

New Development in the Research on the Chronology of the Three Dynasties

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History is a science about "time." It needs chronology in the same way man needs a skeleton. China has a history of continued civilization for 5000 years. However, the earliest year for which precise chronological information is available is the first year of Gonghe (841 BC) during the last phase of the Western Zhou dynasty. Prior to that, the early and middle phases of the Western Zhou, and Xia and Shang dynasties are clearly documented in terms of the genealogy of the royal house. Although sovereigns are recorded, their reign periods are missing. In the last two thousand years, scholars throughout history have put forth numerous suggestions, in an attempt to ameliorate the situation. Limited by a variety of factors, no satisfactory results have been achieved. Take, for example, the year King Wu conquered King Zhou of the Yin. There have been a total of 44 different opinions, with the year 1130 BC as the earliest, and the year 1018 BC as the latest. They differ by 112 years.

In 1996, the Xia-Shang-Zhou Chronology Project was initiated (hereinafter, "the Project"). It is a highly valuable endeavor, which researches the chronology of the Three Dynasties through combining both the humanities and social sciences. The Project allows experts in relevant fields to maximize the potentials of various disciplines to solve key problems associated with the chronology of the Three Dynasties, with an aim to reestablishing a chronological sequence for the pre-841 BC era.

What the Project attempts to achieve is not limited to a single event or reign period. It focuses on, instead, the continuous chronology of the Three Dynasties, and the establishment of its chronological framework. It calls for perfect chronological coordination between dynasties or reign periods, or between celestial events, such as

solar and lunar eclipses, and individual terrestrial events. It is therefore a highly difficult undertaking. But, thanks to the collaboration and diligent research of all scholars involved, breakthroughs have been achieved in a number of areas. This enabled us to report phasic results in this first major collaborative scientific endeavor between humanists and natural scientists in China.

In the past, research on ancient chronology depended mainly on records on dates, astronomy, and calendrics in the received text. The Project continues to take advantage of this approach. In addition, it has explored a different approach, which, keeping in mind chronological data deriving from the periodization of archetypal Xia, Shang and Zhou sites and tombs, collected samples from these sites for a series of carbon-14 tests. The test results, having been calibrated by tree-rings, can be converted to absolute dates. The date information resulting from carbon-14 tests of samples taken according to the archaeological periodization of the Three Dynasties, upon calibration, can provide a chronological sequence that matches the periodization of the Three Dynasties. This chronological sequence, supported by archaeological evidence, constitutes the foundation of the chronological framework for the Three Dynasties. The phasic results of the Project are a consequence of a synthetic method that combines the aforementioned two approaches.

This synthetic method for the Project has enabled various participating fields to maximize their potentials to produce cross-disciplinary research results. For example, historians may gather from primary sources to research their authenticity while astronomers may conduct computational research on astronomical data to arrive at absolute dates; ar-

archaeologists, based on periodization research, may provide reliable, serialized carbon samples on which physicists may conduct highly accurate carbon-14 tests. The dates produced by these two different approaches can then be compared for convergence. In the process of comparing these data, it was discovered that the relevant dates the two different approaches yielded oftentimes are in close proximity with each other. Some cases are complete matches. This kind of mutual verification proves the credibility of the chronological framework for the Three Dynasties established by the Project.

The fact that the Xia-Shang-Zhou Chronology Project could be launched at all depended on scientific and technological advances that provided a relatively adequate environment for research on the chronology of the Three Dynasties. For example, although carbon-14 technology was introduced into China as early as the 1950s and 1960s, it could then only be used for dating remains from prehistoric sites for lack of accuracy. Recent advances in carbon-14 technology have greatly improved its accuracy, reducing the error rate to as little as 0.3% (or an error span of 10-20-odd years, depending on the BP age of the sample tested). This makes the carbon-14 dating of historical remains possible. Even before the launching of the Project, Professors Qiu Shihua and Cai Lianzhen wrote an article, suggesting using carbon-14 dating to solve the chronological problems of the Three Dynasties. Archaeological research on the periodization of the Three Dynasties remains has produced, by trials and errors, increasingly satisfactory results, which coincide with royal genealogies. For example, remains belonging to Phases 1 and 3 of the Yinxu 殷墟 culture yielded inscribed oracle bones which can be linked to the reigns of Kings Wuding, Kangding, Wuyi, and others; a number of unearthed inscribed bronzes fall within the range of the Western Zhou culture, whose periodization can be associated with certain royal reigns, which lays the groundwork for establishing the royal chronology. Advances in computer science and the most recent achievement in astronomy can promptly produce accurate dates on such ancient recorded celestial events as solar eclipses, lunar eclipses, and the conjunctions of the five planets. All these were not possible in the past.

The Project attaches great emphasis to evidence verification. For instance, the combined effort of

archaeology and carbon-14 testing provided a chronological sequence that matches the chronology based on the periodization of Xia, Shang and Western Zhou remains. It was not only authenticated by other archaeological remains but also by astronomical computations. This is the way by which the Project established the chronological framework of the Three Dynasties. It is the result of multi-disciplinary coordination and collaboration.

Determining the year of King Wu's conquest of the Shang, the demarcation line between Shang and Zhou, is of great significance to research on the chronology of the Three Dynasties. In 1997, a series of cultural strata were discovered in Mawang 马王 village, Chang'an 长安 county, Shaanxi 陕西, which belong, respectively, to the middle, early, and initial phases of the Western Zhou, and the late phase of the Predynastic Zhou period. From the late Predynastic Zhou to the initial phase of the Western Zhou, there were no nature-formed strata, which indicates that the cultural strata there built up continuously over a relatively short period of time. A series of carbon samples from these strata, including charcoal, animal bones, carbonized millet, etc., were carbon-14 dated to 1050-1020 BC. King Wu's conquest may have taken place within that range.

However, this range had to be put through further authentication. A comparative study of these dates and the dates of Phase 4 of the Yinxu (reigns of Kings Yi and Xin), the initial phase of the Western Zhou site at Liulihe 琉璃河, and the early phase of the Western Zhou site at Tianma-Qucun 天马-曲村 proves that they fit into a continuum without contradicting one another. The above-cited range is thus believable. This range of 30 years based on archaeological data is much shorter than the 112-year range that existed before, and provides a much more favorable environment for research on King Wu's conquest.

The chronological framework was established through carbon-14 dating a series of carbon samples from every phase of the cultural periodization of the Western Zhou sites. Archaeologists have done research on the periodization of the Fenghao 沔镐 site in Chang'an, Shaanxi, the Liulihe site in Fangshan 房山, Beijing 北京, and the Tianma-Qucun site in Quwo 曲沃, Shanxi 山西, matching them with the early, middle, and late phases of the period. Car-

bon samples collected from these three sites were carbon-14 dated in different laboratories. Since the chronological sequence of every site matches the periodization well while relevant dates in various phases produced by different laboratories correspond with one another, we know that the conclusions derived from them rest on impartial evidence. In the process of studying royal reigns, we have also discovered that some reign periods lend direct support to this framework, further enhancing its credibility.

For example, Tomb No. 8 of the Marquises of Jin Cemetery yielded the bronze chime inscribed with characters "Jin hou Su." Its 355-character-long inscription records the date "the 33rd year of the King." There were only two late Zhou kings who reigned more than 33 years: King Li and King Xuan. Does the date in question refer to King Li or King Xuan? Carbon samples from the tomb were carbon-14 dated to 808 BC \pm 8. According to the chapter on the "Hereditary House of the Jin" in the *Shiji* 史记·晋世家 (*Records of the Grand Historian*), Jin Marquis Su died in the 16th year of King Xuan, or 812 BC, which is close to the carbon-14 date. This further proves that "the 33rd year of the King" can only refer to the reign of King Li, and authenticates the conventional matching of the 1st year of Gonghe with 841 BC. In this way, the chronological framework of the Xia-Shang-Zhou Chronology Project is linked to the established historical chronology. Naturally, the task to reestablish the pre-Gonghe 1 chronology of the Three Dynasties, as defined by the Project, means to work backwards from the date 841 BC.

The range in which the conquest of Shang took place, 1050–1020 BC, was provided by astronomers who based their studies of the event on astronomical records in the inscription on the Li *gui*-food container and in the received text. They produced three dates: 1027 BC, 1044 BC, and 1046 BC. Each has its own rationale. The last one, however, seems to correspond more closely with calendrical data in bronze inscriptions and the reigns of Kings Wu and Cheng, so it has become our first choice. Consequently, the chronology from King Wu to King Li will be worked out within the range of 1046–841 BC.

The chronology from King Wu to King Li was worked out by astronomical computation, which

was mainly based on the archaeological periodization, while taking into consideration 60 inscribed bronzes, with information on years, months, the sexagenary cycle, and lunar phases, and textual records. Some of the reign years are accurately dated. For example, through computation, astronomers matched the 1st year of King Yi with 899 BC; the dates of Tomb No. 8 of the Jin Marquises Cemetery were used to work out the reign period of King Li. The early phase of the Western Zhou has not produced bronzes with the "four essentials" listed above. Nevertheless, other methods have yielded highly believable results. For example, the outer coffin of Tomb No. 1193 of the Liulihe site where the Taibao vessel had been excavated was dated by dendrochronology to work out the reign period of King Kang.

The objective of chronological studies on the late phase of the Shang is a relatively accurate determination of the chronology from King Wuding to King Xin. This resulted from the cultural periodization of the YinXu site (in four phases) in Anyang 安阳 and the periodization of oracle bones (in five phases). Carbon samples were taken from each phase for carbon-14 dating, which consequently produced two chronological sequences that correspond with the periodizations. Because the two periodizations correspond with the royal genealogy of the late phase of the Shang, they should match chronologically as well. The test results prove that although there are relatively few oracle bone samples for carbon-14 dating, the two chronological sequences do not contradict each other. In some cases, they are very close. The reign of Wuding thus produced is a perfect match with the period worked out by astronomers. From this we know that the chronological framework of the late phase of the Shang is also believable.

The reign period of King Wuding of the Shang was calculated by astronomers using data on five lunar eclipses recorded in Group B in oracle bones. It is dated to 1250–1192 BC. It matches the carbon-14 dated early Wuding reign year of 1250 BC \pm 11. Thus these two different approaches reached the same conclusion. The establishment of the late phase of the Shang laid the foundation for the calculation of the reign of Wuding.

The chronology from Wuding to Dixin was mainly calculated by astronomers based on textual

research conducted by historians. Take, for example, the reigns of Kings Yi and Xin (King Zhou). First, based on information on comprehensive ancestral sacrificial rites from oracle bone and bronze inscriptions, a chronology for these sacrificial rites was worked out. The number of the sacrificial rites the sovereign conducted during his reign helped determine his reign period. For verification, astronomers calendared the ritual sequence. Matching the data on King Xin's 2nd through 11th sacrificial rites with the Western calendar resulted in the estimation of the date for his first rite and his reign period. The dating of the reign of Wuding also laid a foundation for working out the year of Pangeng's move to Yin, which could not be earlier than 1300 BC.

Research on the chronologies of the last phase of the Shang and the Xia dynasty also produced a chronological sequence that matches the periodization, based on the dating of carbon samples from sites such as Erlitou 二里头 in Yanshi 偃师, the Shang enclosure at Yanshi, and the Shang enclosure in Zhengzhou 郑州. However, because this period lacks evidence from oracle bone and bronze inscriptions that can be used to date royal reigns, the data produced cannot be linked directly to the royal genealogies. Scholars differ widely on the identification of the Xia sites, and the demarcation line between the Xia and the Shang. Their chronologies had to be estimated from the year of Shang's conquest of the Xia, relying on the durations of the Xia and Shang dynasties as recorded in the received text. Thanks to the carbon-14 data for a number of the Xia and Shang sites, and the astronomical computations for lunar eclipses and other celestial events during the reign of Zhongkang, the basic framework established should not be too far off from the actual chronological sequence.

The Xia-Shang-Zhou Chronology Project is a systematic project. Due to the chronological complexity of the Three Dynasties, every estimate would touch on a series of problems. The change or the placing of any given date would affect other dates in a chain reaction. Despite all this, the Project has finally established the chronological framework for the Three Dynasties, whose authenticity is not only supported by archaeological evidence but also in many areas by astronomical and other scientific researches. This is indeed a breakthrough in China's

research on chronology.

The Three Dynasties chronological table just published is a major achievement of the Project. But the achievement of the Project has far exceeded the table itself. In addition to establishing this Xia-Shang-Zhou chronological table, the Project has trained a number of multi-disciplinary young researchers. It will publish a series of reports and books, which will be of great significance to chronological studies in the future. What is more important, in the process of the Project, humanities and natural sciences were encouraged to collaborate and mutually penetrate, which will have a far-reaching and positive impact on chronological studies in the future and the development of relevant fields. For example, the debate on the chronological sequence of the two Shang enclosures, which has raged for almost 20 years, will die down with the dating results from both sites. The conclusion of the Project will also cause us to rethink the various aspects of the debate, which in and of itself will be of great significance to the advancement of Chinese archaeology.

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