10 and Table 11, with the proportion of 39% and 17%, respectively. This tells us that, except in Table 8, the contents concerning making weapons in other tables are not that dominant as shown in Table 12. Nonetheless, the relatively lower proportion on the making of weapons in Tables 9-11 than in Table 8 does not mean a lesser importance in those categories, as we will see after examining the proportion on the making of ritual vessels.

The content related to the making of ritual vessels has a proportion of 27% according to Table 12, a figure that is half of the making of weapons. Can we say, on the basis of these figures, that the making of ritual vessels is less important than the making of weapons? I will examine it by presenting the passages on how to make ritual vessels in the same dimension as we assess the making of weapons, according to Tables 8-11.

Four kinds of workers in Table 8—chime-bell beam and holder makers, target makers, surveyers, builders and carpenters, and city builders—participated in the making of ritual vessels, directly or indirectly, with a proportion of 18%, approximately equal to that on the making of things for the purpose of daily use. It is necessary to add some words here to explain why I classify the four into the category related to the making of ritual vessels. The depiction on the chime-bell beam and holder makers included in the ziren category, which belongs to the class of wood workers, does not provide a clear clue to any kind of woodwork. This passage is probably a part related to the ideas about decoration and carving, or a part of a later addition.\(^\text{161}\) The making of targets described in

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\(^{161}\) Liu Dunyuan 劉敦願 suggests that the “sunju” passage records the theories on decoration and carving in woodwork during the Warring States period, but the only extant chime-bell beam and holder made of wood he cited as an example in his article bears no decoration. Wen Renjun attempts to relate the “sunju” passage to the unearthed chime-beam and holder from the tomb of Marquis yi of the Zeng in Sui county, Hubei, but
the “weihou” passage imparts to us the information about the shooting ritual held in spring by the King. The Chinese name of the special target was hou 侯, vassal; the name of the ritual is shehou 射侯, literally, to shoot at vassals. According to the sacrifice words recorded at the end of the passage, the intention of this ritual was to hold together those vassals who stood up for the King, meanwhile to curse the vassals (by shooting at them symbolically) who ignored the royal court. This passage also reminds us that various targets (hou) were made for different rituals bearing strong political indication. The “surveyers, builders, and carpenters” and “city builders” are two kinds of artisans gathered under the name of jiangren, which belongs to the “wood worker” category according to the beginning passage. I group them into those whose work was related to the making of ritual vessels since they provided the place where the ritual paraphernalia were set up and therefore where the power was exercised. In any case, I will return to this topic later.

In Table 9, two kinds of artisans—chime-bell makers and measure makers—belong to the ritual vessel makers, with the proportion of 56% within the passages on the metal workers. Why is the making of measure (liang) included in the group on how to make ritual vessels? This passage can be divided into three parts, one of which is the inscription describing a central government’s power over its vassals. Within this context, I add this passage into the category on the making of ritual vessels.

they were made of bronze, obviously not out of the hands of wood workers. It seems, for me, to be a passage on the arts of decoration and carving, but not necessarily limited to the making of chime-bell beams and holders. About the discussions on this passage, see “Kaogong ji ‘ziren wei sunju’ tiao suojian diaoke zhuangshi lilun” <<考工記>><<梓人術積>>條所見彰刻裝飾理論 by Liu Dunyan 劉敦願, in Shandong daxue xuebao (shi) <<山東大學學報>>(史)1962 (2), 76-8; Wen 1991, 60; Wen 1993, 76-7.
I consider the drum makers in Table 10 as a kind of ritual vessel artisans in the light of the importance of music in ancient China. According to the Chunguan “Dazongbo,” of the Zhouli, music played a significant role in the rites of serving the ghosts and spirits, harmonizing the multitudinous people, and bringing all the materials to perfection.\textsuperscript{162} Drums, as one of the most ancient musical instruments in China, often appear in ancient literature together with bells, another ancient Chinese musical instrument carrying strong ritual meaning.\textsuperscript{163} Drums and bells are also found among other musical instruments in the ritual chamber of Marquis Yi’s tomb.\textsuperscript{164} Bells, declared by Von Falkenhausen as the “total social facts, …… are items of the cultural inventory whose analysis can illuminate virtually all aspects of ancient Chinese culture. As luxury objects, bells were, above all, items of conspicuous consumption. They were linked to the definition of social rank and to control over human and material resources, and they embodied an intimate linkage with the ideological superstructure and its performative enactment through ritual. Bell-casting was a matter of considerable political importance, and bell-owners probably regarded the music performed on these instrument not merely as aesthetically pleasing but as empowering in a very concrete sense. It is even conceivable that the extramusical functions of bells were rated above their musical ones…….”\textsuperscript{165}

\textsuperscript{162} Zhouli zhengyi 35. Zhonghua shuju edition.
\textsuperscript{163} Take, for example, the song “guanju” in the Book of Odes. In this song, in order to gain favor from a pretty girl he met occasionally, a gentleman designs several settings in his imagination, including “to entertain her with the music performed with drums and chime-bells.” Maoshi zhengyi 6. Shisanjing zhushu edition.
\textsuperscript{164} About the arrangement of musical instruments in the ritual chamber of Marquis Yi’s tomb, see Von Falkenhausen 1993, 36-7.
\textsuperscript{165} Von Falkenhausen 1993, 65-6.
Chime-stones, which bear a similar meaning to drums and bells, have the content of 11% in Table 11. The depiction on the making of jades, with the proportion of 73%, is the main part in the category for carving workers. The content of chime-stone makers and jade makers has the proportion of 90% in this category. Actually, because of the total loss of texts bearing the names of jieren (arrow makers?) and diaoren (carvers), the other three kinds of artisans constitute the “carving workers” working on weapons and ritual vessels.

Now we get the proportions of the content on both making weapons and ritual weapons in Tables 8-11, which are 85.4%, 81%, 62%, and 100%, respectively. We see that the making of weapons and ritual vessels actually are the main topics of the Kaogong ji by going through Tables 8-12 within the two categories on the making of weapons and ritual vessels from two dimensions. The manufacture represented in the text of the Kaogong ji was not based on a market open to the public, but manipulated by a political power located in the compound of military conquest and ritual impact. To explain it further, if the rituals penetrating every corner of social life provided common values for a community and thus functioned to solidify the community as a political entity from inside, the military conquest served from outside as coercive force to maintain such an entity, on the one hand, and as ambitious impetus to expand its political, economic, and cultural effect, on the other. This dichotomous mode of social and political power had been derived from some scattered ritual centers surrounded by many small villages and later on was operated in an urban surrounding where the ruler and his ministers manipulated the resources and products. In ancient Chinese dynasties like the Shang and the Zhou, the rulers accessed the power by controlling a few precious materials and
goods, such as bronze and bronze objects, which, for a long time, represented the advantage of power. The representation of such a mode was actually to clothe the power with a certain form and it was “the craftsman, the artisan, who did not labor in the cultivated fields but in the mines and at forges, looms, and on earthworks” that cast the form for it.\textsuperscript{166}

The creation of his character became the hallmark of the city, which was not the background of the development of craftsmanship, but the matrix that gave birth to the artists of power. The “Jiangren 匠人” passages in the \textit{Kaogongji} provide us with some information about the construction of the King’s city. By interpreting these passages related to other textual and archaeological sources, I am attempting to identify a King’s city where the political and cultural meanings rested. I will also explain how the sacred power (\textit{power to}, to some extent) was encroached by the secular power (\textit{power over}) during the first and second Chinese Urban Revolution.

The content pertaining to city planning is in two passages which begin with “Jiangren jianguo 匠人建國” and “Jiangren yingguo 匠人營國,” respectively.\textsuperscript{167} The former indicates the awareness of how to choose a suitable (and also auspicious) site to lay out a city by employing such techniques and tools as plumb lines and water levels; the latter, by comparison, attracts more attention from scholars as they study the Chinese classical principles on the layout of the capital city. In addition to the King’s city, the “yingguo” passage also provides some information of the cities in the fiefs of the vassals as well as the princes or ministers, although the information is only limited to city walls

\textsuperscript{166} Treistman 1972, 74.

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and the roads around them. No matter whether this pattern had been realized or not, the recorded city planning implies a very strict stratification in the construction of cities of different levels, which is embodied in a descending sizes of the height of walls and the width of roads from the King’s city (wangcheng 王城), through the vassals’ cities (zhouhoucheng 諸侯城), to the princes and ministers’ cities (ducheng 都城). From this aspect, the difference of the three classes of cities reflects a certain differentiation of social status, which is clothed in a subtle atmosphere of complicated rites. For example, according to the record, in the King’s city, the longitudinal road be nine gui 步 wide, while in a vassal’s city, seven gui wide and in a prince or a minister’s city, five. Beyond this scheme there is a principle which is also recorded in the li classics: “the more (the size, number, amount, etc.), the higher the status.” Furthermore, “It is according to the li (ritual) that the number representing a lower status than its immediate antecedent is its antecedent number subtracted by two.” Based on this knowledge, it is not surprising that “li be changed with different numbers in order to keep harmony with diverse reputations and different statuses.” In this context, the numbers contain much more social than mathematical and numerological meanings and become specific symbols in a specific society.

Another important element concerning the cosmo-magical symbolism of the four directions should also be mentioned here regardless of its separation from the “Jiangren” passages. It appears in the “Zhouren weizhou” passage, which seems not to have been

167 For the annotated translation of the two passages, see (5) and (6) of the fourth part of the thesis.
168 “liqi 禮器” in the liji, 455.
169 “Wei Xian zhuan 魏賢傳” in the Hanshu, 3127.
including in the thirty classes of workers according to the opening paragraph of the

*Kaogong ji*.\(^{171}\)

The first four flags, i.e. the flags embroidered with Dragon, Bird, Bear and Tiger as well as Turtle and Snake, are glaringly concordant with the “Four Deities” of four directions (Cerulean Dragon—east, Vermilion Bird—south, White Tiger—west, and Dark Warrior—north), which constitute a system of “microcosmic symbolization of an ancient Chinese town with its square shape and cardinal orientation.”\(^{172}\) In later dynastic city planning, not only some city gates would be named after the symbols of four directions, the symbolism would also exert considerable influence on the geomancers when they chose a city site.\(^{173}\)

The cosmo-magical symbolism in classical Chinese city planning is an attractive topic touched upon by numerous scholars, including Paul Wheatley, Arthur F. Wright, and Mircea Eliade, to name a few. No matter to which length their discussions probe, none of them passes over the related *Kaogong ji* passages. Generally, as Eliade systematized and Wheatley summarized, the basic modes of symbolism manifested in the classical city—especially the capital city—planning include (1) Reality is a function of the Imitation of a Celestial Archetype; (2) The Parallelism between the Macrocosmos and the Microcosmos necessitates the practice of ritual ceremonies to maintain harmony between the world of the gods and the world of men; (3) Reality is achieved through participation in the Symbolism of the Center, as expressed by some form of *axis mundi*;

\(^{170}\) "zhuanggong shiba nian 莊公十八年” in *Zuozhuan*, 278.

\(^{171}\) See the annotated translation, see (2) of the fourth part of the thesis.

\(^{172}\) Chang 1983, 21.

\(^{173}\) Xiong 2000, 50-1.
(4) The techniques of orientation necessary to define sacred territory within the continuum of profane space involve an emphasis on the cardinal compass directions.\textsuperscript{174} Without question, these features are more or less expressed in the \textit{Kaogong ji} passages which have long been the \textit{locus classicus} concerning the cosmology of classical Chinese city planning.

Among the modes of symbolism presented above, the most noteworthy one that is also concordant with the Chinese ideal city planning is the Symbolism of the Center, the symbolism of centripetality. When the Surveyer measured and mapped the movement of the shadow cast by the sun and consulted the result with the movement of the North Pole star, he was not bothering to study the astronomy but (1) to establish the Center of the Earth (\textit{axis mundi}) where the King’s city was to be located; and (2) to set up the cardinal north-south axis, in terms of where the main structures would be constructed.

This “Center of the Earth” may have been functional as proposed by Sima Qian 司馬遷 that a central government located in the middle of its domain could collect the tributes and secure the country easier than in another area, or, unrelated to any practical purpose, merely serves as a symbol as described elsewhere in the \textit{Zhouli}: “Here, where Heaven and Earth are in perfect accord, where the four seasons come together, where the winds and the rains gather, where the forces of yin and yang are harmonized, one builds a royal capital.”\textsuperscript{175} No doubt, in its dual signification the symbolic significance dominates the \textit{axis mundi} with both a religious and a philosophical tint that on this point (center of

\textsuperscript{174} Wheatley 1971, 418.

all) the Heaven, Earth, all phenomena between them as well as Human beings achieve
great harmony and become thoroughly integrated. It seems no ruler was able to resist
such temptation and the Center of the Earth was thus sanctified as to where the sacred
power originated and where the profane power was received. Some epigrammatic
discourses may shed light on this systematization:

The king receives auspices from the High God only when he operates in the center
of the earth.¹⁷⁶

The king must live in the center under the Heaven. This is li.¹⁷⁷

The country should be established in the center under the Heaven, while the palace
be constructed in the middle of the country.¹⁷⁸

These quotations actually provide an ontological comprehension of the capital, the
axis mundi, at which the divine power enters and diffuses throughout the domain. The
King operated in the axis mundi and established li, by means of which the sacred power
could cover the whole kingdom. The Altar of State can be treated in the same way.
Mentioned in the poem “Mian,” the construction of the Altar of State might have a
history as long as that of the Zhou capital city. Its original form was an earth-mount
where sacrifices were contributed to local gods for assuring blessings for the people.
Later on the earth-mount became the point of ontological transition of divine power,
representing the sacredness of the whole state. According to relatively late sources, the
Altar of State also denoted the axis of the world and exhibited the cardinal directions with
different earths of different colors. Wheatley describes it in the following citation:

¹⁷⁶ “Shaogao 召告” in the Shujing, 221.
¹⁷⁷ “Xunzi 荀子,” in Taiping yulan 太平御覽 juan 76; He 1985, 56.
¹⁷⁸ Lushi chunqiu 吕氏春秋; Zhaoming wenxuan 文选, juan 46; He 1985, 56.
At his investiture a noble carried a clod of earth from the side of the sacred altar facing the direction in which his benefice lay to the capital of his territory, where it formed the nucleus of his own altar to the God of the Soil. In this way supernatural power reaching the earth at the sacred axis of the world was diffused to the four quarters through cosmo-magically sanctioned channels, so that the pre-ordained dispositions of symbolic space were maintained and harmony prevailed in the realm.\textsuperscript{179}

The symbolic centripetality is by no means an invention by ancient Chinese, but a universal concept shared by people in other areas, e.g. ancient Rome, Egypt, India, and Cambodia, among others. Nevertheless, the unique expression of the symbolic meaning of the \textit{axis mundi} is also manifested in traditional Chinese city planning, that is, the religious center, like the centrally situated temple of the archetypal South Indian and Southeast Asian city, was replaced in the Chinese realm by the seat of secular authority.\textsuperscript{180} The Northern Wei capital city Luoyang may serve as a due example to illustrate this point. According to W. J. F. Jenner, when Emperor Xiaowen decided to move his capital city from Pingcheng to Luoyang, his major consideration was that Luoyang was the center of the world. However, Emperor Xiaowen saved this auspicious site mainly for his palace city—the center of secular power, while limiting strictly the number of Buddhist temples within the city, although the Northern Wei was notorious for its zealous promotion of Buddhism as the national religion.\textsuperscript{181}

The symbolism of axiality and that of cardinal orientation are among the important characteristics inseparable from that of centripetality. Facing to the south could suggest the accumulated experience of living in the Northern Hemisphere (for more sunshine and warmth) from antiquity; it could also be related to certain cosmological elements

\textsuperscript{179} Wheatley 1971, 435.
\textsuperscript{180} Wheatley 1971, 429-36.
\textsuperscript{181} Jenner, 1981, 52, 69-70.
originating from the later geomantic theory. The position and importance of the polestar must have been realized and symbolized early; endurance, brilliance, and the centripetality viewed from the phenomena that all the other stars rotated around it, among other symbols, may have been gradually arising from observance and awe of nature. So finally, as Erich Issac contends, ancient people saw that the way of pursuing divine power was to replicate on earth a reduced version of the cosmos, that is, to imitate a celestial archetype. So it’s necessary for a city to maintain a parallelism between macrocosmos and microcosmos by the participation of particular rites and the incorporation of suitable symbolism in city planning.\(^{182}\)

The activity of consulting the shadow cast by the movement of the sun in daylight and the direction of the polestar at night to establish the north-south axis when a capital city erected is portrayed in a poem collected in the *Book of Odes*, depicting the construction of a new capital in 658 B.C.:

The Ting-star is in the middle of the sky;  
We begin to build the palaces at Ch’u  
Orienting them by the rays of the sun  
We set to work on the houses at Ch’u  
…….

We take the omens and they are lucky,  
All of them are truly good.\(^{183}\)

This principle of ordering of space represented in the planning of the King’s city emphasizes a main longitudinal thoroughfare which is also the processional axis of the city, usually flanked symmetrically by the most important official or religious structures. In fact, the main north-south-oriented processional axis was of more significance than

\(^{182}\) Wheatley 1971, 416-7.
any avenue running from west to east in a Chinese city. In Handan 邯郸, the capital city of Zhao 趙 in the Warring States period, there were four hung-tu platforms running from north to south, showing early archaeological evidence of the importance of the axis.184

The Four Deities of the four directions represented in the “Zhouren weizhou” passage contain to some extent the macrocosmic and microcosmic symbolism in classical city planning. The parallelism was formed and therefrom, as a rule, was practically observed when the four animals appeared as symbols linking the layout of the capital city on the earth and the stars in the heaven. The mode of such parallelism is as follows:

- Seven stars in the east—Cerulean Dragon—east of the city
- Seven stars in the south—Vermilion Bird—south of the city
- Seven stars in the west—White Tiger—west of the city
- Seven stars in the north—Dark Warrior (a Snake over a Turtle)—north of the city

The connection is apparent between this mode and the squarish or rectangular shape of classical Chinese capitals in terms of such parallelism. Furthermore, archaeological information provides evidence of antiquity in supporting this connection.

In a paper discussing the religious significance in some Neolithic sites, Lei Congyun argues that the animals painted on a certain ceramic vessel unearthed in a site of Hongshan culture may be related to the four beasts of directions.185 If this piece seems a little far-fetched, the remnant of Yangshao culture discovered somewhere in Henan sheds

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184 Wheatley 1971, 425.
more light on this topic: Tomb 45 was laid out from north to south, while the designs of the dragon and tiger formed with mussel shells were on either side, to the east and west, respectively.\textsuperscript{186} The most persuasive evidence is from the mausoleum of Marquis Yi of the Zeng State in the beginning of the Warring States period. The painting in a lacquer cover shows the figures of a Cerulean Dragon and a White Tiger as well as the name of the Twenty-eight Stars surrounding a glaring Chinese character \textit{dou} $\frac{3}{4}$, which means “star.”\textsuperscript{187} The complete design of the four beasts was a squarish pattern carved in a Han tile with the Chinese character signifying “be enduring and enjoying for ever.” K. C. Chang argues that this pattern actually symbolizes the layout of a traditional Chinese capital.\textsuperscript{188}

The Sui-Tang Chang’an was among the traditional Chinese capital cities designed with great intention to give prominence to the symbolic axis and the macro- and microcosmic patterns. With the Dark Warrior Gate in the north, a monastery named Cerulean Dragon in the east, the thoroughfare, Vermilion Bird Street, ran from north to south splitting the whole city into eastern and western parts. The most important palatial and official buildings in the Palace City and Imperial City were arranged strictly flanking the axis. Although the later built Daming Palace was located at the northeastern corner of Chang’an city, it still roughly observed the same principle, sharing a processional axis running parallel with the Vermilion Bird Street.\textsuperscript{189}

\textsuperscript{186} Wen 1993, 31.
\textsuperscript{187} Wen 1993, 31.
\textsuperscript{188} Chang 1983, 20.
\textsuperscript{189} Xiong 2000, 55-107; maps 2.1., 2.2., 3.1., 4.1., 4.2., 5.1.
We will see how the influence of this schematism was apparently extended to later capital city planning, if taking Hangzhou, the Southern Song capital as an example. The change of the city’s name into Lin’ an (“temporarily stay”) as xingzai (temporary abode) indicates the dilemma the Southern rulers faced when they chose Hangzhou as capital. Hangzhou, as a secondary city developed from a fort in the fifth century B.C., was unsuitable to be the capital both in its historical context and topology in the twelfth century. It had never served as a capital city before and the narrowness of the land embittered by the crowdedness of population limited severely the layout of Hangzhou as an imperial city. But the Southern Song rulers were able to make it “like” a capital city in the milieu of congestion and disorder by adding some cosmological elements, e.g. the roughly rectangular walled palace city and the altar of the Heaven and Earth.\(^\text{190}\)

The emphasis of the Ancestral Temple is the third feature contained in these passages. The extreme significance of the location of an ancestral temple in a capital city, viewed from the aspect of the realization of the cosmo-magical symbolism in a city planning, was that the capital city was defined by its ancestral temple. As Zuozhuan asserts: “All walled towns having an ancestral hall containing the tablets of former rulers were called capitals (du); and were called yi if without it.”\(^\text{191}\) Returning to the “Jiangren yingguo” passage, we are called on to behold the importance of the ancestral temple by the details listed in the depiction of Xia, Shang, and Zhou ancestral temples. The poem “Mian” in the Book of Odes describes the construction of the first Zhou temple in the Zhou Plain in the following lines:

\(^{190}\) Wheatley 1971, 423; Wright 1977, 63-6.
Dead straight was the plumb-line.
The planks were lashed to hold the earth;
They made the Hall of Ancestors, very venerable.

They tilted in the earth with a rattling,
They pounded it with a dull thud,
They beat the walls with a loud clang,
They pared and chiseled them with a faint p’ing p’ing.

They raised the outer gate;
The outer gate soared high.
They raised the inner gate;
The inner gate was very strong.192

The relatively lengthy depiction in both the “Jiangren yingguo” passage and the “Mian” focuses on the ancestor hall, in which Ancient Chinese pursued a kind of religious experience by filling the hall with sacred ritual vessels. In the study of the reconstruction of an early Western Zhou temple-place structure, Wu Hung describes a vivid imaginary journey to a typical Three Dynasties temple:

First, we enter the town through gates in tall walls that blocked off the outside. ... The feeling of secrecy gradually increases as we enter the temple yard and penetrate layers of halls leading to the shrine of the founder of the clan, located at the end of the compound. At last, we enter the shrine; in the dim light, numerous shining bronze vessels, decorated with strange images and containing ritual offerings, suddenly loom before us. We find ourselves in a mythical world, the end of our journey where we would encounter the Origin—the shi. The ritual vessels hidden deep inside the temple compound provide us with the means to communicate with the invisible spirits of ancestors—to present offerings and to ascertain their will. This final stage is recorded in the Book of Rites; ... “[All of these] aim to bring down the Supreme God, as well as ancestral deities, from above.”193

192 Wu 1995, 87.
This journey, more spiritual than physical, reveals that the whole monumental complex of a temple, as the carrier of power within its historical and religious context, connected the heaven and the earth, as well as the world of the living and of the dead. In this special context, the ancestral temple became the soul of the capital city, also furnishing the capital in historical, religious, and political terms.

The highest significance of the ancestral temple is both symbolic and functional. To trace the origin and maintain the ancient in the ancestral temple was to sanctify mundane power and thus to secure the continuum of the rule. When such petitions as asking for help in wars, praying for harvest in crops, enfeoffing vassals, and punishing evils and the ceremonies for the achievement of such petitions were held in the ancestor’s hall, they demonstrated the origin of power and legitimized the contemporary rule on the one hand, and enhanced its foundation and function on the other. However, the ancestral temple itself could perpetuate neither the mundane nor spiritual power. Beyond the stratified temples were the ramifying lineages which secured the validity and efficiency of the plastic representation of social power. But the realistic political power could not be determined by kinship alone, either; and it needed mythological and religious sources to back it up. From this aspect, the sources of political power in ancient Chinese society were both material and spiritual, functional and symbolic. Essentially, the towns or cities containing ancestral temples where the clans and lineages seated provided loci to accomplish political power not only by manipulating agricultural and manufacturing products, but by enhancing the religious symbolism as well.\textsuperscript{194}

\textsuperscript{194} Chang 1976, 61-71.
The cosmo-magical features of traditional Chinese city planning manifested in the passages recorded in the text *Kaogong ji* apparently have a history longer than Chinese urban history itself. Those important elements in the system of traditional urbanism, particularly those associated with the manipulation of space, had been adopted from a still earlier period. They might have taken their rise coevally with the human mind and interwoven with the pattern of human thought, which is quite typical in terms of astrobiology.\(^{195}\) In other words, ancient Chinese people believed the “real” world (reason) transcended the pragmatic realm and could be perceived only in terms of an extramundane experience. By means of rites, the diviners sought to establish the link between the sacred and the worldly. In the astrobiological context, disorder could but only be interpreted into inauspiciousness, therefore, to maintain a parallelism between macrocosmos and microcosmos represented the purpose of human beings to establish their own position in this world in their special way which determined symbolism as the mode of their thinking. The way of managing space in traditional Chinese city planning is actually one of the expressions of this kind of symbolism. This tendency was manifested in their effort to pursue the *axis mundi*.

As the epitomization of ancient Chinese urban form, the elements revealed in those *Kaogong ji* passages on city planning can be traced back to the Yangshao and Longshan cultures. The Yangshao culture was a fairly advanced paleotechnic ecotype developed in and around the middle Yellow River Valley, specifically in the vicinities of the confluence of the *Fen* and *Wei* rivers and diffusing eastward to the western edge of

\(^{195}\) Wheatly 1971, 414-16.
Zhouyuan Plain, northward and westward along the valleys leading into central Shanxi and eastern Gansu. Yang-shao settlements took the form of compact, self-contained, economically autonomous villages comprising a number of semi-subterranean dwellings which often grouped around a communal long-house. Some kinds of fertility rites may have been performed. Despite the basic equalitarian character in economy and politics, Yang-shao societies might have been an initial rudimentary form of status difference.

Longshan culture had developed in the nuclear area of He’an, Shanxi and Shaanxi, where the Yang-shao culture had originated and from there it spread through eastern and southeastern China. Longshan villages were on the whole larger than in Yangshao times and were frequently surrounded by permanent ramparts of stamped earth. The relatively permanence of village life in Longshan reflected a change from shifting to permanent cultivation. Evidence suggests that there is a close association between religious activities and status differentiation among Longshan people, which was embodied not only as a hierarchical pattern, but also as an occupational level.

The definition of the earliest Chinese urban form relies on the Zhengzhou excavations, which K. C. Chang systematizes in five stratigraphical phases: Shang-jie phase, Ge-da-wang phase, lower Er-li-gang phase, upper Er-li-gang phase, and Ren-min-gong-yuan phase, from lowest to uppest. The distinctive urban nucleus did not appear until the lower Er-li-gang stratum, followed by two more advanced urban phases. The most impressive feature of this early Shang city is the trace of a massive earthen wall enclosing a rectangular enclave that is presumably to function as a ceremonial place. The general configuration of the settlement includes a ceremonial and administrative focus
with a group of surrounding villages, hamlets, and handicraft workshops. By comparison, Anyang represents a later phase of Shang civilization and a floruit of Shang urbanization. The stamped-earth foundation building, with a thatched roof reconstructed according to the archaeological excavation, indicates the ceremonial and administrative purposes of its structural prototype.

The morphology—a ceremonial and administrative enclave including within it the members of royal lineage, priesthood, a few selected craftsmen, and perhaps, the guards protecting the area surrounded by countryside where peasantry and the majority of artisans lived—of the earliest Chinese urban form expanded to the heartland of Zhengzhou, Luoyang, Anyang, and Huixian, surrounded by the other nexuses that might have been the secondary urban generation as a result of the diffusion of the cultural hearth. This morphology was also a matrix and carrier of social, political, and economical meanings. The early cities and towns were in certain sense the seats of the lineages from central to local levels, hierarchically organized across the state like a pyramid. This mode of organization resonated the patrimonial characteristic of the Shang and early Zhou government, which was simply an extension to political subjects of the ruler’s patriarchal control over his family in a stratified society including the noble, the craftsmen, and the peasantry. Within this framework, the ancient Chinese people were able to develop the ability of ruling the whole territories from a reorganization of the forms of economic
integration, which essence, in fact, was the manipulation and redistribution of surplus products from the dispersed villages to the ceremonial and administrative foci.  

From Yangshao through Longshan culture, to Zhengzhou and Anyang, the Chinese genesis of urbanization experienced the process during which the administrative center evolved from the religious center and the (first) Urban Revolution was initiated. This process, often referred to as the secularization of power, was, in fact, that of the kings and their corporate groups separating politically from the value system of a society based on kinship. As Wheatley states, “With the rise of secular, or rather secularly oriented, authority, there appeared also a new feature in the monumental architecture of the ceremonial city, namely the palace, a building which inevitably became the vehicle for conspicuous display, a distillation and projection of the glory and prestige of the territorially organized state over which the king ruled.”

However, the kinship continued to be the fundamental organizational element in the Shang after lower Er-li-tou phase and the early Zhou, so concomitantly, the ancestral temple, which was the symbol of the kin-structured society, had persisted as the symbolism of power for centuries until the Spring and Autumn and Warring States periods, when the second Urban Revolution happened. These periods witnessed the transition of the kin-based society to an empire controlled by a central government. As a result, the ancestral temple was reduced to a symbol and remnant of the past, ceasing to serve actively as the main vehicle of manipulating both sacred and secular power. Wu

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196 The part about the genesis of Chinese city owes much to Paul Wheatley. For details, see Wheatley 1971, 3-105.
197 Wheatley 1971, 315.
Hung names the second Urban Revolution “from temple to palace” in Chinese art history.\(^{198}\)

If “from temple to palace” is the right depiction of early Chinese urbanization, the intention of emphasizing ancestral temple in the “Jiangren yingguo” passages implies their antiquity. It is in that quotation of an imaginary journey described in Wu Hung’s research that the Zhou capital as a temple-palace compound is confirmed. This temple-and-palace dual concern is attested to in the “Jiangren yingguo” passage.

Some scholars, however, contend that the “Jiangren yingguo” passages could be the result of political propaganda by means of archaism. Among them some hold that it was a forgery of Liuxin for the sake of legitimizing Wang Mang’s usurpation; while according to others, e.g. He Yeju 何業鉞, the compilation of the text was one of the schemes betraying that the conservative Jiang 祁 clan of the Qi attempted to maintain the old system in the struggle with the Tian 田 clan of the Qi. He even goes so far as to argue that this happened in the time of Duke Jing 景 of the Qi.\(^{199}\) It could be so, although the evidence he provides by no means necessarily supports his conclusion. My opinion is that only when putting the passages into the specific historical and cultural context and providing reinterpretation about them, can we surpass those unstable suspicions based on hackneyed presupposition. In the following paragraphs I will compare the “Jiangren yingguo” passages of the Kaogong ji with the probable typical ideas on city planning

\(^{198}\) Wu 1995, 88-110.  
\(^{199}\) He 1987, 178-80.
prevailing in the period of transition, i.e. the second Chinese Urban Revolution during the Spring and Autumn and the Warring States periods.

Concomitant with the second Chinese Urban Revolution was not only the wider entrenchment between the “temple” and the “palace,” but the chaos among the “palaces” which had been fighting with one another for more political power and space. This determined the emphasis of most states (i.e. previous vassals of the Zhou power) on agriculture and warfare (nong zhan), the pragmatic concerns that were also demonstrated in the layout of their cities and towns. In the *Shangjun shu* (Book of the Lord Shang), Lord Yang 鞏 holds that the number and distribution of cities and towns should be associated with the natural resources, such as the topological and agricultural elements. The *Guanzi* (Book of Master Guan) confirms this idea and furthermore, raises the dialectical explanation between cities and the sources, between agriculture and warfare. Based on this knowledge, the author of the *Guanzi* opposes the stiff formalism that demands the strict regularity in city planning and argues that people should instead pay more attention to the economic function of a city. For example, he proposes that in order to improve the efficiency of administration production, “officials be settled near the palace, while non-officials and farmers near the city gates and workers and businessmen near the markets.”

The *Mozi* (Book of Master Mo) has much concern about the safety of a city and, in it, the author summaries twelve patterns of attacks on cities. To cope with these attacks, he suggests that when a city is to be built, the topology should be

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200 Wu Liangyong 1985, 5-7.
the primary concern and the dimensions of the city be suited to the size of its population and the capacity of its economy.\textsuperscript{201}

The major difference of the ideas on city planning among the \textit{Kaogong ji} and \textit{Shangjun shu, Guanzi, and Mozi} is not their purpose in terms of power but their way of how to realize this power. In other words, the expression of power in the \textit{Kaogong ji} is ritualized and symbolized, while in the \textit{Shangjun shu, Guanzi, and Mozi}, it is more practical and pragmatic. Nevertheless, even their different ways are not absolutely demarcated but actually maintain a certain continuum throughout the Chinese Urban Revolution, that is, both religious elements and profane ways were employed in pursuing the power based on a central government rather than kinship. The dissimilarity among them is a topic of extent rather than of contradiction. For instance, in the "Dudi pian" of the \textit{Guanzi}, the author also holds to the cosmo-magical \textit{axis mundi}, which is the main principle in the construction of the King’s city depicted in the \textit{Kaogong ji}, suggesting that “the Son of Heaven should operate in the middle of the earth.” The layout of the King’s city, according to the \textit{Kaogong ji}, though mainly emphasizing the ritual and symbolic meanings of the city, considers some pragmatic elements—the establishment of the market, for instance—as well. Within this context, I argue that the “Jiangren yingguo” passage was on the basis of the Western Zhou urbanization, earlier than the Spring and Autumn and Warring periods, the boom of the second Urban Revolution.

I would not totally equate the sacred power and secular power as \textit{power to} and \textit{power over}, nor vice versa. But we have to admit that the purpose of both the first and the

\textsuperscript{201} Wu Liangyong 1985, 6-7.
second Urban Revolutions was to gain more and more independence of the “palace” (the secular power) from the “temple” (the sacred power), and, as a result, the power over became more and more dominant within and among the states. This indicates again that the two aspects of power are not strictly separated from each other but interchangeable to some extent. The secularization of the sacred power that was based on kinship and rites during the first and second Urban Revolutions meant, in fact, the encroachment of power to by power over. On this point, the seeming decentralization of the Zhou royal power was actually the victory of the power over over power to, that is, the replacement of the old structure of power (which basis was power to) by the new structure of power (which basis was power over). If my argument that the “Jiangren yingguo” passages represent the ideas of the first Chinese Urban Revolution contains some truth, the bottom line, then, is that the two aspects of power were still in a long process of compromise. A new path would not be broken until the second Urban Revolution. Also for this reason, I categorize city construction into the group on the making of ritual vessels.

To summarize this chapter, I would argue, based on the understanding of the extant Kaogong ji passages in its cultural and social context, that the content of the Kaogong ji reflects a society prior to the Warring States period. It was a period when the ritual power still dominated the structure of power, when the making and use of iron vessels, objects, and weapons could be ignored in significance, and when the principles represented in the construction of the King’s city were on the basis of ritual rather than political power. However, it was by no means a society in which the “power over” was overlooked. Actually the depiction of the making of ritual items and weapons constitutes the majority
of the *Kaogong ji*. This characteristic of the text, to a certain extent, indicates that the period when the *Kaogong ji* was compiled was a time of transition, that is, the secularization of the sacred power that was based on kinship and rites.
CHAPTER FOUR

THE ANNOTATED TRANSLATION OF THE SELECTED PASSAGES IN THE KAOGONG JI

(1) The Beginning Passage

There are six classes of workers\(^{202}\) in a state and the hundred artisans\(^{203}\) are in one of them. (The following are the six classes of workers: The work of) some of them is (just) to sit down and discuss the way (to govern a country); (The work of another) group is to operate and carry out the way; (The work of the third) group is to examine the curvature and the quality (of the raw material to judge if they are useful) in order to prepare the Five Stuffs\(^{204}\) and help people distinguish the (varieties of) utensils; (The work of the fourth) group is to circulate goods (, especially those) rare and unusual to make a profit; (The work of the fifth) group is to work hard to develop products from the earth; (The work of the six) group is to work with silk and helm and make things from them.

Those who sit down to discuss the way are princes and lords. Those who operate and carry out the way are gentlemen and officials. Those who examine the curvature and quality (of the raw materials to judge if they are useful) in order to prepare the Five Stuff

\(^{202}\) Six classes of workers, the literally translation of “liuzhi 六職,” are different from the six kinds of officials in the Zhouli. For the six kinds of officials in the Zhouli, see Table 3.

\(^{203}\) The literal translation of “baigong 百工,” which is translated into “hundreds of craftworkers” in the Western Chou Civilization by Cho-yun Hsu and Katheryn M. Linduff, following Shirakawa Shizuka. See Hsu and Linduff 1988,231; Shirakawa Shizuka 1962-77 (23), 103-06.

\(^{204}\) According to Zheng Xuan, the Five Stuff 五材 includes metal (or bronze), wood, skin, jade, and earth within the context of the Kaogong ji; but some scholars interpret them into Five Elements 五行: metal, wood, water, fire, and earth. See Wen 1993, 7; Zhouli zhushu, 267.
and (make and) help people distinguish the (varieties of) utensils are the hundred artisans. Those who circulate goods (especially those) rare and unusual to make a profit are merchants. Those who work hard to develop products from the earth are framers. Those who work on silk and helm and make things form them are working women.

Making hoes is not a special kind of job in the Yue area;\textsuperscript{205} Making armors is not a special kind of job in the Yan area;\textsuperscript{206} Making pikestaffs is not a special kind of job in the Qin area;\textsuperscript{207} Making bows or making chariots is not a special kind of job in the (nomadic) Hu area.\textsuperscript{208} To say that making hoes is not a special job in the Yue area does not mean that there is no hoe there, but that everyone there knows how to make it; To say that making armors is not a special job in the Yan area does not mean that there is no armor there, but rather, that everyone there knows how to make it; To say that making a pikestaff is not a special job in the Qin area does not mean that there is no pikestaff there, but that everyone there knows how to make it; To say that either making bows or chariots

\textsuperscript{205} Yue 岳 is the name of a state located in present-day Zhejiang 浙江 province during the Spring and Autumn and Warring States periods. For archaeological information about this area, see Hsu and Linduff 1988, 220-21.

\textsuperscript{206} Yan 燕, located in present-day northern Hebei 河北 Province and western Liaoning 遼寧 Province, was one of the first feudal states enfeoffed at the beginning of the Western Zhou period. It used to be one of the Seven Hegemonies during the Warring States period 戰國七雄.

\textsuperscript{207} Qin 秦, located in the middle of present-day Shaanxi 陝西 Province and the west of today’s Gansu 甘肅 Province, was enfeoffed as a feudal state in the time of King Ping of the Zhou 周平王 (r. 770-720 B.C.). In the year of 221 B.C., Ying Zheng 馮政, the king of the Qin, reunited China and called himself “the first emperor 始皇帝.”

\textsuperscript{208} Hu 胡 was the general designation of nomadic nations in the north and northwest of ancient China. The specific location of the hu area(s) has been a controversial issue among scholars for a long time. See the Rizhilu日知錄 (Records of Everyday Knowledge) juan 卷 32 by Gu Yanwu 顧炎武; Wen 1993, 9; “Kaogong ji chengshu niandai xinkao 考工記成書年代新考 (A New Study of the Completed Date of the Kaogong ji as a Book)” by Wen Renjun. In Kaogong ji yizhu 考工記譯著 (A Annotated translation of the Kaogong ji (into Modern Chinese)) by Wen Renjun. Shanghai: Shanghai guji chubanshe 1993, 144-53; Hsu and Linduff 1988, 36-7.
is not a special job in the (nomadic) Hu area does not mean that there is no bow or chariot there, but that everyone there knows how to make them.

Those who are wise invent (how to make) things; Those who are skillful (learn such knowledge from the wise men,) maintain it and initiate it from generation to generation and are (also) called artisans. So what the hundred artisans undertake can all be traced back to the wise men’s invention. Melting metal to make knives, hardening earth to make utensils, making chariots for traveling on land and boats for going through water: these are all (the examples of) the sages’ invention.

The heaven has its (rhythm of) time; the earth has its (local influence of) qi; (different) materials have (different) qualities; particular artisans have special skills. (Only when) the above four are fused together (and match each other perfectly), could products of high quality result. (Given that) the materials are good and the artisans are skillful, the reasons that products of high quality are not made can only be explained that (, when the work is carried out,) either the time is not suitable, or the local qi is not adequate (, or both).

Take, for example, the (delicious) orange (ju) tree (growing south of the Huai River), which could only grow dry and bitter fruit (zhi) if planted north of the Huai River; the crested mynahs (quyu), which would never cross the Ji River (to the

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209 “Qi 氣,” alleged to produce and exist within everything, was an ancient “scientific” and philosophical conception later borrowed by both Daoism and Confucianism. It was regarded as the essence of life and was used to explain the existence of the heaven and the earth and the “ten thousand things” between them. It is related to another pair of concepts—Yin 陰 and Yang 陽—which scholars generally hold, appeared during the Spring and Autumn and the Warring States periods. Also see Wen 1993, 10.

210 The Chinese orange ju 橘 tree, or “citrus reticulata deliciosa,” has long been grown in south of the Huai River (which is generally considered as both the geographical and the climatic dividing line of the north and south) in China mainly because of of the subtropical climate in that area. The zhi 枝, or “poncirus
and the badgers (he), which would die if passing the Wen River (to the south). These are caused by (different nature of) local qi. Take, as (other) examples, the knives made in the Zheng area, the axes made in the Song area, the penknife made in the Lu area, and the swords made in the areas of Wu and Yue, all of which could not be made of good quality out of their locality. These are (also) caused by (different nature of) local qi.

trifoliata,” tree, usually growing in the north of China, looks similar to the ju tree, but its fruit is much smaller than the orange and is not edible. Ancient Chinese people thought the zhi tree was the degeneration of the ju tree when the latter was moved and planted in the north.

The Ji River 济水 rises from the the West Wangwu 西王屋 mountain, which is north of the Yellow River; on the other side of the confluence of the Ji River flowing into the Yellow River, there is a branch, which had been thought to be the lower reaches of the Ji River, of the Yellow River flowing eastward to the sea.

Some scholars suggest that “Wen 汶” is the Large Wen River (Da Wenshui 大汶水) in the north of Shandong 山东 Province, while some others contend that it means the Yangzi River (Wenjiang 江). Generally speaking, those, Guo Moruo, for instance, who argue that the Kaogong ji was an official book compiled in the Qi state hold the former idea.

The Zheng 郑 State, located in the east of the present-day Hu 菏 County of Shaanxi, began with Duke Huan 桓公 of the Zheng from 806 B.C. and was one of the most powerful states during the beginning of the Spring and Autumn period. The Han 鞍 State annexed the whole territory in 375 B.C.

After the conquest of the Shang, Duke of Zhou enfeoffed Wei Ziqi 徽子啓, one of King Zhou 納王’s brothers, in Song 宋 area, including parts of present-day Henan, Shandong, Jiangsu 江蘇, and Anhui 安徽. It was destroyed by the Qi State in 286 B.C.

The Lu 魯 State, located in the southwest of present-day Shandong, with Qufu 齐阜 as its capital, was one of the earliest feudal states established at the beginning of the Western Zhou dynasty. It was annexed to the Chou 楚 State in 256 B.C.

The Wu 吳 State, allegedly established by King Wen’s father Jili 季里’s two brothers—Taibo 太伯 and Zhongyong 仲雍, included parts of today’s Jiangsu, Shanghai, Anhui, and Zhejiang, according to the Shiji. Cho-yun Hsu suspects that sending Zhou’s two princes to the Wu area, which was a marginal area at that time, was probably part of Zhou’s strategy of the conquest of the Shang. But some scholars, e.g. Qi Sihe 齊思和, throw this legend into doubt by questioning the lack of the descendants of the Ji 周 clan governing the Wu area in Chinese history. Another scholar, Hu Qianying 胡謙盈, suggests that the Wu State was actually established in the north first, and then moved to the southeast after Zhou’s conquest of the Shang. It was annexed to the Yue State in 473 B.C. See Hsu and Linduff 1988, 88-90; Qi 1940. “Yan Wu fei Zhou fengguo shuo 燕吴非周封國說 (An argument That the Yan and Wu States Were not Enfeoffed in the Zhou).” In Yanjing xuebao 燕京學報 1940 (28), 175-96.; Hu 1982, “JiZhou Taoli yanjiu 燕周陶器研究 (A Study on the Ceramic Li Vessels in the JiZhou).” In Kaogu yu wenwu 考古與文物 1982 (1), 69-73.
The cattle horns from the Yan area, the Zhe wood (that is best for making bows) from the Jing area,\(^\text{217}\) the arrow-wood from the Fenhu area,\(^\text{218}\) and the copper and tin from the Wu and Yue areas are all the raw materials of good quality. The heaven has its time to produce and destroy; plants and trees have their time to grow and wither; stone has its time to crumble; water has its time to condense, freeze, and rain: these are all the results caused by the time of the heaven.

Generally speaking, wood working consists of seven operations; metal working, six; the work dealing with skin and fur, five; painting, five; scraping and polishing, five; modeling in clay, two. Wood work comprises the making of wheels, chariot bodies, bows, pikestaffs, construction of houses, the making of carts, and the making of containers and targets, etc.\(^\text{219}\) Metal work includes forging, melting, making of bells, measures of capacity and bronze vessels, the making of agricultural implements, and that

\(^{217}\) The Jing 襄 area, according to the “Yugong 禹贡 (Yu tributes)” in the Book of Documents, includes the area from the Jing (in the north) to Hengyang 衡陽 (in the south); according to the “Shidi 釋地 (Interpret the Names on Earth)” in the Erya 禹雅, the area in the south of the Han 漢 River is called Jing. Generally speaking, it includes the area between the Jing mountain, which is in the west of Nanzhang 南漳 in Hubei 湖北 Province, and the Heng 衡 mountain, which is in the northwest of present-day Heng mountain. This area was in the Chu territory during the Spring and Autumn and the Warring States periods.

\(^{218}\) Fenhu 汾胡 was an ancient geographical name, about which location historians have not yet reached an agreement. Zheng Xuan notes that it was geographically beside the Chu State, that is, in the northwest of present-day Fuyang 阜陽 of Anhui Province. During the Tang dynasty it was thought to be in Yancheng 濟城 of Henan. The Qing scholar Yu Yue regards it as the name of one of the “barbarian” countries located to the west of China. Yu Chang 于鬯, in his Xiangcao jiaoshu, contends that Fen and Hu were probably the names of two “barbarian” countries in the northwest. Guo Moruo suggests that Fenhu was actually in the Jin 襄 territory during the Zhou periods. Based on textual evidence, Wen Renjun argues that Fenhu was in the middle reaches of the Fen River, which is in present-day Shaanxi Province. See Zheng Xuan Zhouli zhushu, 268; Sun Yirang Zhourli zhengyi, juan 74; Yu Chang Xiangcao jiaoshu, juan 23; Guo Moruo, "Kaogong ji de niandai yu guobie;" Wen 1993, 11.

\(^{219}\) Ziren 柴人, according to Biot and Needham, were responsible for working on expensive wood. However, in the main text of the Kaogong ji, no record proves such an argument; rather, they were artisans who made containers and targets, etc., as Jia Gongyan 賈公彥 comments in the Zhourli zhushu. See Needham 1965, 13; Zhourli zhushu, 268.
of swords. The work dealing with skin and fur contains drying, hide-armor making, the making of drums, leathers, and furs. The work of painting includes embroidery in single or multiple colors, dyeing feathers, making of basketry, and cleaning silk. The work of scraping and polishing covers the jade work, sculpting, arrow making, and the making of chime-stones. The work of modeling clay comprises the arts of potter and that of tile-molder.²²⁰

The time during the reign of Shun (or Youyushi) is known for its art of potter,²²¹ The time during the reign of Yu (or Xiahoushi) is famous for its (large-scale) construction of water-control projects, palaces and houses;²²² The achievement in making musical instruments can be seen as the hallmark of the Yin Dynasty;²²³ While in the Zhou Dynasty, making chariots was the most estimable work.

In general, what needs more kinds of artisans (than others) to cooperate in the process of construction is the making of chariots. The chariot has six proportional

²²⁰ Altogether there are thirty kinds of artisans referred to in this passage, while the “Zhouren 輯人” passage in the main body is not mentioned here. Based on this, some scholars argue that this passage should have been written in the very beginning when the Kaogong ji was composed. While the “Zhuren” passage is considered to be added after the Kaogong ji had been completed, the records on some artisans that are mentioned in the beginning but do not appear in the main body of the text are thought to have been lost during its circulation. For the details, see Table 5. In addition, among the thirty artisans, some are called “...ren 人,” while others are called “...shi 氏,” which are considered by Zheng Xuan as different titles for different classes of officials. Nevertheless, they do not have to mean that in the concrete context of the Kaogong ji. For my argument, see the second part of the thesis.
²²¹ Youyushi 有虞氏 was the name of an ancient clan, the head of which, Shun 舜, succeeded Yao 堯 as one of the “Five Emperors,” according to legendary history. See Shiji, 21-24. Shanghai guji edition 1993.
²²² Xiahoushi 夏后氏 was the name of an ancient clan, the head of which, Yu 禹, succeeded Shun to be the “emperor” because of his superior merit in constructing water projects, according to legendary history. See Shiji, 29-30. Shanghai guji edition.
²²³ Following Zheng Xuan and Jia Gongyan, I translate “zi” into “musical instruments.” The making of musical instruments was important in the Shang because Tang, the founding father of the Shang, wanted to restore the function of music in governing a country, which had been ruined by the last King of the Xia dynasty, according to the interpretation in the Zhouli zhushu. Lin Yin 林尹’s interpretation follows the Zhouli zhushu. From this aspect, the “Ziren” do not have to be categorized into the group of artisans who
numbers (of different parts and should be observed when being built). The (distance between the) back traverse of the chariot (and the road) is four chi (Chinese foot)$^{224}$, which is the first proportional number.$^{225}$ The height of the ge halberd with its handle is six chi and six cun,$^{226}$ which, when placed obliquely (in the chariot), will be four chi high above the back traverse. This is the second proportional number. The person (standing in the chariot) is eight chi tall, which exceeds the top of the ge halberd by four chi. This is the third proportional number. The height of the shu combat baton is equal to one xun and four chi, which exceeds the head of the man four chi in length.$^{227}$ This is the fourth proportional number. The height of the ji halberd is one chang, which exceeds the top of the shu combat baton by four chi. This is the fifth proportional number.$^{228}$ The height of the qiu spear is equal to one chang and four chi, which exceeds the top of the qiu spear by four chi in length. This is the sixth proportional number. To make the chariot, there are six proportional numbers (that should be observed).$^{229}$

Generally speaking, the way of examining (whether or not) the chariot (can work well) starts with (examining) the parts of the chariot which contact the ground. (These

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$^{224}$ Chi has different standards in this context. Take, for example, 1 Zhou chi, which equals about 23.1 cm; 1 Chu chi, which equals about 22.5 cm; 1 Qi chi, which equals about 19.7 cm. See Wen 1993, 14; Shi 1998, "Kaogong ji de laiyou ji jiangren yingguo de neirong <<考工記>>的來由及<<匠人營國>>的內容 (The Originality of the Kaogong ji and the Content of the “Jiangren yingguo” Passage)" in Chuantong wenhua yu xiandaihua 傳統文化與現代化 (The Traditional Culture and Modernization), 1998 (3), 46-56. Beijing.

$^{225}$ “Four feet” here is not the length of the traverse, as Biot translates. According to Zhouli zhushu, the "zi" means the height between the traverse and the ground. Considering that all of the proportional numbers are in the vertical sense, I prefer the latter. See Biot 1975, 463. Zhouli zhushu, 269; Lin 1997, 423; Wen 1991, 225; 1993, 13.

$^{226}$ 10 cun equal 1 chi.

$^{227}$ 1 xun equals 8 chi.

$^{228}$ 1 chang equals 2 xun, i.e. 16 chi.
parts are the wheels,) consequently, to examine the chariot is to examine the wheels first. According to the principles of examining the chariot, the best wheel should be built solid, with all the pieces fixed perfectly and the portion contacting the ground minimized. If the pieces are not fixed well, then the wheel is not solid, consequently, it cannot run a long time. If the portion contacting the ground is not minimized, then the chariot cannot obtain a high speed. If the wheels are built too high, then the man cannot get on (easily); (on the other hand,) if the wheels are too low, then the horses (will be worn out soon as if they) are always climbing hills. (Based on this knowledge,) the (diameter of the) wheels of the war chariot is six chi and six cun long; the (diameter of the) wheels of the hunting chariot is six chi and three cun long; the (diameter of the wheels) of the four-horse-drawing chariot is six chi and six cun long.\textsuperscript{230} With the wheels six chi and six cun high, the axle of each of the wheels is three chi and three cun high above the ground. Added the thickness of the frame and square wood between the frame and the axis, the bottom of the chariot body is four chi high above the ground. (Suppose) the man (who is using the chariot) is eight chi tall; then the above design is quite convenient for him to get on and off the chariot.

(2) Ancient Chinese Cosmological Information Coded in the “Zhouren” Passage

\textsuperscript{229} The six proportional numbers, because of their measures and dimensions in a military sense, indicate that the vehicle with such numbers is a chariot, not a cart, which was used in battle. \textsuperscript{230} According to this knowledge, the height of the wheels depends on the height of the horses that will pull the vehicle. We can see from these sentences that the horses that pull the chariot are the tallest and strongest kind among the three kinds of vehicles.
The squarishness of the frame of the chariot body is the symbol of the earth, while the circularity of a chariot cover symbolizes the heaven;\textsuperscript{231} The thirty spokes constituting a wheel indicate the thirty days of a month;\textsuperscript{232} twenty-eight cover ribs, twenty-eight stars.\textsuperscript{233} The Dragon Flag with nine tufts stands for the Dahuo stars;\textsuperscript{234} the Bird Flag with

\textsuperscript{231} Scholars, such as Wen Renjun, suggest that this indicates a kind of ancient Chinese cosmology—Gaitian shuo 蓋天說 (The Theory of the Umbrella[like] Heaven), which is recorded in the \textit{Zhoubi suanjing 周髀算經} (The Zhou Gomon and the Mathematical Classic), a varied collection mainly concerning subjects of calendar and the Gaitian Theory. As it states, “Square is the form of the earth, while circle is the form of the sky; they sky is circular and the earth is squarish.” A similar idea is also recorded in the “Tianwenzhi 天文志” of the \textit{Jinshu 隋書} (Book of the Jin)—“The sky is circular like a a cover, while the earth is squarish as a chessboard.” The final compilation of the \textit{Zhoubi suanjing} was likely between 50 B.C. and A.D. 100, but the “Gaitian” Theory might have formed long before that. See Wen 1993, 30; Cullen, 1993. “\textit{Zhou pi suan ching 周髀算經}.” In \textit{Early Chinese Texts: A Bibliographical Guide} by Loewe, Michael ed. The Society for the Study of Early China and the Institute of East Studies, University of California, Berkeley: Birdtrack Press 1993, 33-38.

\textsuperscript{232} According to archaeological information, some of the Shang chariots had wheels with twenty-six spokes; some of the chariots in the Spring and Autumn period had wheels with twenty-eight spokes; while in the middle of the Warring States period, most of the chariots had wheels with twenty-six spokes. The chariots with wheels including thirty spokes appear in some unearthed Qin tombs. The author of the \textit{Laozi}, which was probably a book compiled in the third century, according to Gu Jiegang and D.C. Lau, mentions that “thirty spokes share a axle.” It could be the representative of pre-Qin cosomology but could also be the result of synthesization by Han Confucians. See Wen 1993, 30; Boltz 1993 (1), “\textit{Laotzu Tao te ching 老子道德經}.” In \textit{Early Chinese Texts: A Bibliographical Guide} by Loewe, Michael ed. The Society for the Study of Early China and the Institute of East Studies, University of California, Berkeley: Birdtrack Press 1993, 269-92.

\textsuperscript{233} In order to observe the running of the stars, the pre-Qin astronomers divided the sky into twenty-eight zones, each zone having a representative star as its signal, therefore there were altogether twenty-eight such stars (ershiba xiu 二十八宿, Twenty-eight Lodges). The idea of Twenty-eight Stars appeared not only in ancient China, but in ancient India and Arabia as well. But many an astronomer holds that ancient China was its originality. The names of the Twenty-eight Stars were painted on a the cover of a lacquered box unearthed from the tomb of Marquis Yi of the Zeng State dated in the beginning of the Warring States period. Nonetheless, archaeological information indicates its much earlier originality than the Warring State period. The Twenty-eight Stars were divided into four groups according to the four directions, with seven stars included in each group. The names of the stars in each group changed from time to time in the last several thousand years. Generally speaking, the names of the Twenty-eight Stars are as the following: the Cerulean Dragon in the East, including seven stars: jiao, kang, di, fang, xin, wei, ji; the White Tiger in the West, including seven stars: kui, lou, wei, mao, bi, zi, can; the Dark Warrior in the North, including dou, niu, xu, wei, shi, bi; the vermilion Bird in the South, including jing, gui, liu, xing, zhang, yi, zhen. See Wen 1993, 30-31; Puyangshi wenwu guanli weiyuahui 濮陽市文物管理局委員會等 et al 1988. “Henan Puyang Xishuipo yizhi fajue baogao 河南濮陽西水坡遺址發掘報告 (The excavation report of a remnant at Xishuipo, Puyang, Henan).” In \textit{Wenwu}, 1988 (3).

\textsuperscript{234} Zheng Xuan argues that the Dahuo Stars include the nine stars around the Xin Star; but Wang Jianmin 王健民 contends that the Dahuo Stars were exclusively the Xin Stars of the Cerulean Dragon in the East in ancient China, and later on the Fang Stars of the Cerulean Dragon in the East and the other two stars were also included, therefore constituting nine stars. See \textit{Zhouli zhushu}, 276; Wang 1984. “Zhouli ershiba
seven tufts represents the Chunhuo stars;\textsuperscript{235} the Bear (and Tiger) Flag with six tufts, the Fa stars;\textsuperscript{236} the Turtle (and Snake) Flag with four tufts, the Yingshi stars,\textsuperscript{237} and the flag on which the bow and arrow are depicted, the Hu stars.\textsuperscript{238}

(3) "Gongjin Zhi Gong" and "Jin You Liuji" Passages

The workers working on metals (include six kinds). The zhushi works on the alloy with the lower proportion of bronze, while the yeshi works on the alloy with higher proportion of bronze;\textsuperscript{239} The fushi makes musical instruments; the lishi makes the vessels of measure; the duanshi makes such agricultural tools as the plough and the taoshi makes swords.

The bronze has six different proportions (of different alloys). Divide the weight of the alloy into six parts and that of the tin is equal to one of them; this is the proportion fit

\textsuperscript{235} The Chunhuo 鶉火 Stars include the seven stars of the Liu 柳 Stars of the Vermilion Bird in the South.
\textsuperscript{236} The Fa 伐 Stars include the Can 参 Stars, which consist of three stars, of the White Tiger in the West and three other stars attached to the Can Stars.
\textsuperscript{237} The Yingshi 營室 Stars include the Shi 室 Stars, which consist of two stars, and the Bi 壁 Stars, which also consist of two stars, of the Dark Warrior in the North.
\textsuperscript{238} The Hu 弧 Stars, also known as "Tiangong 天弓," or "Hushi 弓矢," located in the southeast of the Tianlang 天狼 Stars, belong to the Jing 井 Stars and consist of four stars.
\textsuperscript{239} The translation of the "yeshi" and "zhushi" follows Needham. See Needham 1965, 16. Due to the main concern of the "liuji" passage is about the ratios of bronze and tin in six kinds of alloy, it is suitable to translate "ji" into "alloy." Meanwhile, literally, "shang" and "xia" mean "high" and "low," which may indicate the proportion of bronze in certain alloy. According to the "liuji" passage, the alloy with the ratio (bronze to tin) of 3:1 is suitable to make ge and ji, while that with the ratio (bronze to tin) of 3:2 is suitable to make xue (knife) and shashi (arrow head). The ratio of 3:2 should be considered as that of the low alloy because the zhushi (low alloy founders) were responsible for making knives, while that of 3:1, of the high alloy, with which the yeshi (high alloy founders) dealt. On this point contradiction arises—the making of arrowheads made from low alloy is the responsibility of the high alloy founders, according to the text. If we
for making chime bells and cooking vessels. Divide the weight of the alloy into five parts and that of the tin is equal to one of them; this is the proportion fit for making axes.

Divide the weight of the alloy into four parts and that of the tin is equal to one of them; this is the proportion fit for making ge and ji halberd. Divide the weight of the alloy into three parts and that of the tin is equal to one of them; this is the proportion fit for making broadswords. Divide the weight of the alloy into five parts and that of the tin is equal to two of them; this is the proportion fit for making knives and arrows. Tin is equal to half of the weigh of the alloy; this is the proportion fit for making bonze mirrors.

accept Needham's understanding, we will have to attribute the contradiction to a later misarrangement of their depiction.

240 Scholars have not reached an agreement about the alloy with lower proportions of bronze (xiaji 下齊) and the alloy with higher proportions of bronze (shangji 上齊): some of them, Wang Jin 王/GPL, Liang Jin 梁津, and Yuan Hanqing 袁翰青, for instance, argue that the “jin 金 (metal)” in the alloy should be bronze, while others, such as Zhang Zigao 張子高, Zhou Shimin 周始民, and Wen Renjun, contend that it should be copper. Furthermore, about different proportions of different kinds of alloy, different groups also have different ideas, as Tables 1 and 2 show. Table 1 shows the argument of the former, while Table 2 shows that of the latter. Besides, in Chen Mengjia 陳夢家 and Guo Baojun 郭寶鉉’s studies, the proportions of bronze in most kinds of alloy are even higher than shown in Table 2. Though their conclusions are different, their methods are the same, that is, to compare and find the connection between the records in the Kaogong ji and the analyzing data of unearthed bronze weapons and objects. I prefer the former because I do not think that what is recorded in the Kaogong ji has to correspond with the archaeological data, considering (1) ancient Chinese artisans may have different knowledge of the purity of metals and different capability to achieve certain purity of metals from modern people; (2) what is recorded in the Kaogong ji does not have to correspond with contemporary techniques; (3) the archaeological data are far less than enough to give a whole picture about the proportion of bronze and tin, for instance, most of the extant bells were unearthed in the south, while many scholars contend that the Kaogong ji should have been an official book composed in the Qi State, which was in the north of China. For the same reason, I do not translate the “jin” into copper, but bronze. For details, see “Zhongguo gudai jinshu yuanzhi zhi huaxue 中國古代金屬原料之化學 (The Chemistry of Ancient Chinese Metal)” by Wang Jin 王/GPL. In Zhongguo gudai jinshu huaxue ji jindanshu 中國古代金屬化學及金丹術 (Ancient Chinese Metal Chemistry and Alchemy), Beijing: Zhongguo kexue tushu yiqi gongsi 1955, 6; “Zhoudai hejin chengfen kao (An examination of the ingredients in the alloy dated to the Zhou dynasty).” by Liang Jin 梁津. In Zhongguo gudai jinshu huaxue ji jindanshu 中國古代金屬化學及金丹術 (Ancient Chinese Metal Chemistry and Alchemy), Beijing: Zhongguo kexue tushu yiqi gongsi 1955, 52; “Kaogongji ji liuqi chengfen de yanjiu 考工記六齊成分的研究” by Zhou Shimin 周始民, in Huaxue tongbao 化學通報 1978 (3), 54-7; Wen 1993, 32; Lin 1979, 440; Dai Wudan 2003, 42, 134.
The “Fushi” Passage and the Making of the Yong Bell

Fushi make bells (yongzhong). The two projecting angles (luan) (of the bell mouth) are called xian. The edge part between the two xian is called yu. The part above the yu is called gu. The part above the gu is called zheng. The flat top above the

Table 1
Six Different Proportions of Bronze to Tin (1)

<table>
<thead>
<tr>
<th>Alloy for making chime bells and cooking vessels</th>
<th>Bronze/tin</th>
<th>Proportion of bronze</th>
<th>Proportion of tin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axes</td>
<td>4/1</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Ge and ji halberds</td>
<td>3/1</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Broadwords</td>
<td>2/1</td>
<td>67%</td>
<td>33%</td>
</tr>
<tr>
<td>Knives and arrowheads</td>
<td>3/2</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Bronze mirrors</td>
<td>1/1</td>
<td>50%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Table 2
Six Different Proportions of Bronze to Tin (2)

<table>
<thead>
<tr>
<th>Alloy for making chime bells and cooking vessels</th>
<th>Bronze/tin</th>
<th>Proportion of bronze</th>
<th>Proportion of tin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axes</td>
<td>5/1</td>
<td>83%</td>
<td>17%</td>
</tr>
<tr>
<td>Ge and ji halberds</td>
<td>4/1</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Broadwords</td>
<td>3/1</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>Knives and arrowheads</td>
<td>2/1</td>
<td>67%</td>
<td>33%</td>
</tr>
</tbody>
</table>

241 The bell discussed in the Kaogong ji is yongzhong 鈲, one of several kinds of ancient Chinese musical bells, which, according to Von Falkenhausen, can be classified into nine types as the following: ling 鈲, duo 鈲 (the above two are clapper-bells), nao 鈲, yongzhong 鈲, bo 鈲, niuzhong 鈲 (the above four all have shank loops), zheng 鈲, goudiao 鈲, and chunyu 鈲 (the above three are a sort of mixture of the other types). See Von Falkenhausen 1993, 67-72.

242 Von Falkenhausen translates the “xian 銓” as the vertical side the bell body, which is between the yu and the wu, as shown in Figure 32 of his book. See Von Falkenhausen 1993, 72-73. If so, the value of the “Xianjian” would be a variable, which contradicts with its definition. Also, there should be several other parts above the Xian part but still on the bell body, according to the context, but Von Falkenhausen’s arrangement of those parts does not support the text. However, the word “Xian” obviously has more than one meaning in the “fushi” passage, as we will see later on in the discussion on the measurements of different parts of the yongzhong. Here, I adopt the note of Zhouli zhushu. See Zhouli zhushu, 278; Wen 1993, 40; Lin 1997, 443.
called heng. The round part at which the bell is suspended is called xuan. The part resembling a certain beast on the xuan is called gan. The (decorated) bands on the surface of the bell are called zhuan. (The protruding “bell-nipples”) between the zhuan are called mei. The mei are (also) called jing. Above the yu (inside the bell wall) the sunken and shiny part is called sui.

Divide evenly (the length of) the xian into ten parts and deduct two; (the length of the other eight parts) should be (that of) the zheng, which should be equal to the distance between the xian (xianjian). Deduct two (more) parts (of the length of the xian); (the length of the other six parts) should be equal to the distance between two gu (gujian). The distance between the two gu should be equal to (the lateral length of) the wu. Deduct two (more) parts (from the length of xian), (the other four parts) should be equal to the width of the wu (wuguang). The length of the zheng should be equal to that of the yong.

243 Von Falkenhausen notes that most Chinese scholars misinterpret the words Xuan and Wo by inverting their meanings, which, according to the Japanese scholar Hayashi, should be a misuse of the Chinese characters following the Qing scholar Wang Yinzhi. But I have not found an example of such an inversion. In fact, the confusion of the “wo” to “gan” does not change the real meaning of it. See Zhouli zhushu, 278; Lin 1997, 443-44; Wen 1993, 40. Von Falkenhausen 1993, 73-74.

244 According to the Zhouli zhushu (278), the part where the sui is located is sunken and shiny because of its being stroked often in performance. Zheng Xuan suggests that the sui is in fact the sunken part in the center of the area which is called the gu. But modern scholars, such as Li Jinghua, Hua Jueming, and Wen Renjun, contend that the sui should mean the concave wall part between the yu and the lower edge of the zheng; it is beneath the gu and on the inside of the bell wall. See Wen 1993, 42; “Bianzhong de zhongmi, zhongsui xinkao (A New Examination of the Mi and Sui Parts of Chime-bells)” by Li Jinghua and Hua Jueming. In Kejishi wenji (Vol. 13), 40-46. Shanghai: Shanghai Kexue jishu chubanshe 1985; Von Falkenhausen 1993, 83-84.

245 Here we encounter two different indications of the “Xian.” In the saying that “Divide evenly (the length of) the xian into ten parts,” the “xian” means the length of each of the vertical sides which extend from the projecting angles of the yongzhong; while in the context where the “xianjian” is mentioned, the “xian” means each of the projecting angles of the bell, as I discussed above.

246 My interpretation of the proportions of the length of those parts is based on the Zhouli zhushu and the suggestions of such scholars as Cheng Yaotian, Lin Yin, and Wen Renjun. See Zhouli zhushu, 278; “Kaogong chuanguo xiaojiao” by Cheng Yaotian, in Xuxiu sikuquanshu (85), 206. Shanghai: Shanghai guji chubanshe 1995. Okamura Hidenori, a Japanese scholar, provides another suggestion on how to explain the phrase “deduct two.” In his view, the minuend should not be the length of the Xian, but that of the
length of the yong should be equal to its circumference (at the bottom). Divide its circumference (at the bottom) into three parts and deduct one, the rest should be equal to the circumference of the heng. Divide the length of the yong into three parts, two of which are above and one below, where the xuan should be designed.

How thick should the bell body be? What about the sound, clear or unclear? (If the sound is affected by the form of the bell mouth, to what extent) the sound will be affected by what kind of bell mouth, a flaring one or a constricted one? (To all the above questions) there are answers (which should be concerned about when a bell is made). If the bell is too thick, (when being struck,) it will sound like that of a stone (being struck); if too thin, (when being struck,) its sound will disappear too soon. If the bell mouth is flaring, it will sound bombastic; if constricted, it will sound choked. If the yong is overly long, (when the bell is struck,) the sound will not be stable. So (when being made,) a larger bell’s gujian is divided into ten parts, one of which should be equal to its thickness; a smaller bell’s zhengjian is divided into ten parts, one of which should be equal to its thickness. If a bell is made big in width yet short in length, it will sound hasty and can immediately antecedent measurement of each part. Okamura’s interpretation seems more reasonable than Cheng et al.’s, according to Von Falkenhausen, because it “accord[s] more closely with what may be observed on actual specimens.” See Von Falkenhausen 1993, 85-91; “Henshō-no sekkei to kōzō [Hyō-shi henshō-wō chushin-ni] (The design and structure of chime-bells, with emphasis on the Biao-niuzhong)” by Okamura. Sen’oku Hakkokan Kiyo 1986 (3), 53-74. Nonetheless, as Von Falkenhausen suspects from Hirase Takao’s research, “the Shang and Zhou bell-casters may have used a bell proportioning system quite different from that of the Kaogongji. In any case, it seems fair to conclude that casters in Zhou times did not adhere consistently to whatever standards may have existed at that time.” (Von Falkenhausen 1993, 91) Considering such a big discrepancy between what is recorded in the Kaogongji and the actual specimens, I would not adopt Okamura’s suggestion in order to justify them with each other. Furthermore, in this context, except that the division of the Xian is referred to, there is no indication about the number of parts each antecedent measurement is divided and without such indication, we have no idea about “two of how many parts” should be subtracted. When the whole text of the Kaogongji is considered, when the proportions of relative parts are mentioned, the typical narrative is often that “Divided something into how many parts and then subtract how many of them.” Therefore, I regard the length of the Xian as the minuend.
only be heard nearby; if a bell is made small in width yet long in length, it will sound leisurely and can be heard farther away. To make the sui, divide the thickness (of the bell wall) into six parts, one of which should be equal to (the sui’s) depth (underneath the bell’s platform). Make it (i.e. the sui) rounded (and smooth).  

(5) The “Jiangren Jianguo” Passage

When the Jiangren (Surveyers) build the (capital) city, (first,) they use plumb lines and water levels to gauge the flatness of the land; plant a straight pole in the in the ground and align it with plumb lines; observe and mark the shadows of the pole during the time when the sun rises and sets; draw circles and make it cross the shadows; then discriminate the east-west direction (from the north-south direction) by (analyzing the

247 The ancient Chinese bell casters distinguished various vibrating areas of the bell by manipulating the thickness of the bell wall. It seemed that, after a bell was out of workshop, the musicians still needed to scrape those specific areas of the bell wall in order to adjust the tones they wanted. The elaborate design of the sui part is most probably for such a reason. To make the thickness (or depth) of the sui equal to one sixth of that of the bell wall may be a sort of empirical standard. Also, archaeological discovery tells us that most of the unearthed bells dated to pre-Qin periods have their inner wall polished, as recorded in the Kaogong ji—“make it rounded (and smooth).” See “Fuzhi Zenghouyi zhong de tiaoHi wenti chouyi 複製曾侯乙鐘的調律問題芻議 (A Primary Argument on the Problems of Adjusting the Tones in the Replication of the Bells Unearthed from the Tomb of Marquis Yi of the Zeng)” by Huang Xiangpeng. In Jianghan kaogu 江漢考古 1982 (2); Wen 1993, 44.

248 The use of the water level may be traced back to the Shang, based on the analysis of some inscriptions on oracle bones and the information from some Shang archaeological sites. Take, for example, the form of the Chinese character gui 戱 carved in the oracle bone, which seems to represent the crossing ditches employed to observe whether or not the land was flat, when filled up with water. See Wen and Yuan 1983, 25. Furthermore, such ditches were actually found in the Shang remnants at Anyang during excavations of the 1920s and 1930s. See “Yindai shehui shenghuo 殷代社會生活 (The Social Life in the Yin Dynasty)” by Li Yanong 李亞農. In Xinranzhai shilunji 欣然齋史論集 (The Collection of Historical Theses in the Xinran Study) 1962, 548-9. Shanghai: Shanghai renmin chubanshe. Wen Renjun suspects that the water level used in the Kaogong ji may be an advanced method developed by the Shang people; nevertheless, we can deduce little details from the depiction in this passage. See Wen 1993, 84-85. The earliest record on the water level appears in the “Tianwen zhi 天文志 (Archaeological Records)” in the Suishu 隋書 (Book of the Sui Dynasty) and the year was 412. See Suishu, 518-20.
above data and adjust the four directions by) consulting the shadow of the pole at noon and the position of the polestar at night.  

(6) The “Jiangren Yingguo” Passage

It is the Jiangren (Architects) who plan the capital city. (The Capital city) should measure nine li by nine, with three gates on each side. Inside the city there should be nine longitudinal streets crossed by nine latitudinal streets. Each of the nine longitudinal

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249 The method of deciding the four directions follows these steps: (1) the surveyer plants a straight pole vertically in the ground; (2) marks the shadows cast by the sun at the very moments when it rises and sets; (3) draws a circle with the center at the point where the pole is planted and certain length as radius and the circle will cross the two shadows; (4) connects the two points where the circle crosses the shadows with a straight line, which points to the east-west directions; (5) connects the middle point of the line with the center point of the circle with a straight line, which points to the north-south directions; (6) adjusts the four directions through observing the shadow cast by the sun at noon and through observing the position of the polestar at night. I relate this method to the purpose of establishing the center of the earth and the north-south axis when the King’s city was built.

250 “Nine” is more a symbolic number than a practical one. In this context, it is used exclusively by the King, while the vassals and Ministers can only used seven and five, respectively, as we will see later on in the depiction of the different levels of the height of city walls and of the width of roads and streets. Beyond this scheme there is a principle which is also recorded in the li classics: “the more (size, number, amount, etc.), the higher status.” (Liji, 455) Based on this knowledge, it is not surprising that “li be changed with different numbers in order to keep harmony with diverse reputations and different statuses.” (Zuozhuan, 278.)

He Yeju 何業鉅 suggests that the design of the King’s city recorded in the Kaogong ji is the representative of the “well-field” mode and, according to this mode, the King’s city should be divided into nine equal squarish areas; the Palace City is one of them and is located in the center. Furthermore, he relates this mode to Zhou’s military system. He suspects that such inscriptions on Western Zhou bronzes as “ChengZhou bashi 成周八師 (The eight divisions of the ChengZhou)” and “Yin bashi 殷八師 (The eight divisions of the Yin)” in actuality embody that the “bashì” here means eight divisions surrounding the royal division, therefore, altogether nine divisions, just as the well-field mode. See He 1985, 39-55.

Paul Wheatley has a different idea about the mode of the layout of the King’s city advocated in the Kaogong ji, as he points out in his The Pivot of the four Quarters: “It will be remarked at once that this idealized urban plan relied on the same principle of subdivision as the old well-field system of land settlement which we have discussed in Chapter Two. However, whereas the latter resulted in eight units arranged about a central tract, the layout advocated in the K’ao-kong Chi (Kaogong ji) was a more complicated affair of sixteen quarters or wards. There was, moreover, no central unit, only a group of four fulfilling that role, and occupying not a ninth, but a quarter, of the total area. It was also possible to space the nine internal avenues regularly only by allowing two of them to run along the outer walls of the city.” See Wheatley 1971, 411.
streets should be nine gui wide.\textsuperscript{251} The ancestral Temple should be on the left [east] and the Altars of State on the right [west]. The court should be in front [south], and the market in the rear [north].\textsuperscript{252}

The Xia people called their royal ancestral temple Shishi, the main hall of which should be two seven-\textit{bu} (i.e. 14 \textit{bu}) long from north to south and one fourth of 14 \textit{bu} longer (i.e. 17.5 \textit{bu}) in width (from west to east). This hall should consist of five rooms, the middle of which is four \textit{bu} long and four \textit{bu} plus four \textit{chi} wide; each of the other four room located at the four corners is three \textit{bu} long and three \textit{bu} plus three \textit{chi} wide.\textsuperscript{253}

Altogether there should be nine steps. In each of the corner rooms there should be two

\textsuperscript{251} Gui 軌, literally denoting the track of a chariot, is a standard of length—a gui equals eight chi.

\textsuperscript{252} The Ancestral Temple, the Altar of State, the Court, and the market constitute the main functional areas of the King's city; such a design had served for a long time as the \textit{locus classicus} in the layout of a traditional capital city. This design not only emphasizes the center of the King's city, but establishes the axis of the city as well. On the basis of this passage, meanwhile combining other textual reference, He Yeju restores the layout of the King's city in his monograph \textit{Kaogong ji yingguo zhidu yanjiu}. See He 1985, 52.

\textsuperscript{253} My interpretation of the Shishi 世室 of the Xia Dynasty is based on Zheng Xuan's commentary. Zheng Xuan notes that the Shishi of the Xia 夏 consisted of five rooms that were planned according to the Theory of Five Elements—The Earth room was in the center, the largest room, the Wood room in the northeast, the Fire room in the southeast, the Water room in the northwest, and the Metal room in the southwest. See \textit{Zhouli Zhushu}, 289. However, the rare archaeological information on the Xia construction leaves the structure of the Shishi for future study. Wen Renjun suspects that the structure of the Xia Shishi might only be the imagination based on the structure of the Zhou Mingtang 明堂, which also included five rooms. Wen 1993, 89. Nonetheless, we should not discard the Shishi construction for lack of archaeological data or consider it as merely groundless imagination. In fact, the similarity between the Xia Shishi and Zhou Mingtang may reflect somewhat the historical and cultural connection between the Xia and the Zhou. According to the \textit{Shiji}, the Zhou clan had been Xia's confederation until Buku 不, who led the movement of his people from Xia's territory to the nomadic nations. See \textit{Shiji}, 76. Some modern scholars, for instance, Li Min 李民, confirm such a connection, in the light of modern discoveries. Li Min suggests that, in the middle of the Xia dynasty, the Xia government was challenged by the eastern nations and, almost at the same time, the Zhou people left Shanxi 山西, where they had been living under the domination of the Xia, for the highland of Shaanxi 陕西. The Zhou people did share a historical, linguistic, as well as ethnic basis with the Xia people. The Xia-Zhou connection was actually used later by the Zhou people as political propaganda to legitimize their conquest of the Shang and their status as masters of the Chinese Central Plain. See “Shi Shangshu Zhourenzunxia Shuo 釋向書周人尊夏說 (An Interpretation of the Theory that the Zhou People Respected the Xia Recorded in the \textit{Book of Documents})” by Li Min. In \textit{Zhongguoshi yanjiu} 中國史研究 (The Study of Chinese History) 1982 (2), 128-34. K. C. Chang also asserts the existence of such a basis during the Three Dynasties, even though they succeeded one another sequentially.
windows designed to flank the door. All the walls should be stuccoed white. The size of the front hall should occupy two thirds of that of the main hall and its north-south length, one third of the main hall’s.

The Yin (i.e. Shang) people named their royal ancestral temple Chongwu (double roofs),\textsuperscript{254} which should be a main hall seven \textit{xun} long (from north to south),\textsuperscript{255} with a base of three \textit{chi} high, four ridgepoles and double roofs.\textsuperscript{256}

The Zhou royal ancestral temple is called Mingtang (Bright Hall), which should be nine \textit{yan} wide (from east to west), seven \textit{yan} long (from north to south), and a \textit{yan} high, if measured by \textit{yan}, which is equal to nine \textit{chi}. (As the Xia Shishi, the Zhou Bright Hall) includes five rooms, but (each of them is) two \textit{yan} long and two \textit{yan} wide.\textsuperscript{257}

The \textit{ji} is the suitable measure for a room; \textit{yan}, for a hall; \textit{xun}, for a palace; \textit{bu}, for wild land; \textit{gui}, for a road. The Temple Gate (front gate) of the ancestral temple should be as wide as seven big \textit{jiong} (three \textit{chi} each) and the Wei Gate (smaller gate in the temple),

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\textsuperscript{254} There is a general agreement that “Chongwu” 重屋 means “double roofs.” But Wen Shaofeng and Yuan Tingdong contends that it should be interpreted as “a storied building,” based on their analysis of an inscription on the oracle bone—\textit{gao} 高 (high). See Wen and Yuan 1983, 381-82.

\textsuperscript{255} A xun equals eight chi.

\textsuperscript{256} Some scholars, Wen Renjun, for instance, regard the remnant of an early Shang building unearthed at Erlitou of Yanshi in Henan as the actual specimen of this kind of structure. See “Henan Yanshi Erlitou zaoShang gongdian yizhi fajue baogao 河南偃师二裡頭早期宮殿遺址發掘報告 (An Excavation Report on the Remnant of An Early Shang Palace Building unearthed at Erlitou of yanshi in Henan)” by Zhongguo kexueyuan kaogu yanjiusuo Erlitou gongzuodui 中國科學院考古研究所二裡頭工作隊. In \textit{Kaogu} 1974 (4). Wen 1993, 89-90.

\textsuperscript{257} The Mingtang is alleged to be the construction where significant political events happened and important religious rites were held in Zhou times. It was a building with great cosmological and numerological meanings that symbolize God’s order of Heaven’s blessings. There are remnants of several ritual buildings unearthed from the south suburb of the Han Chang’an city, which, some scholars suggest, should include the Mingtang structure built by Wang Mang. But it seems that the restored layout of the probable Mingtang structure identified by modern scholars is different from that recorded in the \textit{Kaogong ji}. See Sun 1987, 40. If the identification of Wang Mang’s Mingtang is true, the argument that the \textit{kaogong ji} was forged by Liuxin to legitimize Wang Mang’s usurpation must be wrong.
three small jiong (two chi each). The Lu Gate should be no more than five carts' wide, while the Ying Gate, three gui wide.

There should be nine rooms within the Lu Gate for the king's nine consorts to live in, another nine rooms out of the Lu Gate for the nine ministers to meet with the king (and to apply themselves to administration). The business of a country can be divided into nine classes, each of which should be administered by an appointed minister.

The gate of the palace should be designed five zhi high; the (four) corners of the place walls, seven zhi high; the (four) corners of the King's city walls, nine zhi high.

The longitudinal road should be nine gui wide; the circle road (within the city walls), seven gui; the wild road, five gui.

Cities built in the fiefs of princes or ministers should not have any corner of the city wall higher than the palace gate (five zhi); cities constructed in the domains of vassals should not have any corner of the city wall higher than that of the palace wall (seven zhi). The width of longitudinal roads in vassals' cities should not exceed that of the circle road within the King's city (seven gui), while the longitudinal roads in princes and ministers' cities built in the fiefs of princes or ministers should not have any comer of the city wall higher than the palace gate (five zhi); cities constructed in the domains of vassals should not have any corner of the city wall higher than that of the palace wall (seven zhi). The width of longitudinal roads in vassals’ cities should not exceed that of the circle road within the King’s city (seven gui), while the longitudinal roads in princes and ministers’

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258 A big jiong equals three chi; while a small jiong equals two chi, according to Zheng Xuan. See Zhouli zhushu, 290.
259 The Lu Gate was the gate for the King’s chamber; the Ying Gate was the main entrance of the Court. Both of them were designed on the axis of the layout of the King’s city, according to He Yeju. See He 1985, 52; Zhouli zhushu, 290.
260 The King’s nine consorts (jiupin) were at the same time officials in charge of women’s study, virtue, speaking, and works as well as certain rites, according to the Liji and Zhouli. See Liji, 18; Zhouli, 11-12.
261 Zhi means a wall three zhang in length and a zhang in height; when used in counting the length of something, a zhi equals three zhang; when used in counting the height of something, a zhi equals a zhang. See Zhouli zhushu, 290.
cities should be no wider than the wild roads in the domain of the King’s city (five gui).²⁶²

²⁶² Such a manipulation of numbers contains two principles as we have discussed above: (1) the bigger the number, the higher the status and (2) the difference of numbers between two sequential levels of status is two. It can be understood as an attempt to achieve harmony by coding a series of social orders into numerology, meanwhile sanctifying such a mode by corresponding rituals.
Appendix A

Tables

Table 3

The Structure of the Extant Zhouli Text

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<td>Heavenly Officials (tianguan) and the head of the Ministry state (zhongzai), or the Prime Minister for the King</td>
<td>Tianguan zhongzai</td>
</tr>
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<td>II</td>
<td>地官司徒</td>
<td>Earthly Officials (diguan) and the head of the Ministry of Education (situ), which is in charge of civil administration and social welfare</td>
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</tr>
<tr>
<td>V</td>
<td>秋官司寇</td>
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<td>Winter Officials (dongguan) and the *Book of Artificers (kaogong ji)</td>
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Table 4
The Structure of the Extant "Tianguan zongzai" Section\(^{263}\)

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<td>Premier</td>
<td>Dazai</td>
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</tr>
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<td>宮人</td>
<td>Commandants of the Royal Palace</td>
<td>Gongren</td>
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<td>Gongbo</td>
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\(^{263}\) The rank(s) of the noblemen in the office(s): 1. Qing 齐 2. zhong dafu 中大夫 3. xia dafu 下大夫 4. shangshi 上士 5. zhongshi 中士 6. xiashi 下士
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<td>Hunters</td>
<td>Shouren</td>
<td>Are in charge of hunt</td>
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<td>14</td>
<td>鱼人</td>
<td>Fishermen</td>
<td>Yuren</td>
<td>Capture fish</td>
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<td>15</td>
<td>鱼人</td>
<td>Fishermen</td>
<td>Bieren</td>
<td>Capture turtles, tortoises, crustaceans, oysters, etc.</td>
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<td>16</td>
<td>腊人</td>
<td>Meat-driers</td>
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<td>Dianfu gong</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>典緬</td>
<td>Supervisors of silk and its manufacture</td>
<td>Diansi</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>典枲</td>
<td>Supervisors of helm and its manufacture</td>
<td>Dianxi</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>内司服</td>
<td>Dress-maker</td>
<td>Neisifu</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>縫人</td>
<td>Tailors</td>
<td>Fengren</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>染人</td>
<td>Dyers</td>
<td>Ranren</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>追師</td>
<td>Jewellers</td>
<td>Duishi</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>履人</td>
<td>Shoemakers</td>
<td>Lüren</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>夏采</td>
<td>Keepers of the dead kings’ (or princes’) caps and robes</td>
<td>Xiacai</td>
<td></td>
</tr>
</tbody>
</table>
Table 5

The Structure of the Extant Kaogong ji Text

<table>
<thead>
<tr>
<th></th>
<th>Chinese</th>
<th>Pinyin</th>
<th>English translation</th>
<th>Categories</th>
<th>Word counting (ca.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>国有六職</td>
<td>Guo you liuzhi</td>
<td>Six professions in a state</td>
<td>Beginning passage</td>
<td>740</td>
</tr>
<tr>
<td>2.</td>
<td>輪人</td>
<td>Lunren</td>
<td>Wheelwrights</td>
<td>Wood workers</td>
<td>782</td>
</tr>
<tr>
<td>3.</td>
<td>軸人</td>
<td>Yuren</td>
<td>Chariot body makers</td>
<td>Wood workers</td>
<td>160</td>
</tr>
<tr>
<td>4.</td>
<td>轸人#</td>
<td>Zhouren</td>
<td>Shaft and axle makers</td>
<td>Wood workers</td>
<td>450</td>
</tr>
<tr>
<td>5.</td>
<td>攻金之工</td>
<td>Gongjin zhidong</td>
<td>Workers who work on metal</td>
<td>Metal workers</td>
<td>115</td>
</tr>
<tr>
<td>6.</td>
<td>筑氏</td>
<td>Zhushi</td>
<td>“Lower alloy” founders</td>
<td>Metal workers</td>
<td>23</td>
</tr>
<tr>
<td>7.</td>
<td>冶氏</td>
<td>Yeshi</td>
<td>“High alloy” founders</td>
<td>Metal workers</td>
<td>82</td>
</tr>
<tr>
<td>8.</td>
<td>桃氏</td>
<td>Taoshi</td>
<td>Sword-smiths</td>
<td>Metal workers</td>
<td>97</td>
</tr>
<tr>
<td>9.</td>
<td>慶氏</td>
<td>Fushi</td>
<td>Chime-bell makers</td>
<td>Metal workers</td>
<td>254</td>
</tr>
<tr>
<td>10.</td>
<td>氏</td>
<td>Lishi</td>
<td>Measure-makers</td>
<td>Metal workers</td>
<td>144</td>
</tr>
<tr>
<td>11.</td>
<td>段氏*</td>
<td>Duanshi</td>
<td>Plough makers</td>
<td>Metal workers</td>
<td>0</td>
</tr>
<tr>
<td>12.</td>
<td>函人</td>
<td>Hanren</td>
<td>Cuirass makers</td>
<td>Tanners</td>
<td>170</td>
</tr>
<tr>
<td>13.</td>
<td>鲍人</td>
<td>Baoren</td>
<td>Skinners</td>
<td>Tanners</td>
<td>163</td>
</tr>
<tr>
<td>14.</td>
<td>人</td>
<td>Yunren</td>
<td>Skinners</td>
<td>Tanners</td>
<td>100</td>
</tr>
<tr>
<td>15.</td>
<td>韋人*</td>
<td>Weiren</td>
<td>Tanners</td>
<td>Tanners</td>
<td>0</td>
</tr>
<tr>
<td>16.</td>
<td>袄人*</td>
<td>Qiuren</td>
<td>Furriers</td>
<td>Tanners</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>畫繪之 事 (畫人, 繪人)</td>
<td>Hua hui zhishí (including huaren and yiren)</td>
<td>Textiles, dyeing, and embroidery workers</td>
<td>Dyeing workers</td>
<td>125</td>
</tr>
<tr>
<td>18</td>
<td>鐘氏</td>
<td>Zhongshi</td>
<td>Feather-dyers</td>
<td>Dyeing workers</td>
<td>30</td>
</tr>
<tr>
<td>19</td>
<td>筐人*</td>
<td>Kuangren</td>
<td>Basket-makers(^{264})</td>
<td>Dyeing workers</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>氏</td>
<td>Huangshi</td>
<td>Silk-cleaners</td>
<td>Dyeing workers</td>
<td>94</td>
</tr>
<tr>
<td>21</td>
<td>玉人</td>
<td>Yuren</td>
<td>Jade workers</td>
<td>Carving workers</td>
<td>370</td>
</tr>
<tr>
<td>22</td>
<td>人*</td>
<td>Jieren</td>
<td>Arrow makers</td>
<td>Carving workers</td>
<td>0</td>
</tr>
<tr>
<td>23</td>
<td>雕人*</td>
<td>Diaoren</td>
<td>Stone carvers</td>
<td>Carving workers</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>磐氏</td>
<td>Qingshi</td>
<td>Stone-chime makers</td>
<td>Carving workers</td>
<td>54</td>
</tr>
<tr>
<td>25</td>
<td>矢人*</td>
<td>Shiren</td>
<td>Arrow shaft makers</td>
<td>Carving workers</td>
<td>84</td>
</tr>
<tr>
<td>26</td>
<td>陶人</td>
<td>Taoren</td>
<td>Potters</td>
<td>Ceramics workers</td>
<td>50</td>
</tr>
<tr>
<td>27</td>
<td>旃人</td>
<td>Fangren</td>
<td>Moulders (tiles)</td>
<td>Ceramics workers</td>
<td>47</td>
</tr>
<tr>
<td>28</td>
<td>梓人*</td>
<td>Ziren</td>
<td>Chime-bell beam and holder makers</td>
<td>Wood workers</td>
<td>342</td>
</tr>
<tr>
<td>29</td>
<td>梓人*</td>
<td>Ziren</td>
<td>Drinking vessel makers</td>
<td>Wood workers</td>
<td>58</td>
</tr>
</tbody>
</table>

\(^{264}\) Wen Renjun suspects that it might be the workers on printing and dyeing. See Wen, 1990, p. 196.
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Occupation</th>
<th>Specialization</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>Ziren</td>
<td>Target makers</td>
<td>Wood workers</td>
<td>110</td>
</tr>
<tr>
<td>31</td>
<td>Luren</td>
<td>Weapon handle makers</td>
<td>Wood workers</td>
<td>282</td>
</tr>
<tr>
<td>32</td>
<td>Jiangren</td>
<td>Surveyors, builders, and carpenters</td>
<td>Wood workers</td>
<td>43</td>
</tr>
<tr>
<td>33</td>
<td>Jiangren</td>
<td>City builders</td>
<td>Wood workers</td>
<td>262</td>
</tr>
<tr>
<td>34</td>
<td>Jiangren</td>
<td>Hydraulic workers</td>
<td>Wood workers</td>
<td>264</td>
</tr>
<tr>
<td>35</td>
<td>Cheren</td>
<td>Agricultural implement handle makers</td>
<td>Wood workers</td>
<td>109</td>
</tr>
<tr>
<td>36</td>
<td>Cheren</td>
<td>Cartwrights</td>
<td>Wood workers</td>
<td>197</td>
</tr>
<tr>
<td>37</td>
<td>Gongren</td>
<td>Bow makers</td>
<td>Wood workers</td>
<td>1180</td>
</tr>
</tbody>
</table>

* means that this item appears in the opening paragraph but is not included in the main body.

# means that this item is not included in the opening paragraph but appears in the main body.

^ means that this item appears in one category but its main body may speak for another.
Table 6
The Ages and Authorship of the 36 Sub-units of the Extant Kaogong Ji Text According to Wen Renjun

<table>
<thead>
<tr>
<th>No.</th>
<th>Sub-units</th>
<th>Ages</th>
<th>Authorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Guo you liuzhi</td>
<td>Middle or late Warring States period</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Fan gongmuzhigong qi</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Youyushi shangtao</td>
<td>One of the earliest parts</td>
<td>Qi</td>
</tr>
<tr>
<td>4</td>
<td>Lunren weilun</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lunren weigai</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Yuren weiche</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Zhouren weizhou</td>
<td>Spring and Autumn and Warring States periods</td>
<td>Chu</td>
</tr>
<tr>
<td>8</td>
<td>Zhen zhi fang ye</td>
<td>Between the early and late Warring States periods</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Gongjin zhigong</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Zhushi weixue</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Yeshi weishashi</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Taoshi weijian</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Fushi weizhong</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Lishi weiliang</td>
<td>Before 386 B.C.</td>
<td>Qi</td>
</tr>
<tr>
<td>15</td>
<td>Hanren weijia</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Baoren zhishi</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Yunren weigaotao</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Hua hui zhishi</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Zhongshi ranyu</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Mangshi liansi</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Yuren zhishi</td>
<td>One of the earliest parts</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Qingshi weiqing</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Shiren weishi</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Taoren weiyan</td>
<td>Warring States period (after 386B.C.)</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Fangren weigui</td>
<td>Warring States period (after 386B.C.)</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Ziren weisunju</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Ziren weiyinqi</td>
<td>Early Warring States period</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Ziren weihou</td>
<td>Warring States period</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Luren weiluqi</td>
<td>Warring States period</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Jiangren jianguo</td>
<td>Between late Spring and Autumn and early Warring States periods</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Jiangren yingguo</td>
<td>Warring States period</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Jiangren weigouxu</td>
<td>Qi</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Cheren zhishi</td>
<td>One of the earliest parts, late Spring and Autumn period ²⁶⁵</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Cheren weilei</td>
<td>One of the earliest parts, late Spring and Autumn period</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Cheren weiche</td>
<td>One of the earliest parts, late Spring and Autumn period</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Gongren weigong</td>
<td>Early Warring States period</td>
<td></td>
</tr>
</tbody>
</table>

²⁶⁵ Wen states that the concepts of the angles in *Kaogong ji* were formed during the late Spring and Autumn period and this part should have been compiled into *Kaogong ji* as one of the earliest parts. Therefore, the earliest parts should not be earlier than the late Spring and Autumn period.
Table 7

Word Counting of the Six Kinds of Artisans

<table>
<thead>
<tr>
<th></th>
<th>Word counting</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Passage</td>
<td>740</td>
<td>11%</td>
</tr>
<tr>
<td>Wood workers</td>
<td>4239</td>
<td>61%</td>
</tr>
<tr>
<td>Metal workers</td>
<td>715</td>
<td>10%</td>
</tr>
<tr>
<td>Tanners</td>
<td>433</td>
<td>6%</td>
</tr>
<tr>
<td>Dyeing workers</td>
<td>249</td>
<td>4%</td>
</tr>
<tr>
<td>Carving workers</td>
<td>508</td>
<td>7%</td>
</tr>
<tr>
<td>Ceramic workers</td>
<td>97</td>
<td>1%</td>
</tr>
<tr>
<td>Sum</td>
<td>6981</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Word counting</td>
<td>Proportion</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>Wheelwrights</td>
<td>782</td>
<td>18%</td>
</tr>
<tr>
<td>Chariot body makers</td>
<td>160</td>
<td>3.8%</td>
</tr>
<tr>
<td>Shaft and axle makers</td>
<td>450</td>
<td>10.6%</td>
</tr>
<tr>
<td>Chime-bell beam and holder makers</td>
<td>342</td>
<td>8%</td>
</tr>
<tr>
<td>Drinking vessel makers</td>
<td>58</td>
<td>1%</td>
</tr>
<tr>
<td>Target makers</td>
<td>110</td>
<td>3%</td>
</tr>
<tr>
<td>Weapon handle makers</td>
<td>282</td>
<td>7%</td>
</tr>
<tr>
<td>Surveyers, builders, and carpenters</td>
<td>43</td>
<td>1%</td>
</tr>
<tr>
<td>City builders</td>
<td>262</td>
<td>6%</td>
</tr>
<tr>
<td>Hydraulic workers</td>
<td>264</td>
<td>6%</td>
</tr>
<tr>
<td>Agricultural implement handle makers</td>
<td>109</td>
<td>3%</td>
</tr>
<tr>
<td>Cartwright</td>
<td>197</td>
<td>5%</td>
</tr>
<tr>
<td>Bow makers</td>
<td>1180</td>
<td>28%</td>
</tr>
<tr>
<td>Sum</td>
<td>4239</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 9

Word Counting of the “Gongjin Zhi Gong”

<table>
<thead>
<tr>
<th></th>
<th>Word counting</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers who work on metal</td>
<td>115</td>
<td>16%</td>
</tr>
<tr>
<td>&quot;Lower alloy&quot; founders</td>
<td>23</td>
<td>3%</td>
</tr>
<tr>
<td>&quot;High alloy&quot; founders</td>
<td>82</td>
<td>11%</td>
</tr>
<tr>
<td>Sword-smiths</td>
<td>97</td>
<td>14%</td>
</tr>
<tr>
<td>Chime-bell makers</td>
<td>254</td>
<td>36%</td>
</tr>
<tr>
<td>Measure makers</td>
<td>144</td>
<td>20%</td>
</tr>
<tr>
<td>Plough makers</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td><strong>715</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
Table 10

Word Counting of the “Gongpi Zhi Gong”

<table>
<thead>
<tr>
<th></th>
<th>Word counting</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuirass makers</td>
<td>170</td>
<td>39%</td>
</tr>
<tr>
<td>Skinners (baoren)</td>
<td>163</td>
<td>38%</td>
</tr>
<tr>
<td>Drum makers (yunren)</td>
<td>100</td>
<td>23%</td>
</tr>
<tr>
<td>Tanners</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Furriers</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Sum</td>
<td>433</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 11

Wording Counting of the “Guamo Zhi Gong”

<table>
<thead>
<tr>
<th></th>
<th>Word counting</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jade makers</td>
<td>370</td>
<td>73%</td>
</tr>
<tr>
<td>Arrow makers? (jieren)</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Stone carvers</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Chime-stone makers</td>
<td>54</td>
<td>11%</td>
</tr>
<tr>
<td>Arrow shaft makers (shiren)</td>
<td>84</td>
<td>17%</td>
</tr>
<tr>
<td>Sum</td>
<td>508</td>
<td>100%</td>
</tr>
</tbody>
</table>
Table 12
Three Categories of All the Artisans Recorded in the *Kaogong Ji*

<table>
<thead>
<tr>
<th>Workers</th>
<th>Word counting</th>
<th>Sub-sum</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weapons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheelwrights</td>
<td>782</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chariot body makers</td>
<td>160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft and axle makers</td>
<td>450</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weapon handle makers</td>
<td>282</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bow makers</td>
<td>1180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High alloy founders</td>
<td>82</td>
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<td>Sword-smiths</td>
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<td><strong>Ritual vessels</strong></td>
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<td>Chime-bell beam and holder makers</td>
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<td>Target makers</td>
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<td>Surveyers, builders, and carpenters</td>
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<td>City builders</td>
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<td>Chime-bell makers</td>
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<td>Jade makers</td>
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<td>Hydraulic workers</td>
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Appendix B

The Translation of the *Kaogong ji*

There are six classes of workers in a state and the hundred artisans comprise one of them. [The following are the six classes of workers: The work of] some of them is [just] to sit down and discuss the way [to govern a country]; [The work of another] group is to operate and carry the way out; [The work of the third] group is to examine the curvature and the quality (of the raw materials to judge if they are useful) in order to prepare the Five Stuff (wucai) and help people distinguish [the varieties of] utensils; [The work of the fourth] group is to circulate goods [,especially those] that are rare and unusual in order to make a profit; [The work of the fifth] group is to work hard to develop the products from the earth; [The work of the sixth] group is to work with silk and helm and make things from them.

Those who sit down to discuss the way are princes and lords. Those who operate and carry out the way are gentlemen and officials. Those who examine the curvature and quality [of the raw materials to judge if they are useful] in order to prepare the Five Stuff and help people distinguish [the varieties of] utensils are the hundred artisans. Those who circulate goods [, especially those] that are rare and unusual in order to make a profit are merchants. Those who work hard to develop the products from the earth are framers. Those who work on silk and helm and make things from them are working women.

Making hoes is not a special kind of job in the Yue area; Making armor is not a special kind of job in the Yan area; Making pikestaffs is not a special kind of job in the Qin area; Making bows or making chariots is not a special kind of job in the [nomadic]
Hu area. To say that making hoes is not a special job in the Yue area does not mean that there are no hoes there, but that everyone there knows how to make them; To say that making armor is not a special job in the Yan area does not mean that there is no armor there, but that everyone there knows how to make it; To say that making pikestaffs is not a special job in the Qin area does not mean that there are no pikestaff there, but that everyone there knows how to make them; To say that making bows or chariots is not a special job in the [nomadic] Hu area does not mean that there are no bows or chariots there, but that everyone there knows how to make them.

Those who are wise invent [how to make] things; Those who are skillful [learn such knowledge from the wise men,] maintain them and initiate them from generation to generation; these are [also] called artisans. So what the hundred artisans undertake can all be traced back to the wise men’s inventions. Melting metal to make knives, hardening earth to make utensils, making chariots for traveling on land and boats for going through water: these are all [the examples of] the sages’ invention.

The heaven has its [rhythm of] time; the earth has its [local influence of] qi; [different] materials have [different] qualities and particular artisans have special skills. [Only when] the above four are fused together [and match each other perfectly], could products of high quality result. [Given that] the materials are good and the artisans are skillful, the reasons that products of high quality are not made can only be explained as that [when the work is carried out,] either the time is not suitable, or the local qi is not be obtained (, or both).
Take, for example, the delicious orange [ju] tree [growing south of the Huai River], which could only grow dry and bitter fruit [zhi] if planted to the north of the Huai River. [Other example:] the crested mynahs [quyu] would never cross the Ji River (to the north); the badgers (he) would die if living [to the south of] the Wen River—these are caused by [different nature of] the local qi. Take, as [more] examples, the knives made in the Zheng area, the axes made in the Song area, the penknife made in the Lu area, and the swords made in the areas of Wu and Yue, all of which could not be made of good quality outside of their own locality. These are [also] caused by [different nature of] the local qi.

The cattle horns from the Yan area, the Zhe wood [that is best for making bows] from the Jing area, the arrow-wood from the Fenhu area, and the copper and tin from the Wu and Yue areas are all raw materials of good quality. Heaven has its time to produce and destroy; plants and trees have their time to grow and wither; stone has its time to crumble; water has its time to condense, freeze, and rain: these are the results caused by the time of the heaven.

Generally speaking, wood work consists of seven operations; metal work, six; work dealing with skin and fur, five; painting, five; scraping and polishing, five; modeling in clay, two. Wood work comprises the making of wheels, chariot bodies, bows, pikestaffs, construction of houses, the making of carts, and the making of containers and targets, etc. Metal work includes forging, melting, making of bells, measures of capacity and bronze vessels, making of agricultural implements, and sword making. Work dealing with skin and fur involves drying, hide-armor making, making of drums, leathers, and furs. Work of painting includes embroidery in single or multiple colors, dyeing feathers, making of
basketry, and cleaning silk. Work of scraping and polishing covers the jade work, sculpting, arrow making, and making of chime-stones. Work of modeling clay comprises the art of pottery and the art of tile molding.

The time during the reign of Shun (or Youyushi) is known for its art of pottery; The time during the reign of Yu (or Xiahoushi) is famous for its [large-scale] construction of water-control projects, palaces and houses; The achievement in making musical instruments can be seen as the hallmark of the Yin Dynasty, while in the Zhou Dynasty, making chariots was the most estimable work.

In general, what needs greater number of artisans [than others] to cooperate in the process of production is making of chariots. The chariot has six proportional numbers [that must be observed when being built]. The [distance between the] back traverse of the chariot [and the road] is four chi (Chinese foot), which is the first proportional number. The height of the ge halberd with its handle is six chi and six cun, which, when placed obliquely [in the chariot], should be four chi high above the back traverse. This is the second proportional number. The person [standing in the chariot] is eight chi tall, which exceeds the top of the ge halberd by four chi. This is the third proportional number. The height of the shu combat baton is equal to one xun and four chi, which exceeds the height of the man by four chi in length. This is the fourth proportional number. The height of the ji halberd is one chang, which exceeds the top of the shu combat baton by four chi. This is the fifth proportional number. The height of the qiu spear is equal to one chang and four chi, which exceeds the top of the qiu spear by four chi in length. This is
the sixth proportional number. To make the chariot, there are six proportional numbers [that should be observed].

Generally speaking, the way of examining [whether or not] the chariot [can work well] starts by examining the parts of the chariot which contact the ground. Consequently, it is necessary to examine the wheels first. According to the principles of examining the chariot, the best wheel should be built solid, with all the pieces fitted perfectly and the portion making contact the ground minimized. If the pieces are not fitted well, then the wheel is not solid; consequently, it cannot run a long duration. If the portion making contact the ground is not minimized, then the chariot cannot obtain a high speed. If the wheels are built too high, then the man cannot get on [easily]; [on the other hand,] if the wheels are too low, then the horses [will soon fatigue as if they] are always climbing hills. [Based on this knowledge,] the diameter of the wheels of the war chariot is six chi and six cun long; the diameter of the wheels of the hunting chariot is six chi and three cun long; the diameter of the wheels of the four-horse-drawing chariot is six chi and six cun long. With the wheels six chi and six cun high, the axle of each of the wheels is three chi and three cun high above the ground. Adding the thickness of the frame and square wood between the frame and the axis, the bottom of the chariot body is four chi high above the ground. [Suppose] the man [who is using the chariot] is eight chi tall, then the above design is quite convenient for him to get on and off the chariot.

Wheelwrights make wheels. The working on the three component parts (including the hub, spokes, and felloes) of the chariot should be in the proper time. Once the three parts have been finished, the skillful artisan [in assembling the wheel] fit them. A
[workable] hub ensures the fluent rotation [of a wheel]; The [standard] spokes provide uprightness [to hold the edge of the wheel]; The [suitable] felloes ensure the solidity of the wheel in its assembly. [If the above can be achieved,] even though the wheel becomes old, the three component parts should still function well; such craftsmanship can be called perfection.

[To examine a finished wheel, first,] look at it from a certain distance as a whole: [a good wheel should have] its rim rounded smoothly and curved downward elegantly; [if one] looks at it closely, [a good wheel should have] a minimum of its portion contacting the ground. The principle based on in such an examination is merely ensuring the wheel’s accurate circularity.

[If one] looks at its spokes from a certain distance, [good] spokes should be made tapering from the hub to its rim like straight arms; [if one] looks at them more closely, [good] spokes should be made smooth and straight. The principle based on in such an examination is merely ensuring their straightness.

[If one] looks at its hub from a certain distance, a [good] hub should look like an eye [protruding from a face, providing an image of perfect hub of a wheel]; [if one] looks at it more closely, the [good] hub should be covered with leather smooth and tight. The principle based on in such an examination is merely ensuring its perfection of workmanship.

[If one] looks at the convexity [of a spoke], the tongue of the spoke that enters into the felloe (zao) should be placed accurately; [if one] looks at the foot of the spoke that
enters into the hub (zi), the zi should fix directly opposite the zao. [If such standards can be matched,] as long as the wheel is running, the spoke will not be deformed.

They basic way of carving the hub is to [know and] mark the Yin and Yang sides of the wood [used to make the hub]. The part in the Yang side has a finer grain and therefore is harder, while that in the Yin side has a wider grain and therefore is softer. [In order to make a good hub,] the Yin part of the wood should be fortified by fire till its hardness matches that of the Yang part. In this way as long as the hub is in use it will not lose its regularity and evenness.

If the hub is small in diameter but long in length, there will not be enough space for all the spokes; if the hub is large in diameter but short in length, there will be too much space between mortices and it will have problems with solidity. For this reason the height of the wheel is divided into six parts, one of which is regarded as the measure of the contour of the cross-section of the felloes (yawei). The yawei is further divided into three parts, two of which should be lacquered. Get and measure the square inside the lacquered part [, which is a circle] and fold it in two; the length [obtained in this way] should be that of the hub, which is identical with its circumference (wei). [Divide further its circumference into three parts,] one of which should be the measurement for making the hollow center inside the hub (sou). Divide the length of the hub into five parts; deduct one and use the rest of it as the circumference of the bearing xian, which is on the side nearest to the chariot body; deduct three and use the rest of it as the circumference of the bearing zhi, which is at the opposite end of the bearing xian. A hub with an ideal shape should be made corresponding to the other parts, while the design of the thongs should be
in a precise position. The glue should be thick when set; the animal sinews should be evenly distributed and tightly bounded in layers when placed; the covering leather (tao) should be [tightly] fastened to the hub. After being polished [with stone], the covering leather assumes a white-blue color. Such a hub can be considered well made.

Divide the length of the hub into three parts, two of which should be outside and one inside. It is there where the spokes enter [the hub]. Concerning the spokes, the depth of the mortices (zaoshen) should be equal to the width of the spokes (fuguang). If the width of the spoke is larger than the depth of the mortice, [the structure] will be very unstable; it is impossible for even a skillful workman to solidify it. If the depth of the mortice is larger than the width of the spoke, the solidity will be more than enough but the strength will be less than necessary. [So the best way] is to measure the width of the spoke and make it equal to the depth of the mortice. [If it so be done,] heavy though the burden may be, the hub of the chariot will not split.

Divide the length of the spoke into three parts and make the [outer] one gradually taper towards the felloe. [If it so be done,] deep though the mud may be, it will not cling to the spoke.

Divide the circumference of the end of the spoke entering the hub (guwei) into three parts; subtract one and make the rest as the circumference of the other end of the spoke pointing to the felloe (jiaowei).

The spokes should be uniform and straight after being treated [with heat]. When floated on the water [to be examined], they should be of equal buoyancy.
[The tongue of the spoke should] point at right angle straight into the felloe. If the tongue and the spoke-hole in the felloe (zao) are well fitted, [the structure] will be very solid, even without the aid of a wedge; if they are not well fitted, the tongue in the hole can be seen outside even with the aid of a wedge. (In other words, the structure will be unsteady.)

On a wheel with the diameter of six chi and six cun long, the cake-like convexity (geng) amounts to two thirds of a cun. [If being made with such a measure,] the wheel has a high possibility of being stable.

When a wheel is being made, [the tread of the rim] should be slender [than the inside part of the felloe] if it is designed to run in the area wet and plain; [the tread of the rim] should be equal [in size] to the inside part of the felloe if it is designed to run in the mountain area. When a chariot is running in the wet plain, a slender rim will be cutting through the mud like a knife and will not get stuck; when a chariot is running in the mountain area, the rim with the same size as the inside of the felloe should be thick enough to resist the [rough] stones. In this case, as long as it is being used, the wheel’s mortices will not be shaky.

Being treated [with heat], the felloe should not have tissues broken outside, nor folds inside, nor swelling bumps on either left or right side. [If the above can be achieved,] it should be perfect in terms of fire treatment.

[Regarding the whole wheels,] compass them in order to examine whether they are circular or not, measure the two sides of each wheel with a square in order to examine whether they are correct or not, suspend the wheels in order to examine whether the
spokes are straight or not, float them in order to examine whether the buoyancy of every part of a wheel is the same or not, measure the hollow spaces (sou) on both sides of the hubs with glutinous millet in order to examine whether they have equal volume or not, weigh each pair of wheels with a balance in order to examine whether they are equal in weight or not. If the wheels can be made to satisfy all the above requirements, that is, the wheels are circular according to compass, the two sides of each wheel are correct according to square, the spokes are straight, the buoyancy of every part of a wheel is the same, the hollow spaces on both sides of each hub have the equal volume according to millet, each pair of wheels are equal in weight according to balance, then the workmanship can be regarded as that of a master-craftsman.

Wheelwrights make covers for chariots. The circumference of the top end of the cover holder (dachangwei) is three cun long, while that of the other end (chengwei) is twice that length, which is six cun. Outspread the chengwei as the diameter of the tumefying center of the chariot cover which connects with the upper end of the holder (buguang), which is six cun in length. The height of the tumefying center of the chariot cover plus the height of the upper part of the holder (buchang) is 2 chi. The height of [each of] the lower parts of the holder (chengchang) is twice as that of the upper part, which is four chi; so there are two times four chi (, i.e. eight chi altogether).

Divide a cun into ten parts; the length of one part is called a mei. The tumefying center of the chariot cover is a mei high (buzun). Each of the square mortices in the tumefying center of the chariot center where the cover ribs enter (gongzao) is four mei wide on each side. The height of the part above the upper side of the gongzao (zaoshang)
is two mei, while that of the part below the lower side of the gongzao (zaoxia) is four mei. The gongzao is two and half cun deep. The deeper end of the gongzao is two mei deep and a mei wide.

The cover with each of the ribs six chi in length is called "pizhi" [because it covers the outer ends of the two wheel hubs]; the cover with each of the ribs five chi in length is called "pilun" [because it covers the two wheels of the chariot]; the cover with each of the ribs four chi in length is called "pizhen" [because it covers both sides of the chariot body].

Divide the length of each of the cover ribs into three parts and curve the inner one nearest to the center. Divide the circumference of each hole in the tumefying center where the ribs enter into three parts (guwei) and deduct one; the rest should be the circumference of the other end of each rib (zaowei). Divide the length of each rib into three parts, one of which is the height between the cover center and the outer end of the ribs (zun). The cover center is relatively higher than the outer part; so [when the chariot is running in the rain,] the rain falling onto the cover will leave it quick and far.

[A chariot should have a cover of suitable size.] If the cover is too high, it would be difficult for it to pass through the regular gates; if the cover is too low, it may obstruct the view of the chariot driver. For this reason, the chariot cover, generally speaking, is about ten chi high. A good chariot cover, even without being covered with cloth on top and without being bound with ropes at the outer ends of the ribs, will not collapse when the chariot is running on a country road. Such craftsmanship can be considered as that of a master-craftsman.
Chariot-body makers construct the chariot bodies. If the height of chariot wheels (lunchong), the width of the chariot body (cheuguang) and the length of the crossbar at the front end of the thill where the horses are harnessed (hengchang) are equal to each other, (the result) is termed as “Three Equals (sanchen)” [in a chariot].

Divide the cheuguang into three parts and subtract one, the remainder should be the length of the body (sui). Divide the sui into three parts; one is in the front and the other two are in the rear, where the traverse on the upper front of the chariot body (shi) should be [located and] treated [with heat]. Half of the cheuguang should be the same measure as the height between the shi and the bottom and the chariot body (shichong). Half of the sui should be the same measure as the height between the handrail on each side of the chariot body and the bottom of the chariot body (juechong).

Divide its (the chariot body’s) width into six parts, one of which is as long as the circumference of the traverse on the rear of the chariot body (zhenwei). Divide the zhenwei into three parts and deduce one, the remainder should be the circumference of the shi in length (shiwei). Divide the shiwei into three parts and subtract one, the remainder should be the circumference of the jue (juewei) in length. Divide the juewei into three parts and subtract one, the remainder should be the circumference of each of the crossed bars on the lower parts of both sides of the chariot body (zhiwei). Divide the zhiwei into three parts and subtract one, the remainder should be the circumference of each of the crossed bars underneath the shi (duiwei).

[In the making of the chariot body,] the round parts should be made according to the compass; the square parts should be made according to the square; the standing parts
should be made according to the plumb; the traverse parts should be made exactly horizontal; the straight parts should be perpendicular to the earth [as if a plant growing upward] and the cross parts should fit one another as if branches to the stem of a tree.

Regarding choosing the materials [in the making of chariots], the large and the small [in strength] should not be assembled together. [Otherwise,] those where the small holds the large will be cracked; those where the large pulls the small will be broken. For those chariots without skin fastening their bodies (zhanche), the chariot bodies should be relatively narrower than those of the shiche, which are fastened with skin [so that their bodies will not be shattered].

Shaft-makers make shafts and axles. There are three kinds of shafts with differing degrees of incurvation (sandu). There are [also] three different kinds of wood axles with differing textures (sanli). The shafts for first-class horses in the country should have the incurvation of four chi and seven cun deep (which means the perpendicular distance between the upper part of positive camber and the lower part of the negative camber). The shafts for hunting horses should have the incurvation of four chi deep. The shafts for the dobbins should have the incurvation of three chi and three cun deep. Among the sanli, the first means that the texture of the axle is even and smooth; the second, made with hard wood and the third, that the axle and the hub fit with each other perfectly.

The shaft before the fan, which is the straight part of the shaft extending out of the chariot body, should be ten chi long; the length of the whip should be half of it. Concerning the renmu, which hold the chariot body, if the length of the shaft being divided into ten parts, one of them should be equal to the circumference of each of the
renmu. Regarding the hengren (on which the yokes are fastened), if its length being divided by five, one part of it should be equal to its circumference. If less than the standards, neither the renmu nor the hengren can be said to be adequate for its function.

Divide the width of the zhen (which is one of the renmu underneath the rear part of the chariot body) by ten, one of which should be the circumference of the axle.

Divide the length of the shaft by ten, one of which should be the circumference of the dangtu (which is the carved wood between the shaft and the axle and is located at the point where the shaft and the axle cross). Divide the circumference of the dangtu into three parts and subtract one; the remainder should be equal to the circumference of [the zhoujing, which is] the very front part of the shaft where the renheng is fastened (jingwei). Divide the jingwei into five parts and deduce one; the remainder should be the circumference of [the zhouzhong, which is] the very rear part of the shaft holding the zhen of the chariot (zhongwei).

Generally, the shaft of the chariot is treated [with heat] according to its texture and should not be curved too much [otherwise it will be easily broken].

Now the shaft of the cart is too low [for the bulls], which leads to difficulty when climbing [a slope]. Even if finally overcomes the slope, [during the process,] the cart is easily turned over (because the steeper the slope, the larger the angle of the cart to the horizon). There is no other reason than that the shaft is straight [as a whole] and without curve [to adjust the height of the cart to that of the draught bulls]. For this reason, the cart, in spite of keeping good balance and running well on the flat, must be weighed down on its front shaft when it climbs the slope, otherwise, the neck of the draught bull
would be strangled [by the rein]. There is no other reason than that the shaft is straight [as a whole] and without curve [to adjust the height of the cart to that of the draught bulls]. For this reason, when climbing a slope, the cart, although needing double traction when running on the flat, will succeed in climbing it; when running down from top of a slope, the cart, however, must be drawn backward from the rear of the cart, otherwise, the back of the draught bull would be suppressed [by the rein]. There is no other reason than that the shaft is straight [as a whole] and without curve [to adjust the height of the cart to that of the draught bulls]. For this reason, the shaft must be made strong and with suitable curve: curved too much, it is easily broken; curved less than enough, it will cause the chariot to be turned over easily. If the curve looks like the zhu stars (which means that it satisfies the standard), it is possible for the chariot to run fast and stable [whether it is running on the slope or on the flat]. If the chariot runs fast and stable, it can be used for a long time.

If the all parts of the shaft match one another perfectly, then it is possible to make the chariot run stable and the driver to feel peaceful. The chariot shaft should be crooked yet without disjunction; it should be treated according to the texture of the wood without any knots or crack. [A good shaft is to help] the draught horses go forward and the chariot driver drive backward without any difficulty. [If this could be achieved,] after a whole day's running, the left draught horse will not be worn out; drawing the chariot to run thousands of li, the horses will not hurt their feet; driving from the beginning to the end of a year, the driver will not frazzle his clothes. This can be achieved only when all the parts of the shaft match each other perfectly. [A good shaft is to] help the horses draw
the chariot. [For instance, sometimes,] even when the horses stop pulling the chariot, the shaft will still help the chariot move forward some.

A good shaft should be lacquered and the lacquer on the shaft looks close-grained. Underneath the fan and close to the futu there is a part [of the shaft] about seven cun in length, which is usually not lacquered; [the rest is lacquered.] If the part of the shaft underneath the fan is lacquered and the lacquer looks close-grained, the shaft can be called the work of a master-craftsman in the country.

The squarishness of the frame of the chariot body is the symbol of the earth, while the circularity of a chariot cover symbolizes the heaven; thirty spokes in a wheel indicate the thirty days of a month; twenty-eight cover ribs, twenty-eight stars. The Dragon Flag with nine tufts stands for the Dahuo stars; the Bird Flag with seven tufts represents the Chunhuo stars; the Bear [and Tiger] Flag with six tufts, the Fa stars; the Turtle [and Snake] Flag with four tuft, the Yingshi stars; and the flag on which bow and arrow are displayed, the Hu stars.

The workers of metals [include six kinds]. The zhushi work on the alloy with lower proportions of bronze, while the yeshi work on the alloy with higher proportions; The fushi make musical instruments; the lishi make the vessels of measure; the duanshi make such agricultural tools as the plough and the taoshi make swords.

Bronze has six different proportions [in different alloys]. Divide the weight of an alloy into six parts and that of tin is equal to one of them; this is called the proportion fit for making chime bells and cooking vessels. Divide the weight of an alloy into five parts and that of tin is equal to one of them; this is called the proportion fit for making axes.
Divide the weight of an alloy into four parts and that of tin is equal to one of them; this is called the proportion fit for making ge and ji halberds. Divide the weight of an alloy into three parts and that of tin is equal to one of them; this is called the proportion fit for making broadswords. Divide the weight of an alloy into five parts and that of tin is equal to two of them; this is called the proportion fit for making knives and arrows. Tin is equal to half of the weigh of the alloy; this is the proportion fit for making bronze mirrors.

Zhushi make knives, which should be a chi long, a cun wide. [A knife should not be straight but curved and] six of them should be arranged into a circle. It should be always sharp as new; even when it is almost used up, there is no flaw [in the alloy].

Yeshi make arrows. The arrowhead should be a cun long and a cun in circumference. The arrow foot should be ten times as long as the arrowhead (i.e. a chi) and weigh thirty wan. The hu of the ge halberd should be two cun wide; the width of the nei double it (i.e. four cun); the length of the hu triple it (i.e. six cun); the width of the yuan quadruple it (i.e. eight cun). [The angle between the yuan and hu should be fit for the ge halberd to function as a weapon.] If it is too obtuse, the ge halberd cannot hurt the enemy; if it is too sharp, the ge halberd cannot cut down its goal. [The ratio of the width of the yuan and the nei should be fit for the ge halberd to function as a weapon.] If the nei is too wide, the yuan would be easily broken; if the nei is too short, the ge halberd could be used efficiently [in the battlefield]. For this reason the angle between the yuan and the hu is a little more than a right angle. The ge halberd weighs three lue.

The hu of the ji halberd is one and a half cun wide; the width of the nei triple it (i.e. four and a half cun); the length of the hu quadruple it (six cun) and the width of the yuan
quintuple it (seven and a half cun). The angle between the yuan and the hu is a right angle. The stab included, the [whole] ji halberd weighs three lue.

Taoshi make swords. The width across the two edges of the blade equals two and a half cun (laguang); the width between the ridged middle and each edge of the blade is equal to half of laguang. The laguang should be the circumference of the sword handle (jingwei). The length of the sword should be double its circumference. In the middle of the sword handle is the hou (which includes three bulgy rings set on the handle). Divide the laguang into three parts and subtract one; the remainder should be equal to the diameter of the end of the sword handle (shouguang). Make it round with this diameter. If the sword body is five times long as its handle and the whole sword weighs nine lue, this kind of sword can be called the highest standard (shangzhi) and can only be used by the noble of the highest status (shangshi); if the sword body is four times long as its handle and the whole sword weighs seven lue, this kind of sword can be called the middle standard (zhongzhi) and can only be used by the middle noble (zhongshi); if the sword body is three times long as its handle and the whole sword weighs five lue, this kind of sword can be called the lowest standard (xiazhi) and can only be used by the lowest noble.

Fushi make bells (yongzhong). The two projecting angles (luan) (of the bell mouth) are called xian. The edge part between xian is called the yu. The part above the yu is called the gu. The part above the gu is called the zheng. The flat top above the zheng is called the wu. The part above the wu is called the yong. The flat top above the yong is called the heng. The round part at which the bell is suspended is called the xuan. The part
resembling a certain beast on the xuan is called the gan. The [decorated] bands on the surface of the bell are called the zhuan. [The protruding “bell-nipples”] between the zhuan are called the mei. The mei are (also) called the jing. Above the yu the sunken and shiny part is called the sui.

Divide evenly (the length of) the xian into ten parts and deduct two; (the length of the remainder eight parts) should be (that of) the zheng, which should be equal to the distance between the xian (xianjian). Deduct [further] two parts [of the length of the xian]; [the length of the other six parts] should be equal to the distance between two gu (gujian). The distance between the two gu should be equal to [the lateral length of] the wu. Deduct [further] two parts [from the length of the xian], [the other four parts] should be equal to the width of the wu (wuguang). The length of the zheng should be equal to that of the yong. The length of the yong should be equal to its circumference [at the bottom]. Divide its circumstance (at the bottom) into three parts and deduct one; the rest should be equal to the circumference of the heng. Divide the length of the yong into three parts, two of which are above and one below, where the xuan should be designed.

How thick should the bell body be? What about the sound: clear or unclear? [If the sound is affected by the form of the bell mouth, to what extent) will the sound be affected by what kind of bell mouth, a flaring one or a constricted one? [To all the above questions] there are answers [which should be of concerned when a bell is made]. If the bell is too thick, [when struck,] it will sound like that of a stone [being struck]; if too thin, [when struck,] its sound will disappear too soon. If the bell mouth is flaring, it will sound bombastic; if constricted, it will sound choked. If the yong is overly long, [when the bell
is struck,] the sound will not be stable. So [when made,] a larger bell’s gujian is divided into ten parts, one of which should be equal to its thickness; a smaller bell’s zhengjian is divided into ten parts, one of which should be equal to its thickness. If a bell is made wide yet short, it will sound shallow and can only be heard nearby; if a bell is made narrow yet long, it will sound leisurely and can be heard farther away. To make the sui, divide the thickness [of the bell wall] into six parts, one of which should be equal to (the sui’s) depth [underneath the bell’s platform]. Make it (i.e. the sui) rounded [and smooth].

Lishi make vessels of measure. Smelt the bronze and tin till there are no impurities. If there is nothing impure coming out of them, weigh them; having weighed them, measure their volumes with water; and then mould the vessels of measure. Mould the measure fu, which (main part) is a chi deep and squarish inside (in the bottom); each side of the square should be a chi wide, and as a whole, the fu looks round when viewed from the outside. It contains a fu (which is the standard measure in the Qi state). The bottom part underneath the fu is a cun deep; it contains a dou. On both sides of the fu there are two identical containers like two ears [on a head], each of which is three cun deep and contains a sheng. The fu weighs a jun. Strike it and it sounds like the gong scale in the swing of the “Yellow Chime-bell.” It is used freely in the market as the official standard among other different measures. The inscription on the fu reads: with the wise king’s effort to invent a standard for the people so that they can use it throughout the whole country, the beneficial measure has been made and spread to all the states according to the enactment. The later generations should [also] be enlightened by this invention and keep this measure as a rule.
Generally speaking, when the bronze and tin are smelting, there is such a phenomena: after the black and muddy air disappears, there comes the yellow and white air; after the yellow and white air comes the green and white air; and after the green and white air comes the green air—only then can the vessels be moulded.

Duanshi (the agricultural tool makers). (Passage lost)

Hanren make cuirasses. The cuirass made from the hide of a rhinoceros (xijia) includes seven pieces; the cuirass made from the hide of female rhinoceros (sijia) consists of six pieces; and the cuirass made of double layers of hide (hejia) comprises five pieces. The xijia can be used for a hundred years; the sijia can be used for two hundred years; and the hejia can be used for three hundred years.

Generally, in the process of making a cuirass, it is necessary to measure the body first, then to cut the hide. Measure the half above waist (shanglū) and then the half below waist (xialū); they should be the same weight. The length of the cuirass should be equal to the circumference of the waist. Regarding the hide, it will not be tough enough unless it has been treated thoroughly [with hammer]. If being treated [with hammer] more than enough, however, the hide will become twisted [and loses its toughness].

In general, the way of examining the cuirass is: (1) to look at the stitches [on the hide], which should be as tiny as possible, (2) to look at the inside of the hide, which should be as smooth as possible, (3) to look at the seams, which should be as straight as possible, (4) to wrap the whole cuirass, which should be as small as possible, (5) to hold it and look at the whole thing, which should be as solid and graceful as possible, (6) to wear it, in which (i.e. the good one) no irregularities should be found. If the stitches look
tiny, the hide should be tough; if the inside of the hide looks smooth, the material is good; if the seams look straight, the workmanship is wonderful and if the cuirass can be wrapped to a small package, its quality is fine; hold it and if it looks solid and graceful, it must be well polished; wear it and if there is nothing irregular, it must fairly flexible [and the person who wears it can move around easily].

Regarding the work of skinners (baoren). If one looks from a certain distance at the hide the skinners make, it (the good one) should be white as the color of the tu flower (which is a kind of bitter edible plant). If one goes forward and holds it; it should be felt soft and smooth. Reel it up tightly; it should not be oblique to either side. If one looks at the junction where two hides are sutured together, it should be as narrow as possible. If one looks at the thread with which the hides are sutured, it should be as hidden as possible. The color of the hide should be white as the tu flower. If one dips the hide into some special liquid and wash it, it will become tough. The hide should be smooth. If one treats it with certain oil, it will become soft and supple. Hold and unfold it; it should be flat and straight. If flat and straight, it must be made from the material of integral quality; if oblique and twisted, it must be made loose in one place and stiff in another. If the hide is made loose in one place and tense in another, when it is used to make things, it will first split where it is stiff. If it is split, [it has to be trimmed;] then the original wide piece of hide becomes narrower. Roll the hide up tightly; if it is not oblique to either side, it is the result that the hide has achieved the same thickness as a whole. If the junction of two pieces is as narrow as possible, the hide will spread normally [and will not be twisted]. If the thread has been as hidden as possible, it will not wear out even if the hide does.
Yunren make drums. [The pieces of wood that constitute a drum are all] six chi and six cun in length; each of the pieces has its left and right ends six cun and its middle a chi wide and each of the pieces is three cun in thickness. The height of the arched part of the drum is equal to one third [of the diameter of the drum surface]. Divide every piece of the drum wood into three parts and all the sections are flat and correct. The body of the drum is eight chi high; the diameter of the drum surface is four chi long; the diameter of the middle section is one third [of that of the drum surface] longer: [a drum of this kind] is called the fen drum (used in army). To make the gao drum, [the following measures should be satisfied:] (1) its body should be a xun (a xun equals eight chi) and four chi high; (3) the diameter of its surface should be four chi long; and (3) the extruding angle in the middle of the drum body is equal to a xinzhe. Generally speaking, to cover the surface of the drum [with hide], it should be on the day of qizhe. For a good drum, the lines on its surface should form concentric circles from the center out. If the drum is large and short, [when struck,] it will sound hasty and can only be heard nearby; if it is smaller and longer, it will sound leisurely and can be heard for a (relatively) long distance.

Weishi (Tanners). (Passage lost)

Qiushi (Furriers). (Passage lost)

Concerning the work of textile, dyeing, and embroidery workers (huaren and huiren). They are in charge of mixing five colors. The direction of the east is symbolized by the color of green; the south, of red; the west, of white; the north, of black; the heaven, of dark black (xuan); the earth, of yellow. The order of coloring [cloth]: the color of green is next to that of white; red next to black; dark black next to yellow. The design
consisting of green and red is termed wen; the design consisting of red and white, zhang; the design consisting of white and black, fu (3); the design consisting of black and green, fu (2); the design consisting of all the five colors, xiu. Paint the earth the color of yellow, which is symbolized by a square. Paint the sky following the sequential changes of color of different seasons. Symbolize fire by a circle; symbolize mountains by a roe deer; symbolize water by the dragon; birds, beasts, and snakes [are also other common symbols in painting]. Those who can paint the four seasons with their corresponding colors and make them striking can be called skillful. Regarding the work of painting, dyeing, and embroidering, white color should be the last [to be added and fit into the design].

Zhongshi dye feather. Soak broomcorn (kaoliang) in vermilion for three months and then steam them thick enough to dye feathers. Being dipped into the dyestuff three times, the color of the feather will become pink (xun); five times, deep green with red overtone (zou); and seven times, black (zi).

Kuangren (basket-makers). (Passage lost)

Huangshi (silk-cleaners) prepare silk. Soak silk in warm water together with plant ash (shuishui); insolate it somewhere a chi above the earth for seven days; expose it to sunlight in daytime and place it in a well at night; repeat this for seven days and nights: this is called preparing silk with water (shuilian). To prepare cloth (lianbo): (1) burn chinaberry tree into ash and mix it with water, (2) the mixture will become thick enough to prepare cloth in several days, (3) water the cloth with it and then put the cloth into the smooth container, (4) water the cloth with the liquid mixed with shell ash, (5) clean out the ash deposit (with clean water) and then wring out the cloth, (6) shake it, (7) water it
with zhe again, (8) (clean the deposit and) wring the cloth again, (9) cover it with shell ash, (10) leave it set overnight, (11) the next day, water it and wring it out again, (12) expose it to sunlight in the daytime and place it into a well at night, and (13) repeat this for seven days and seven nights: this is called preparing cloth with water (shuilian).

Yuren is in charge of jade. The gui entitled to the Son of Heaven is named the Zhen type and is a chi and two cun long; that of the highest ranking noble (gong) is the Huan type, which is the Ming type of nine cun long; that of the second in rank a marquis (hou), the Xin type, which is the Ming type of seven cun long; the third in rank, earl (bo), the Gong type, which is the Ming type of seven cun long. The mao, four cun long, is held by the Son of Heaven when he meets with the vassals.

[The qualities of the jades used by the Son of Heaven and officials of classified ranks are different:] The Son of Heaven uses jade of pure color, while the high noble, that of spotted colors (the ratio of jade to stone is four to one); the marquis, that of stippled (the ratio of jade to stone is three to two). The earl uses jade containing one half jade and some other stone; those [whose rank is] lower than the viscount and baron use fur and cloth. The gui used by the Son of Heaven has silk bound in the middle. Four gui arranged together, each 1 chi and 2 cun long, are to sacrifice the heaven. The big gui type, three chi long, looks like two pyramid-shapes butted together, is exclusively used by the Son of Heaven. The tu (earth) gui type, a chi and five cun long, is designed to survey the shadow of the sun and measure the land. The Luo (naked) gui type, a chi and two cun long, with a spoon [on one side], is made for sacrifice in the ancestral temple. The wan gui type, nine cun long, held by a board of the same size of the wan gui and covered with suitable cloth,
is to be bestowed to the vassals for their virtues. The yan gui type, nine cun long, is shaped like "pan gui," (which is the symbol of punishing the evil and rebels and correcting the deeds of the vassals.)

The bi, which outer diameter is a chi and inner diameter is three cun long, is the standard of length. The gui bi type, which diameter is five cun long, is used in sacrificing to the sun, the moon, and the stars. The bi cong type, nine cun long, is used by the vassals when they present gifts to the Son of Heaven. The gu gui type, seven cun long, appears (in the ceremony) when the Son of Heaven marries off his daughters. Both the big and middle zhang are nine cun long, while the bian zhang type is seven cun long, with the perimeter of four cun long, a cun thin, and on the other side a golden spoon is attached and decorated with lead outside and red lacquer inside, which diameter is four cun and extending a cun long to direct the contained soup out and tied with silk. These three are to be presented as a sacrifice to the mountains and rivers when the Son of Heaven travels or hunts in the domain; they could also used in the guan ritual before the priest kills the horses as a sacrifice to the mountains and rivers. [The function of] the big zhang type is similar [to that of the gu gui type, that is], it is to be presented [in the ceremony] when the vassals marry off their daughters. The zhuan (carved) gui and zhuan zhang, which are both eight cun long, together with the bi cong type, are to be used in marriage. The ya zhang type and zhong zhang, seven cun long, on one side of the perimeter two cun long, a cun thin, are used [as symbols of the army when the court decides] to launch a war [against an enemy] or deploy the army. The zu cong type bound with silk, which diameter is five cun long, is used by the empress as a measure of weight in balance. The
big cong type, [regarded as something] owned by a wife [in a family] and [actually] held by the empress [in the royal family], is twelve cun long, the perimeter of every pair of corresponding angles being four cun long and each side, a cun thin. The zu cong of seven cun long, with its diameter one and a half long, is used by the Son of Heaven as the standard of weigh. Two guis, five cun long each, the bottom of one of each on the opposite side of the other, flanking a cong between them, are presented to sacrifice the earth, or to sacrifice the four directions in the “lù” sacrifice. The zhuan (carved) cong type is eight cun long, held by the vassals when presenting gifts to the empress. The an (a kind of container) decorated with jade is twelve cun high, with dates and nuts in it. [When used, usually] twelve pairs of an [are for the king], nine are for the vassals and five are for the ministers in the ceremony that furen, the third wife of the Son of Heaven, hosts. The zhang type with the slant edge on its bottom side, on which there are absolutely no ornaments, is used in the ritual of sacrificing the mountains and rivers, in presenting food, cooked meat, and uncooked flesh.

Jieren (a kind of wood workers). (Passage lost)

Diaoren (Stone carvers). (Passage lost)

Qingshi make chime-stones. The top angle of the chime-stone (jugou) is equal to a ju (a ju equals ninety degree) and a half. If one supposes the width of the relatively shorter and wider part (gubo) is one proportion, the length of it (guchang) should be two; the length of the relatively longer and narrower part (guuchang) (the portion being struck) should be three. Divide its gubo into three parts and subtract one; the rest should be equal
to the width of the relatively longer and narrower part (guubo). Divide the guubo into three parts, one of which should be equal to the thickness of the longer and narrower part

Strike the chime-stone; if it sounds too clear, scrape its two sides (pang); if it sounds too low, scrape its two ends (duan).

Shiren make arrows. For hou arrow and the fu arrow, if being divided by three, their front two parts should weigh the same as the rear one. For bing arrow and the tian arrow, if being divided by five, their front two parts should weigh the same as their rear three. For the sha arrow, (if being divided by seven,) its front three parts should weigh the same as its rear four.

Divide the arrow shaft by three; make it gradually slimmer from the point connecting the front one and the rear two parts. Divide the arrow shaft by five; fix the arrow feathers in its rear one fifth. The depth of the feather entering into the arrow shaft (yushen) should be equal to the diameter of the shaft section (gaohou).

Float the arrow shaft on water to discriminate the side away from the sun (yin) from the one towards the sun (yang). The bi, which is at the end of the arrow shaft formed as a notch, should be set up at the point where the yan and yang sides of the shaft can be divided evenly. The feather should also be fixed in the bi where it can be divided evenly.

Divide the length of the arrow feather into three parts, one of which should be equal to that of the arrowhead. This ensures that, even though the wind is strong, the arrow can fly through it without interference. The arrowhead should be a cun long, which is equal to its circumference. The ting, or arrow foot, which is the other end of the arrowhead fixed into the shaft, should be ten times as long as the arrowhead and weigh three yuan.

[The strength of the arrow shaft should be even everywhere.] If its front part is less than strong, it will fly lower than the normal; if the rear part is less than strong, it will fly
higher than the normal; if the middle is less than strong, it will fly hardly straightway; if it is more than strong, it will fly unsteadily. If the arrow feather is too big, the arrow will fly slowly; if it is too small, it will fly obliquely. For this reason, (when making an arrow, one should) grip the arrow shaft with the fingers and move it in order to examine whether or not the arrow feather is too big or too small; bend the shaft a little in order to examine whether or not its strength is evenly distributed.

Concerning the quality of the arrow shaft, [supposing there are two pieces of wood to choose,] the piece with a naturally round form is the better one; if they are both equally round, the piece weighing more is the better one; if they both weigh the same, the piece with less knots is the better one; if neither of them has many knots, the one with the color of maroon is the better.

Taoren (potters) make the yan container, which has a capability of two fu (a fu equals six dou and four sheng), (which body is) half a cun thick and which mouth is a cun thick. (Potters make) the pen container, which has a capacity of two fu, (which body is) half a cun thick and which mouth is a cun thick. (Potters make) the zeng container, which has a capacity of two fu, (which body is) half a cun thick and which mouth is a cun thick with seven holes in its bottom. (Potters make) the li container, which has a capacity of fu hu (a hu equals a dou and two sheng), (which body is) half a cun thick and which mouth is a cun thick. (Potters make) the yu container, which has a capacity of two hu, (which body is) half a cun thick and which mouth is a cun thick.
Fangren (moulders) make the gui container, which capacity is a hu, which height is a chi, which body is half a cun thick, which mouth is a cun thick. (Fangren make) the dou container, which capacity is one third hu and which height is a chi.

Considering the work of potters and moulders, those containers that lose their feet, or are deformed because of careless treatment, or have cracks, or are not smooth can not be sold in the market. Make the containers according to the container maker zhuan and make the dou container according to the plumb. The zhuan is four chi high and its bottom is squarish with each side four cun long.

Shenren make the holders and beams for hanging musical instruments (sunju). Under the heaven there are five categories of “big beasts” (dashou): (1) those animals with antlers (zhizhe), (2) those animals without antlers (gaozhe), (3) those animals with short furs (luozhe), (4) birds (yuzhe), (5) and dragons and snakes (linzhe). Animals belonging to the zhi and gao categories are often used as sacrifices in the rituals associated with an ancestor temple. Those belonging to the categories of luo, yu, and lin are often used in decorating the holders and beams for hanging musical instruments.

Those whose bone grow outside, those whose bone grow inside, those that walk backwards, or sideways, those that move constantly, or zigzag, those that speak with their heads and necks, or with their mouths, or with either or both sides of their bodies, or with their wings, or with their laps, or with their stomach, belong to the category of “small animals” (xiaochong), which can be used as models in decoration.

Those that have thick lips, big mouths, projecting eyes, small ears, huge stomachs, short backs, big bodies, short necks, etc., belong to the luo category. Generally speaking, they are strong but not good at running, with tremendous bellowing. Strong but not good at running, they are useful in holding heavy burdens; with tremendous bellowing, they are suitable for bells. If animal figures like these are used in making holders for bells, when they are struck, the sounds seem to come from the holders.
Those that have sharp beaks, split mouths and lips, narrow eyes, gracile necks, small bodies, and undeveloped bellies belong to the bird category. Usually they are not strong but alert; their singing sounds high and clear and can be heard afar: their figures are suitable for [decorating] the chime-stone, that is, figures like these can be used in making the holders for chime-stones. If one plays chime-stones supported by such holders, it will sound as if it comes from the chime-stone holders with the bird figures.

Those whose heads are small but long and whose bodies are round and well-proportioned belong to the dragon-and-snake category. Their figures are fit for beams. In general, those that prey and devour other animals must extend their claws, protrude their eyes, and spread their scales and beard [when they do that]. When they extend their claws, protrude their eyes, and spread their scales and beard, they must look to be bursting with anger; if they look like they are bursting with anger, they are suitable for holding heavy burdens; furthermore, their expression must look as if they are roaring. If their claws are not extended, their eyes not protruding, and their scales and beard are not spread, they must look listless; if they look as if they are listless but are still used in holding heavy burden, they must look as if they cannot hold it; (consequently,) their expression does not look as if they are roaring.

Ziren make drinking vessels. The capacity of a shao ladle is a sheng; the capacity of the jue goblet is a sheng and the capacity of a gu beaker is three sheng. To present (xian), the jue should be used; to bestow (chou), the gu. A xian plus three chou is equal to a dou. A dou of meat plus a dou of wine for each meal is the average appetite of a man. To examine the (quality) of the drinking vessel made by ziren, the master of ziren will try drinking with it as usual; if it does not permit him to drink the wine over, generally speaking, the master will blame the vessel maker.

Ziren make arrow targets (hou). In the squarish middle of the gu (guzhong), its width is equal to its height in dimension. Divide its width by three; the width of the hu, which is a square in the center of the target, is equal to one third of the gu’s width. The upper two extending “arms” of the target (shangge) plus the width of the target should be three times as long as the width of the target. The lower two extending “feet” of the target (xiage) are half as long as the width of the target. The ropes extending from the shangge
(shanggang) and xiage (xiagang) are a xun long each. The diameter of the ring (used to fasten rope) is a cun in length. To set up the pihou, which is decorated with the hide of a tiger, leopard, and bear and the center of which looks like a bird, is to assess the shooting art of the officials in (the special) spring (ritual). To set up the wucaizhihou, which is painted with such five colors as red, white, green, yellow, and black, is to hold the welcome shooting ritual in the meeting with the vassals. To set up the shouhou, on which animals are painted, is to hold the shooting ritual at king’s banquets. In the ritual of sacrificing the hou, wine, dried meat, and meat sauce are needed. The sacrifice words are as follows: “You, allegiant vassals, are not like those disloyal ones, who disobey and are unwilling to meet the king; so please raise your bows and shoot them. Blessings to the allegiant vassals, may you always have good drink and good food, and may the blessings extend to your great-grandchildren.”

Luren make weapon handles. The handle of the ge halberd is six chi and six cun long; the shu combat baton, a xun and four chi; the chariot ji halberd, a chang; the qiu spear, a chang and four chi and the yi spear, three xun. Generally speaking, no weapon should be taller than three times the height of the person who uses it. If it is taller than that, he cannot use it; otherwise, it would be harmful for the user. For this reason, when attacking a city, the soldiers should hold shorter weapons; but when defending a city, the soldiers should hold longer weapons. The number of those who attack a city is often more [than that of those who defend it]; usually they need to march a long way [in order to attack the city] and [sometime] have to suffer the lack of food and drink; moreover, they have to overcome the obstacles of high mountains and dense forests along their way [to the city]. This is why their weapons have to be shorter [so that they need not carry longer and heavier weapons with them]. By contrast, the number of those who defend the city is usually less [than that of those who attack it]; they have enough to eat and enough to drink; they
need not travel far and, moreover, they need not to go through those huge mountains and dense forests. This is why they can carry longer weapons with them.

In regard to weapons: those used for sickling the enemy (goubing) should not be unstable and those used for thrusting the enemy (cibing) should not be crooked. For this reason, the section of the goubing handle should be elliptical, while the cibing, circular. Those weapons used for pounding the enemy (jibing) should have the same strength throughout the handle; the part of the handle where the jibing is held should be a little thinner (than the rest) so that it can be held tightly and wielded easily. The cibing should have strength throughout the handle; the part of the handle where it is held should be a little thicker and heavier (than the rest) so that it will hit the target accurately and be deadly when used.

To make the handle of a shu combat baton, divide its length into five parts, one of which should be the length of the pi, which is the part from the point held by hand to the end of the handle. This section of the pi should be circular. Divide the circumference of the pi into three parts and subtract one, the rest should be equal to the circumference of the zun (jinwei), which is the cone-shaped bronze butt-end of the shu combat baton. Divide the jinwei into five parts and subtract one, the rest should be equal to the circumference of its front part.

To make the handle of the qiu spear, divide its length into three parts, two of which are in the front part and one of which is in the rear part; at that point, which section should be circular, the part held by hand should be carefully designed. Divide its circumference into five parts and subtract one, the rest should be equal to the its jinwei. Divide its jinwei into three parts and subtract one, the rest should be equal to its ciwei, which is the circumference of the front of the handle.
In general, when examining the work of the weapon handle maker, make it stand on the ground and shake it in order to find to what extent it is crooked; put it between two walls and look at whether or not it is curved evenly; hold the middle of it and shake it in order to observe its strength. Suppose all of the five kinds of weapons and the flag on a chariot are set up (on the chariot); if the chariot is not unstable when it runs, then the work of the weapon handle makers can be called a master workman.

When the Jiangren (Surveyers) build the [capital] city, [first,] they use plumb lines and water levels to gauge the flatness of the land; plant a straight pole in the ground and aligns it with plumb lines; observe and mark the shadows of the pole during the time when the sun rises and sets; draw circles and make it cross the shadows; and then discriminate the east-west direction [from the north-south direction] by [analyzing the above data and adjust the four directions by] consulting the shadow of the pole at noon and the position of the polestar at night.

It is the Jiangren (Architects) who plan the capital city. [The Capital city] should measure nine by nine li, with three gates on each side. Inside the city there should be nine longitudinal streets crossed by nine latitudinal streets. Each of the nine longitudinal streets should be nine gui wide. The ancestral Temple should be on the left [east] and the Altars of State on the right (west). The court should be in front (south), and the market in the rear (north).

The Xia people called their royal ancestral temple Shishi, the main hall of which should be two seven-\textit{bu} (i.e. 14 \textit{bu}) long from north to south and one fourth of longer (i.e. 17.5 \textit{bu}) in width (from west to east). This hall should consist of five rooms, the middle
of which is four \(bu\) long and four \(bu\) plus four \(chi\) wide; each of the other four room located at the four corners is three \(bu\) long and three \(bu\) plus three \(chi\) wide. Altogether there should be nine steps. In each of the corner rooms there should be two windows designed to flank the door. All the walls should be stuccoed white. The size of the front hall should occupy two thirds of that of the main hall and its north-south length, one third of the main hall’s.

The Yin (i.e. Shang) people named their royal ancestral temple Chongwu (double roofs), which should be a main hall seven \(xun\) long (from north to south), with a base of three \(chi\) high, four ridgepoles and double roofs.

The Zhou royal ancestral temple is called Mingtang (Bright Hall), which should be nine \(yan\) wide (from east to west), seven \(yan\) long (from north to south), and a \(yan\) high, if measured by \(yan\), which is equal to nine \(chi\). [As the Xia Shishi.] the Zhou Bright Hall includes five rooms and [each of them is] two \(yan\) long and two \(yan\) wide.

The \(ji\) is a suitable measure for a room; \(yan\), for a hall; \(xun\), for a palace; \(bu\), for wild land; \(gui\), for road. The Temple Gate (front gate) of the ancestral temple should be as wide as seven big \(jiong\) (three \(chi\) each) and the Wei Gate (smaller gate in the temple), three small \(jiong\) (two \(chi\) each). The Lu Gate should be no more than five carts wide, while the Ying Gate, three \(gui\) wide.

There should be nine rooms within the Lu Gate for the king’s nine consorts to live in, another nine rooms out of the Lu Gate for the nine ministers to meet with the king (and to apply themselves to administration). The business of a country can be divided into nine classes, each of which should be in charge of by an appointed minister.
The gate of the palace should measure five zhi high; the (four) corners of the place walls, seven zhi high and the (four) corners of the King’s city walls, nine zhi high.

The longitudinal road should be nine gui wide; the circle road (within the city walls), seven gui and the wild road, five gui.

Cities built in the fiefs of princes or ministers should not have any corner of the city wall higher than the palace gate (five zhi); cities constructed in the domains of vassals should not have any corner of the city wall higher than that of the palace wall (seven zhi). The width of longitudinal roads in vassals’ cities should not exceed that of the circle road within the King’s city (seven gui), while the longitudinal roads in princes and ministers’ cities should be no wider than the wild roads in the domain of the King’s city (five gui).

Architects are responsible for building ditches among fields. The si, which is a spade-shaped farm tool used for digging, is five cun wide; the ou plough is two times as wide as the si; so, if one uses an ou plough to excavate a ditch, the ditch should be a chi wide and a chi deep, which is called quan. The measure of the ditch located at the end of the field should be doubled, i.e. two chi wide and two chi deep, which is called sui. Nine fu—which means one hundred mu of land—constitute a well-formed field (jing). The ditch between two well-field is four chi wide and four chi deep, which is called gou. A square land with each side ten li (Chinese mile) is called a cheng. The ditch between two cheng is eight chi wide and eight chi deep, which is called a xu. A square field with each side of a hundred is called a tong. The ditch between two tong is two xun wide and two xun deep, which is called a kuai. Water from huai converges into a river and every river has its own name.
Concerning the topography under heaven, between two mountains, there must be a river. On each side of a big river, there must be a road [along with it]. If a ditch is excavated adversely to the direction of the mountain range, water cannot flow in it; if the ditch is not straight, water cannot flow in it. The shaogou—which is the ditch not going through arable land—should double its previous width every thirty li as it flows downward. To make backwater flow, the architect should build the structure with the angle of a qingzhe, which sides should have the ratio of three to five. To make water fall from a certain height, the angle of the place where water falls down should be right-angled. Generally speaking, one should excavate the ditch according to the flow of water and construct the embankment according to the topography. A well-designed and constructed ditch helps water flow fluently without silt; a well designed and constructed embankment allows the silt to solidify itself.

When an embankment is being built, the width of its top part should be equal in dimension to its height; the ratio of the grades of the two sides of the embankment should be three to two. To make a larger embankment, one should make the bottom of the embankment wider.

When excavating a ditch or constructing an embankment, one should regard a day’s work done by a man as standard, figure out how many laborers are needed for the whole project according to the labor needed in the construction of every li, then manage the labor to complete the whole project. When using ropes and boards to restrict the wall, one must control the strength of the ropes: if it is too restricted to the boards, the boards will be curved and will not work as they should.
Concerning a thatched cottage, the height of the roof should be equal to one third of its length; a tile-roofed house, the height of the roof should be equal to one fourth of its length; a round barn, cellar, squarish barn, or city wall, the width (or diameter) of the top should be equal to five sixths of its height, which is termed niqiang; the path in front of the main hall [of a house], the height of the middle of the path should be equal to one twelfth of half of the path’s width; the watercourse in the palace, it should be three chi deep; the palace wall, it should be three chi thick and its height should be three times as high as the thickness of it.

In regard to the cartwright, the angle equal to half of a right angle is called a xuan; the angle equal to a xuan and a half is called a zhu; the angle equal to a zhu and a half is called a ke and the angle equal to a ke and a half is called qingzhe.

Cartwrights make the handles of the lei plow. The length of the lower end (zi) is equal to a chi and a cun and the length of the straight middle part is equal to three chi and three cun; the length of the carved upper part is equal to two chi and two cun. The length of the handle from the lower end along its curve to the upper end is equal to six chi and six cun; the straight-line distance between the lower end and the upper end is equal to six chi, which is equal to the distance of a bu. The straight zi is suitable for plowing hard land while the carved zi is suitable for plowing soft land. The straight zi is convenient (for the users) to push the plow, while the curved zi is convenient (for the users) to dig down into the earth. If the angle between the zi and the straight middle part of a lei plow is equal to a qingzhe, (151.29°?) such a plow is said to be suitable for both hard and soft lands.
Cartwrights make carts. The axe handle (ke, which is the standard in making carts) is three chi long, three cun wide, and a cun and a half thick. Divide the length of the ke by five, one part of which is equal to the width of the axe blade. The length of the cart hub (gu) is equal to half of a ke; the circumference of it (wei) is equal to a ke and a half. The spoke is a ke and a half long, three cun wide, and a cun thick. The felloe of the cart (qu) is made from three pieces of wood, each of which is three ke in length.

The cart running in a wet plain should be fit with a shorter hub, while a cart running in the mountain area should have a longer one. A shorter hub makes the wheel run fast; while a longer one makes it run stable. In regard to the cart running in the area of a wet plain, when the felloe of the wheel is treated with heat, the wood for making the felloe should have its heart part towards outside (fanrou); in regard to the cart running in the mountain area, when the felloe of the wheel is treated with heat, the wood for making the felloe should have both its heart and outer parts towards outside (zerou). The felloe made from the wood with its heart part towards outside looks smooth; while that made from the wood with both its heart and outer parts towards outside is tough.

Divide the height of the wheel (lunchong) by six, one of which should be equal to the circumference of the section of the felloe. The Bai cart, which is suitable for running in the mountain area, should have its hub a ke long, which circumference should be equal to two ke, with each of its spokes a ke long, and should have its felloe made from three pieces of wood, each being two ke long. Divide the height of wheel of the Bai cart, one fifth of it should be equal to the circumference of the section of its felloe. The big cart, which is suitable for running in the wet plain area, should have its wheel three ke high,
have a cake-like convexity (geng) a cun thick, and its body (pinfu) two and two thirds ke long. The yang (goat) cart, which is suitable for running in the area between the wet plain and mountain area should have its pinfu two and one third ke long; the bai cart should have its pinfu two ke long.

In regard to the making of the cart shaft, its length should be three times the height of its wheel. Divide the length of the cart shaft into three parts, two of which are in the front and one of which is in the rear; at the point where the two parts are divided chisel a hole (gou) so that it can be fixed to the axle. The distance between the two wheels of the cart should be six chi in length. The yoke should be six chi long.

Gongren make bows. (The bow makers) should get the six raw materials (gan, jiao, jin, jiao1, si, and qi) according to their specific times (when they are in their best quality for making bows). Once the six raw materials have been prepared, delicate skills are required to fit them together. The bow body (gan) should be strong enough for the arrow to fly far; the ox horn (jiao) should be good enough for the arrow to fly fast; the sinew (jin) should be tough enough for the arrow to shoot deep; the glue (jiao) is required to solidly glue the parts together; the silk (si) is needed to fasten the bow body; and the lacquer (qi) are used to protect the bow body from the mar of frost and dew.

There are, generally, seven materials suitable for making the bow body: the zhe (three-bristle cudrania) wood is the best; the yi wood takes second place; the yan sang (oak) the third; ju (tangerine) the fourth; mugua (Chinese flowering quince) the fifth; jing (several bushes living in the chu area) the sixth; and zhu (bamboo) the inferior. In regard to the selection of the material for making the bow body, those that are dark red in color
and sound clearly when struck are the best. Being dark red in color indicates that the
timber is from the heart of the tree; sounding clear when knocked means that the timber is
far from the root of the tree. Regarding how to cut the wood and make the bow body, (the
bow makers) should reverse its texture to curve it in order to make the bow to shoot far;
in order to make the bow to shoot deep, (the bow makers) should choose the wood with a
straight and strong texture. (One of) the principles of cutting the bow body is that the
timber should not be cut obliquely so that the texture of the wood could not be destroyed.
[If this principle can be observed,] the gong will not be twisted when being used.

In regard to the selection of the ox horn: the horn from the ox killed in autumn is
thick, while that from the ox killed in spring is thin; the horn from the young ox is
straight and smooth, while that from the old ox is coarse and rough; the horn from the
sick ox is not solid inside whereas the horn from the lean ox is ashen. The good ox horn
should be light green in color and its tip should be fully developed. The part towards the
root of an ox horn, because it is close to its head therefore nourished by the qi, is soft.
Because it is soft, it grows curved [and can be used in making bows]. White in color
indicates that it has the potential of being curved. The middle part of a horn, which is
usually attached with the carved part between the end and the middle of a bow (wei),
should be tough enough to be curved. Being green in color indicates that the horn is
tough enough. Concerning the tip of a horn concerned: if it grows farther from the head,
it cannot be nourished by its qi, so it is (more) fragile (than other parts). The tip of a horn
is usually more fragile than other parts, so those that are softer are better for making
bows. The full development of the horn tip indicates its softness. If an ox has a horn two
chi and five cun long, with its root part white, its middle part green, and its tip fully developed, it can be said to be wearing another ox on its head, which implies that the value of the horn is equal to that of a whole ox.

In regard to the selection of the glue: it should be vermillion in color and dry in quality. Good glue should be dry, have deep cracks, be shining on the surface, and the cracks be interwoven into bunches. Deer glue is light green in color; horse glue is light red in color; ox glue is crimson in color; mouse glue is dark in color; and rhinoceros glue is yellow in color. Other glutinous materials cannot compete with the above.

In regard to the selection of the sinew: the ideal sinew should be narrow and long if it is small and it looks knotted and smooth if it is large. If the small sinew is narrow and long, the large sinew looks knotted and smooth, the animal with such sinews must be strong and fast. If the bow is made with the sinews from such an animal, no doubt the bow will be as strong as the animal and the arrow will fly as fast as the animal moves. The sinew should be fully treated.

The lacquer should be limpid.

The color of the dry silk should be the same as that of the silk in water.

Only when the above six materials are ready can bows of high quality be made.

To make bows, [the bow maker] cuts the timber to make bow bodies in winter, treats the ox horns with thick wine in the spring, prepares the sinews in summer, and fix the three together with silk, glue, and lacquer in autumn. When the weather becomes cold the bow maker should put the bow into the bow box [in order to keep it in good shape]. When the weather becomes extremely cold the bow maker should examine the cracks of
the lacquer on the bow body [to know if they are distributed evenly]. Being made from timber cut in winter, the bow body looks smooth and its texture looks dense; having been treated with thick wine in spring, the ox horn becomes more flexible; being prepared in summer, the sinew will be evenly extended and being dealt with in autumn, the three materials will combine with other materials to perfectly form the bow. Being put into the bow box when the weather becomes cold, the bow will keep its shape without being changed [by the temperature]; examining the lacquer cracks when the weather becomes extremely cold, the bow maker will know whether or not they look like evenly distributed circles [, which indicates the high or low quality of the lacquer]. If all of the above have been done during a year, install the bow string in the coming spring, then the bow can be used.

When cutting the timber to make a bow body, the bow maker should avoid destroying the texture of the wood; when cutting the ox horn the bow maker should avoid injuring the texture of the horn; the bow maker should treat the nodal part carefully, otherwise the sinew will suffer damage when the bow has been used for some time. The quality of the nodal part, generally speaking, is harder [than other parts of the bow body]. This part rubs the sinew internally [harder than other parts do]. It is always the reason that the sinew will break around this part. For this reason the ox horn should be treated with thick wine three times and the bow body should also be treated with certain liquid twice. If the ru—which is a piece of wood fastened to the middle of the bow body to strengthen it—is too thick, the bow will be too hard to bend; (otherwise,) if the ru is too thin, the bow body will be too soft to be used. For this reason the bow body should be
treated with thick liquid carefully, meanwhile the thickness of the ru should also be considered carefully. The ru should be fastened tightly with silk and conglutinated densely to the middle of the bow body, even though other parts of the bow body do not require such tightness or density. The thickness of silk and glue at those parts should be distributed evenly.

Cut the bow body in the right way and distribute the glue evenly. If the bow body cannot be cut in the right way and the glue cannot be distributed evenly, the horn will suffer accordingly. The dry glue rubs the ox horn from the inside; this is always the reason that the horn is impaired.

To treat the ox horn one should observe such a principle, i.e. the long piece of horn should be attached to the wei parts (in order to strengthen them). If the horn attached here is not long enough, it won't follow the curve of the wei towards the inside but will veer outside when the bow is pulled—which is called ninao; consequently, the bow will not be powerful enough and the arrow won't fly very far. However, if the ox horn is longer than it should be and nearly reaches the ends of the bow (xiao), as if the bow has been coated in a box, the bow cannot accomplish its role properly and powerfully. Now, because the joint between the wei and the xiao is flexible, the bow can play its role properly and the arrow can fly fast; because there are two pieces of bone attached to the place where the bow is held (fu), they make the bow stronger and more powerful, therefore, the arrow will fly faster. However, if the ox horn is longer than it should and reaches the ends of the xiao parts as if the bow has been coated within a box, the bow cannot play its role properly and powerfully.
Treat the bow body with fire fully but not excessively; treat the ox horn with fire fully but not too much; develop the sinew fully without impairing it; and boil the glue properly with the right ratio of water and a suitable temperature. If a bow is made like this, its shape will not be changed, no matter where—in the dry or wet air—it is placed. If the bow is of poor quality, it indicates that the horn and the timber were not well seasoned when they were treated with fire. [If a bow is made like this,] it will not be stable inside, even though it may look good from the outside. If a bow looks good from the outside yet is unstable inside, the work will never be regarded as good craftsmanship.

In regard to the making of the bow: its two end should be made squarish enough, its fu should be made high enough, its wei should be made long enough, and its bi—which is the horn attached to the gan in the middle part of the bow body—should be made thin enough. [If a bow can be made like this,] it will not wear out even though it is used for a long period of time. If the fu of the bow is not high enough and the xiao are curved properly when the bow string is pulled, the fu will be impaired. If the fu is made curved, when the bow string is pulled, the joint between the fu and the wei will be injured. If the joint between the fu and wei is damaged, even though the xiao are curved properly when the bow string is pulled, the horn and the gan will also be twisted.

There are six kinds of materials required in the making of bows. Only when the gan is strong enough can the bow play its role easily but powerfully. Only being put in the bow box when it is not used can the bow keep its proper shape. [For a good bow,] when the string is pulled fully, the distance between the middle of the string and the fu should be three chi, which is the right standard. Only when the horn is used to strengthen the
bow will the horn and the string not be deformed when the bow string is pulled. In this way, the bow will be curved as part of a circle, not only when the bow string is pulled fully, but also after it is released.

If a bow is made of materials of high quality, by skillful workers, and at a suitable time, it is said to be made of three even virtues (sanjun). If the horn does not injure the gan and gan does not injure the sinew, they can also be called sanjun. To measure the strength of a bow also involves sanjun. Therefore, we observe that three times sanjun yields nine harmonies (jiuhe). A bow made of jiuhe should have its gan and horn equal in weight, should use sinew of three mou, glue of three yuan, silk of three di, and lacquer of three yu. (However, this is not an absolutely strict standard.) In the case of making a bow of high quality, a little more of every material is needed, while in making a bow of lesser quality, a little less is needed.

In regard to the making of the bows for the Son of Heaven, nine of such bows should constitute a circle; in regard to the making of the bows for vassals, seven; in regard to the making of the bows for the Grand ministers, five; in regard to the making of the bows for the Servicemen, three. A bow that is six chi and six cun in length is called the higher type (shangzhi), which is only suitable for Senior Servicemen to use; A bow that is six chi and three cun in length is called the middle type (zhongzhi), which is only suitable for Ordinary Servicemen to use; a bow that is six chi in length is called lower type, which is only suitable for Junior Servicemen to use.

A bow should be made according to the body, personality and the quality of its user. For the user who is fat, short, and slow in both temper and action, the bow should be
made strong and powerful; to assort with such a bow, the relatively softer arrows should be used. For the user who is thin, tall, and quick in temper and fast in action, the bow should be made less strong and powerful; to assort with such a bow, the relatively harder arrow should be made. If the user is slow in both temper and action yet his bow is made less strong and powerful and his arrows are made relatively soft, he will never make the arrow fly fast, consequently, the arrow can hardly reach the target, and, [even if it reach the target,] it will not penetrate deeply. If the user is quick in temper and fast in action yet his bow is made strong and powerful and his arrows are made hard and can fly fast, the arrow can hardly hit the target.

If the potential of the strength of a bow towards the outside (wangti) is more than that of the strength towards the inside (laiti), such a bow can be categorized as the jia bow or yu bow, which is suitable for shooting the hou target or using arrows tied a rope at one end (yi). If the wangti of a bow is less than its laiti, such a bow can be categorized as a king’s bow and is suitable for shooting hide, wood, and shield. If the wangti of a bow is equal to its laiti, such a bow can be categorized as the tang bow, which is suitable for shooting deeply.

The best bow should not have any crack of lacquer; the bow with cracks of lacquer on the horn and sinews of middle part but not in other parts of the bow takes second place; the bow with cracks of lacquer on all the horn and sinews of the bow but not deeply-dense, the third place; the bow without cracks of lacquer on the wei parts [but with cracks on all other parts], the inferior. The cracks throughout the bow look like the
crease lines of the hand; those on the horn look like circles; those on the ox sinew look like pockmarks and those on the deer sinew look like small worms.

Before using a bow, one should clean the dust that covers the bow, touch the bow body, and examine it. If the horn of the bow is of high quality, such a bow is termed a gou (curved) bow; if the horn and the gan of the bow are both of high quality, such a bow is termed a hou (target) bow; and if the horn, the gan, and the sinew are all of high quality, such a bow is termed a shen (deep) bow.
Appendix C
Glossary of Chinese Characters

anhuì 安徽
anyl 安陽
baigòng 百工
bang 邦
bi 壁
bianzhòng de zhòngmì zhōngsuì xīnkuǎo 編鐘的鐘謎鐘遂新考
bo 鑄
cān 參
chen mèngjiā 陳夢家
chen zhī 陳直
cheng yàotiān 程瑶田
cheng 成
chengwēnshūju 成文書局
chengzhōu bā shì 成周八師
chì 尺
chōngwù 重屋
chù 楚
chuàntróng wénhuà yù xiàndàihuà 傳統文化與現代化

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chun 春
chunguan 春官
chunhuo 鹳火
chunqiu gulang zhuan 春秋穀梁傳
chunqiu 春秋
chunyu 銛于
da sikong 大司空
dai wusan 戴吾三
dai zhen 戴震
daizhen de kaogongji tu 戴震的考工紀圖
daodejing 道德經
dawenshui 大汶水
di 地
diguan 地官
ding 定
ding 鼎
don 东
donnguan 冬官
dou 斗
duzichun 杜子春
ducheng  都城

duo  鐸

erlitou gongzuodui  二裡頭工作隊

ershiba xiu  二十八宿

erya 爾雅

fa  伐

fang  房

fen  分

fengshan shu 封禪書

fenhu 汾胡

fugong 婦功

fujun 撫軍

furen 夫人

fuyang 阜陽

fuzhi zenghouyi zhong de tiaolü wenti chuyi 複製曾侯乙鐘的調律問題芻議

gaitianshuo 盖天說

gansu 甘肅

gao 高

ge ji kao 戈戟考

ge ji yulun 戈戟余論
ge ji zhi zaibian 戈戟之再辯

gé 戈

gòng 共

gōnggōng 共工

gōngjīn zhì gōng 攻金之工

gōngmu zhì gōng 攻木之工

gōngpí zhì gōng 攻皮之工

gu jiegang 顧頡剛

gu yanwu 顧炎武

guamo zhì gōng 刮摩之工

guanzi 管子

guī 矢

guī 軌

guī jì shuwen 古籍述聞

guò bāojūn 郭寶鈞

guò dèwéi 郭德維

guò mòruò 郭沫若

guóyǔ 國語

hàn 漢

hàn 韓
handan 邯郸
hanwudi 漢武帝
hao shi yide 好是懿德
he xiu 何休
he yeju 何業鉅
hebei 河北
hejian xianwang zhuan 河間獻王傳
hejian xianwang 河間獻王
henan puyang xishuipo yizhi fajue baogao 河南濮陽西水坡遺址發掘報告
henan yanshi erlitou zaoshang yizhi fajue baogao
河南偃師二裡頭早商宮殿遺址發掘報告
henan 河南
hengyang 衡陽
hong mai 洪邁
hou 侯
hu anguo 胡安國
hu jiacong 胡家聰
hu qianying 胡謙盈
hu zhaochun 胡肇春
hu 弧
hu 胡
hua jueming 華覺明
hua 華
huahui zhishi 畫繪之事
huang xiangpeng 黃翔鵬
huangdi neijing 黃帝內經
huanggong 桓公
huaren 畫人
huaxue tongbao 化學通報
hubei 湖北
huidi 惠帝
huiren 繪人
huixian 輝縣
hushi 弧矢
ji 姬
ji 戟
jia gongyan 賈公彥
jia hui 賈徽
jiang yong 江永
jiang 姜
jianghan kaogu 江漢考古
jiangqi jiuzhi 姜齊舊制
jiangren jianguo 匠人建國
jiangren yingguo 匠人營國
jiangren 匠人
jiangsu guangling guji keyinshe 江蘇廣陵古籍刻印社
jiangsu 江蘇
jiaxia 稷下
jibian 戰辯
jie 戥
jili 季歷
jin 晉
jin 金
jing 井
jing 刑
jingdian 經典
jingjizhi 經籍志
jingxue boshi 經學博士
jinshu 晉書
jinwen congkao 金文叢考
jishui 濟水

jizhou taoli yanjiu 姬周陶鬲研究

ju 橘

juan 卷

kang youwei 康有為

kaogong chuangwu xiaoji 考工創物小記

kaogongji bushi qiguo guanshu 考工記不是齊國官書

kaogongji chengshu niandai xinkao 考工記成書年代新考

kaogongji chezhi tujie 考工記車制圖解

kaogongji daodu tuyi 考工記導讀圖譯

kaogongji de laiyou ji jiangrenyingguo de neirong 考工記的來由及匠人營國的內容

kaogongji de niandai yu guobie 考工記的年代與國別

kaogongji jie 考工記解

kaogongji liuji chengfen de yanjiu 考工記六齊成分的研究

kaogongji niandai xinkao 考工記年代新考

kaogongji tu 考工記圖

kaogongji tushuo 考工記圖說

kaogongji yingguo zhidu yanjiu 考工記營國制度研究

kaogongji yizhu 考工記譯注

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liangzhou zhiguan kao 兩周職官考
liangzhu 良渚
liaoning 遼寧
liji 禮記
lin xiyi 林希逸
lin yin 林尹
ling 鈴
liqi 禮器
liu dunyuan 劉敦願
liu hongtao 劉洪濤
liu jie 劉節
liu 柳
liude 劉德
liudeng zhi shu 六等之數
liulige 琉璃閣
liuxiang 劉向
liuxin 劉歆
liuzhi 六職
lu guizhen 魯桂珍
lu 魯
lunren 輪人
ma duanlin 馬端臨
ma rong 馬融
maoshi 毛詩
min zhi bing yi 民之秉彝
mingwen shuju 明文書局
mozi 墨子
mu 穆
nanqishu 南齊書
nanzhang 南漳
nao 饒
nei 內
nie chongyi 聶崇義
niuzhong 鈕鐘
nong zhan 農戰
nongfu 農夫
nongye chubanshe 農業出版社
nu 矯
puyangshi wenwu guanli weiyuanhui 濮陽市文物管理委員會等
qi sihe 齊思和
qi 器
qi 氣
qi 齊
qin 秦
qinding sikuquanshu zongmu 欽定四庫全書總目
qing 卿
qing 磬
qingzhe 磬折
qiu 秋
qiuguan 秋官
qufu 曲阜
ren 人
rizhilu 日知錄
sanlutu jizhu 三禮圖集注
shaanxi 陝西
shandong daxue xuebao 山東大學學報
shandong 山東
shang 商
shandong huabao chubanshe 山東畫報出版社
shanghai guji chubanshe 上海古籍出版社

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shangjun shu 商君書  
shanglü 商旅  
shangqi 上齊  
shangwu yinshuguan 商務印書館  
shanxi 山西  
shehou 射侯  
shen chong 沈重  
shese zhi gong 設色之工  
shi di 釋地  
shi pipan shu 十批判書  
shi shangshu zhourenzunxia shuo 釋尚書周人尊夏說  
shi 史  
shi 室  
shi 師  
shi 氏  
shidafu 士大夫  
shihuangdi 始皇帝  
shiji 史記  
shijing 詩經  
shisanjing zhushu 十三經注疏
shouwen jiezi 說文解字
shuiyeqingyi 水野清一
shujing 書經
shun 舜
shuoji 說戟
si maqian 司馬遷
si weizhi 斯維至
sibucongkan 四部叢刊
sikong 司空
sikuquanshu zongmu 四庫全書總目
sima guang 司馬光
sima qian 司馬遷
sishengweidou 四升爲豆
sishi’er juan 四十二卷
song 宋
su zhe 蘇轍
suishu 隋書
suixian 隨縣
sun yirang 孫詒讓
taibei 台北
taibo 太伯

tang 唐

taoshi de qingtongjian 桃氏的青銅劍

tian jing 田景

tian 天

tian 田

tiandi xuanhuang 天地玄黃

tiangong 天弓

tianguan zhongzai 天官冢宰

tianguan 天官

tianlang 天狼

tianqi xinzhi 田齊新制

tiansheng zhengmin 天生烝民

tianwenzhi 天文志

tu 徒

tuanzhi zhi gong 搏墳之工

wang anshi 王安石

wang jianmin 王健民

wang jin 王瓊

wang niansun 王念孫
wang sengqian 王僧虔
wangcheng 王城
wanggong 王公
wanghou 王后
wanwu 萬物
wei xian zhuan 魏賢傳
wei 位
wei 爲
wei zheng 魏徵
weizi qi 微子啓
wen renjun 聞人軍
wen 汶
wendiange 交殿閣
wenhui taizi zhuan 文惠太子傳
wenjiang 汶江
wenshi 文史
wenwang 文王
wu 吳
wu 物
wucai 五材
wuxing 五行
xia weiying 夏煒英
xia 夏
xiaguan 夏官
xiahou shi 夏后氏
xiao zixian 蕭子顯
xiaocheng 孝成
xiaogong 孝公
xiaowu 孝武
xiaqi 下齊
xin 心
xiranzhai shi lunji 欣然齋史論集
Xinwényi chubanshe 新文藝出版社
xiwangwu 西王屋
xiyang 襄陽
xizhou tongqi duandai 西周銅器斷代
xu guangqi 徐光啓
xun yue 苟悅
xunzi 苟子
xuxiu sikuquanshu 續修四庫全書
yan wu fei zhou fengguo shuo 燕吳非周封國說
yan 燕
yancheng 儀城
yang liansheng 楊聯陞
yang 陽
yang 鞔
yanjing xuebao 燕京學報
yanjing 燕京
yao 堯
yeshi wei ge ji kao 治氏為戈戟考
yi fu bangguo 以富邦國
yi sheng baiwu 以生百物
yi yang wanmin 以養萬民
yi 彤
yijing 易經
yili 儀禮
yin ba shi 殷八師
yin 陰
yindai shenhui shenghuo 殷代社會生活
yingshi 營室
yingzheng 嬴政
yisheng baiwu 以生百物
yiyang wanmin 以養萬民
yongqi 用器
yongzhong 甬鐘
youwu youze 有物有則
youyushi 有虞氏
yu chang 于鬯
yu yue 禹樾
yu 禹
yu 餜
yuan hanqing 袁翰青
yue 粵
yugong 禹貢
ze 則
zenghouyi 曾侯乙
zhang zigao 張子高
zhang 掌
zhanguo qixiong 戰國七雄
zhanguo 戰國
zhao 趙
zhejiang 浙江
zheng qiao 鄭樵
zheng xuan 鄭玄
zheng 政
zheng 鄭
zheng 銳
zhengmin 氰民

zhi 枇

zhongguo gudai jinshu huaxue ji jindanshu 中國古代金屬化學及金丹術
zhongguo gudai jinshu yunazhi zhi huaxue 中國古代金屬原質之化學
zhongguo kexueyuan kaogu yanjiusuo 中國科學院考古研究所
zhongguo tianwenxue shi 中國天文學史
Zhongguo wenhua yanjiu huikan 中國文化研究叢刊
zhongguo xianqin shidai de mache 中國先秦時代的馬車
zhongguoshi yanjiu 中國史研究
zhonghua shuju 中華書局
zhongyong 仲雍
zhou shimin 周始民
zhou 周
zhou 纣
zhoubi suanjing 周髀算經
zhougong 周公
zhouguan kaogongji de kaoguxue de jiantao 周官考工記的考古學的檢討
zhouguan liyi shu 周官禮儀疏
zhouguan 周官
zhouguanjing 周官經
zhouli boshi 周禮博士
zhouli ershiba xing bian 周禮二十八星辨
zhouli kaogongji de chezhi 周禮考工記的車制
zhouli kaogongji yi kaocha 周禮考工記一考察
zhouli shuzhong youguan nongye tiaowen de jieshi 禮書中有關農業條文的解釋
zhouli tongshi 周禮通釋
zhouli yinde周禮引得
zhouli yishu 周禮義疏
zhouli zhengyi xu 周禮正義序
zhouli zhengyi 周禮正義
zhouli zhushu jiaokan ji 周禮注疏校刊記
zhouli zhushu tiyao 周禮注疏提要
zhouli zhushu 周禮注疏
zhouli 周禮
zhoupengwang 周平王
zhouren weizhou 輔人為輔
zhouwang 紂王
zhu xi 朱熹
zhuanggong shiba nian 莊公十八年
zhuangzi 莊子
zhuhou cheng 諸侯城
zhuzi jicheng 諸子集成
ziran kexueshi yanjiu 自然科學史研究
ziren 梓人
zonghou 宗后
zuozhuan 左傳
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