THE CEREMONIAL MUSIC OF ZHU ZAIYU

朱載堉的禮樂

By

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ABSTRACT OF THE DISSERTATION

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The Chinese music theorist, composer, mathematician, and scholar ZHU Zaiyu 朱載堉 (1536–1611) is well-known in music history as the creator of the mathematical theory of 12-tone equal tuning (equal temperament). The major part of his writings is collected in the Yuelü quanshu 《樂律全書》 [Comprehensive treatise on music and music theory], an encyclopaedic work comprising 14 separate titles, and written over a number of years from before 1581 to 1607. His music theory is mainly presented in Lülü jingyi 《律呂精義》 [Precise principles of the musical pitches] (Preface dated 1596), which is the single most important treatise within the Yuelü quanshu, and this topic has been the focus of most studies on Zhu Zaiyu to date. The principal music scores of Zhu Zaiyu constitute another sub-opus within the Yuelü quanshu, whose titles are comprised in the Caoman guyue pu 《操縵古樂譜》 [Ancient music with zither figurations], Xuangong heyue pu 《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches], Xiangyin Shiyue pu 《鄉飲詩樂譜》 [Songs of the 《Shijing》 for performance at the Country Banquet], and Xiaowu xiangyue pu 《小舞鄉樂譜》 [Music of the country to accompany the minor dances]. (Due to time constraints, the 4 very interesting songs in Lingxing xiaowu pu 《零星小舞譜》 [Choreography for the minor dances at the Lingxing Temple] are not included in the present study.) The musical compositions in these works were written over a period of years dating from not long after 1567. They have lain mutely under the shadow of Zhu Zaiyu’s extraordinary achievements in theory, and have never been fully studied. These musical compositions are the subject of the present dissertation. The research aims to understand the music, to transcribe the scores, and thus help to bring them back to sounding life.

The core of the work comprises the music transcriptions of Ch. 7. These aim to come as close to Zhu Zaiyu’s Urtext as a transcription can, and for those scores furnished with instrumentation, they should be sufficiently explicit in all details to be directly performable in a manner as Zhu Zaiyu
intended. Ch. 1–6 present supporting studies which help to understand the music in its historical and theoretical contexts, but extensive analysis is not attempted. For orientation, Ch. 1 provides a review of Zhu Zaiyu’s life and musical works. It appends a translation and study of a rather neglected primary document which played a crucial part in Zhu Zaiyu’s life, his 〈Rangguo zhenglun shu 讓國正倫疏 [Petition to relinquish the principality and rectify family relationships]〉, most likely written in 1593. Ch. 2 describes the ceremonials of the classic text Yili 《儀禮》 [Protocol and ceremonial] for which Zhu Zaiyu composed much of his music. Ch. 3 surveys Zhu Zaiyu’s music notation, and includes a special study of his zither figurations called caoman 操縵. Ch. 4 appraises Zhu Zaiyu’s music tuning, with the immediate purpose of determining the sounding pitch of his huangzhong 黃鍾, and it naturally impinges on facets of his music theory. Ch. 5 and Ch. 6 furnish information and particulars about the instrumentation and orchestration of the compositions transcribed in Ch. 7.

An incidental finding uncovered by these investigations is the re-discovery of a fragment of a treatise or essay by Zhu Zaiyu which has long been lost (at least since 1825). It is the Xiantiantu zhengwu 《先天圖正誤》 [Correcting errors in the a priori diagram of the 《Yijing》]. I mention this re-discovery in Ch. 1, but time constraints do not permit a fuller discussion. This must await a later study. In more ways than one, the present dissertation is better regarded as a work in progress, than as a finished piece of research.
To my parents

Hui Luk-yip 許綠葉

Woo Kai-fun 胡啟勳

in loving memory
Acknowledgements

My studies in music have benefitted from the influence and advice of many teachers, both at the Chinese University of Hong Kong in the early years, and at Rutgers University in later years: to all of whom I owe a debt of gratitude. In my work on this dissertation, I have been guided by the advice of Prof. Floyd GRAVE, Prof. Nancy RAO 饒韻華, Prof. Richard CHRISMAN, and Prof. Douglas JOHNSON. A course of study with Prof. GRAVE provided the initial stimulus for my interest in the history of music theory, and this eventually led to the present project on the music of Zhu Zaiyu 朱載堉. Throughout the protracted research work, the guidance and encouragement of Prof. GRAVE and Prof. CHRISMAN have been a steady support, for which I am particularly grateful. In the final stages of writing, I was fortunate to have enlisted the advice of Dr. TSE Chun Yan 謝俊仁, who commented generously on my work from his profound expertise in Chinese music.

In research such as this, good library resources are indispensable. Dr. Martin HEIJDRA, Director of the Gest East Asian Library at Princeton University, has been unstinting in making available to me the superb collection at that library. Mr. Tao YANG 杨涛 has done the same for me at the Rutgers East Asian Library.

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As the reader who peruses this dissertation will become aware, some parts of the work appear to be hastily curtailed. This is the regrettable result of administrative deadlines. I apologize for these defects, and hope that they will be made good in a future publication. In spite of such imperfections, humbly and respectfully I dedicate this work to the loving memory of my parents

Woo Kai-fun 胡啟勳 & Hui Luk-yip 許綠葉
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Chapter 1

The life and works of Zhu Zaiyu 朱載堉 / A review

The Chinese music theorist, composer, mathematician, and scholar Zhu Zaiyu 朱載堉 (1536–1611) is well-known in music history as the creator of the mathematical theory of 12-tone equal tuning (equal temperament). This is the system of music tuning most commonly adopted throughout the world today. The major part of Zhu Zaiyu’s writings is collected in the Yuelü quanshu 《樂律全書》 [Comprehensive treatise on music and music theory] [A: Yuelü quanshu]¹, an encyclopaedic work comprising 14 separate titles, and written over a number of years from before 1581 to 1607. The scope of the work encompasses not only the theory of music tuning, but also music history, mathematics, astronomy and calendrical science, and metrology (the science of measurement); and in addition, large tracts of the work consist of music scores and dance choreographies.

It is generally acknowledged that Zhu Zaiyu’s greatest contribution to music lies in his invention of 12-tone equal tuning. Its theory is presented in 4 individual treatises constituting part of the Yuelü quanshu, viz. Lüli rongtong 《律曆融通》 [The concordance of music and calendar] [A: Lüli] (Preface dated 1581), Lüxue xinshuo 《律學新說》 [A new discourse in musical metrology] [A: Lüxue] (Preface dated 1584), Lülü jingyi 《律呂精義》 [Precise principles of the musical pitches] [A: Lülü jingyi] (Preface dated 1596), and Suanxue xinshuo 《算學新說》 [A new discourse on computation] [A: Suanxue] (engraved in 1603). Lüli rongtong was eventually presented to the Ming Emperor Shenzong 明神宗 in 1595 as part of a calendrical opus; and still later, in 1606, Lüxue xinshuo, Lülü jingyi, and Suanxue xinshuo were presented as part of a musical opus.

The principal musical scores and dance choreographies of Zhu Zaiyu constitute a sub-opus within the Yuelü quanshu, sometimes referred to by the informal title of Yuewu quanpu 《樂舞全譜》 [Complete score and choreography for music and dance]. The musical compositions comprise 4 titles, viz. Caoman guyue pu 《操縵古樂譜》 [Ancient music with zither figurations] [A: Caoman], Xuantong heyue pu 《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches] [A: Xuantong], Xiangyin Shiyue pu 《鄉飲詩樂譜》 [Songs of the Shijing for performance at the Country Banquet] [A: Xiangyin], and Xiaowu xiangyue pu 《小舞鄉樂譜》 [Music of the country to accompany the minor dances] [A: Xiaowu]. For the dance there are 3 choreographic titles, viz. Liudai xiaowu pu 《六代小舞譜》 [Choreography for the minor dances of the 6 ancient dynasties] [A: Liudai], Eryi zhuizhao tu 《二佾綴兆圖》 [Diagrams of dance steps for 2 rows of dancers] [A: Eryi], and Lingxing xiaowu pu 《零星小舞譜》 [Choreography for the minor dances at the Lingxing Temple] [A: Lingxing]. None of these works bears a date. We know for certain that they
were all presented to the Ming Emperor Shenzong in 1606 as part of Zhu Zaiyu’s musical opus; and we have good reason to believe that they were written over a period of years, dating from not long after 1567.

During his lifetime, Zhu Zaiyu’s work never attracted much attention, and his calendrical and musical theories were not officially adopted. In Chinese musicological circles, modern awareness of Zhu Zaiyu was only re-awakened after the seminal researches of LIU Fu 刘復 [B: LIUF 1933] and WANG Guangqi 王光祈 [B: WANGGQ R2009(1934): 304–308]. Then, since the 1980s, a resurgence of interest has blossomed, with the publication of the first modern and annotated editions of Lüxue xinshuo and Lülü jingyi by FENG Wenci 馮文慈 [A: Lüxue / FENG 1986; A: Lülü jingyi / FENG 1998]. This was followed by Lüli rongtong in 2006 [A: Lüli / LIU & TANG 2006]. Monographs on Zhu Zaiyu were published by DAI Nianzu 戴念祖 [B: DAINZ 1986, rev. 2011] and CHEN Wan-Nai 陳萬鼐 [B: CHENWN 1992], and a biography was written by XING [B: XINGZL 1998]. Congresses celebrating Zhu Zaiyu’s work were held in China, and individual research papers were produced at an accelerated pace. These researches were capped by the publication of Zhu Zaiyu’s collected (but not quite complete) works in a facsimile edition in 2013 [A: Zhu / Li F2013].

The West was first introduced to the work of Zhu Zaiyu through the monograph on Chinese music by AMIOT [C: AMIOT 1779]. In more recent times, the primary musicological studies on Zhu Zaiyu in Western languages are contained in the writings of COURANT [C: COURANT 1914: 78–143], NEEDHAM & ROBINSON [C: NEEDHAM et al: Vol. 4.1 1962: 220–228; C: Kenneth Robinson 1980], and HSÜEH [C: HSÜEH 1973]. The first substantial translation of Zhu Zaiyu’s work into a non-Chinese language was made by WU Zihui, with his study of Zhu Zaiyu’s dance [C: WU 2008]. Except for the excellent studies of HSÜEH and WU, the works in Western languages cannot compare in depth and scope with the monographs of CHEN and DAI in Chinese.

Up to the present time, the bulk of research on Zhu Zaiyu has focused on his music theory. The work of WU on Zhu Zaiyu’s dance is a remarkable exception. His many musical compositions, and the practical side of his music making, have lain in the shadow of his extraordinary achievements in theory, and they have never been fully studied. Yet Zhu Zaiyu was a practical musician too, who practised and loved his music as much as he theorized about it. In 1610, when he was an old man of 75, he wrote in the Jialiang suanjing 《嘉量算經》 [Mathematical treatise of the measuring vessel] [A: Jialiang: Bk. 3: 33a]:

When I wrote the Yuelü quanshu, I had put into it all the 8 sonorous materials. In this chapter I use only 1 person to play the pipe, 1 person to play the qin, 1 person to beat the
and sing. I too sing along on my own, and we sing and harmonize with each other. Therein is joy!

When we leaf through the Yuelü quanshu, page upon page of music notation look up silently into our eyes. They have not sounded for over 400 years. It is the object of this study to understand this music, to transcribe these compositions, and thus help to bring them back to sounding life. Then we too may hear the sounds that Zhu Zaiyu had heard, and perhaps, share in the joy that he had experienced.

THE LIFE OF ZHU ZAIYU

As the purpose of the present study is not primarily biographical, only a brief outline of Zhu Zaiyu’s life will be given here, for the reader’s review. For fuller information, the reader is referred to the monographs of Dai [B: DAINZ 2008: Ch. 2–3], Chen [B: CHENWN 1992: Ch. 1], and Wu [C: Wu 2008: 9–51].

Before 1986, the facts of Zhu Zaiyu’s life were known mainly through the short biographies and genealogical table of the Princes of Zheng 鄭王 in the official history Mingshi [History of the Ming dynasty (1368–1644)] 5. The official history is supplemented by anecdotal and secondary accounts, mainly gleaned from gazetteers and local histories like Henei xian zhi [Gazetteer and history of Henei county], Huaiqing fu zhi [Gazetteer and history of Huaiqing prefecture], and Henan tongzhi [General gazetteer and history of Henan province]. 6 Some of these accounts are quite fabulous. 7 In 1986, an important primary document was discovered by Chen Wannai 陳萬鼐. 8 This is a biographical sketch and eulogy of Zhu Zaiyu, written by the noted calligrapher Wang Duo 王鐸 (1592–1652) in 1624 on commission from Zaiyu’s 2nd son Zhu Yitai 朱翊鈦 (> 1571 – < 1635), and intended to be engraved on a memorial stele for Zaiyu. It is titled 〈Zheng Duanqing Shizi cizang shendaobei 鄭端清世子賜葬神道碑 [Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng]〉 9, Duanqing being Zhu Zaiyu’s posthumous honorific title [yihao 謚號]. The biography was actually engraved, but the stele was never erected, and its shattered remains were unearthed at Qinyang city 沁陽市 in Henan in 1995, near the site of Zhu Zaiyu’s grave. 10 This is now our best source of information for the facts about Zhu Zaiyu’s life, aside from his own writings. It has been intensively studied by Chinese scholars 11, but the language is difficult and arcane, and it still awaits translation into other languages.
While the *Yuelü quanshu* is well known, and provides scattered pieces of autobiographical information, there are 2 documents from Zhu Zaiyu’s own hand that have received scant attention, and are not included in the Collected works [A: Zhu / Li F2013]. They are 2 petitions that Zhu Zaiyu submitted to the throne after the death of his father Zhu Houwan the Prince Gong of Zheng (鄭恭王朱厚烷, 1519 – c. 17 February 1591), and most likely written in 1593–1594. 12 The 1st petition is 〈Rangguo zhenglun shu 讓國正倫疏 [Petition to relinquish the principality and rectify family relationships]〉, with a supplementary 〈You shu 又疏 [Another (supplementary) petition]〉 [A:〈Rangguo〉]. The 2nd petition is 〈Yi zheng lunchi shu 議正倫齒疏 [Petition to rectify family relationships according to seniority]〉 [A:〈Yi zheng lunchi〉]. In these petitions, Zhu Zaiyu begs to abdicate his succession to the title of Prince, and to relinquish the principality of Zheng to his cousin Zhu Zaixi (朱載壐, > 1536 – 1606 – ?). From 1591 to 1606, he submitted 7 such petitions in all, and his wish was finally fulfilled on 26 June 1606. 13 This was a momentous event for Zhu Zaiyu, and his unprecedented act of magnanimity has won him praise and admiration, and it was the one thing for which he became most famous in his lifetime. His motives for the abdication have puzzled many, and in these petitions we can catch a glimpse into his thinking and feelings on the matter, expressed in his own words. On p. 20 I present a translation and critical study (given in the Notes) of the 1st of these petitions.

**Biographical sketch**

Zhu Zaiyu 朱載堉 was born in 1536 14 into a noble house of the Ming royalty, the Princes of Zheng 翁王. The seat of the fief of Zheng lay in Huaiqing prefecture 懷慶府: Henei county 河內縣 (today Qinyang city 沁陽市 in Henan province), and he lived there all his life. His father was Zhu Houwan the Prince Gong of Zheng 鄭恭王朱厚烷, and his mother, Consort Gao 妃高氏, died 2 years after he was born. Very likely, this contributed to the influence that his father had on him, and the very strong bond that existed between them. He had 3 younger brothers, all born of his step-mother Lady Wang 王夫人, but only Zaisheng 載陞 (c. 1541 – 1588) and Zaixi 載犰 (1548–1571) lived beyond infancy. Zaiyu was intelligent and precocious as a child, frequently astonishing his tutors with difficult questions. He studied the *Shijing* 《詩經》, to his father’s delight, and showed an inclination towards music and mathematics. At the age of 10, he was officially installed as Prince Heir of Zheng [Zheng Shizi 鄭世子], meaning that he was his father’s designated successor to the title of Prince.

Zaiyu’s academic character and Confucian moral principles were shared with his father. The Ming Emperor Shizong 明世宗 at that time was obsessed with Daoism, to the neglect of his official duties. In 1548, Houwan submitted a memorial to the Emperor, advising him against such frivolities. This incurred the Emperor’s anger, but he held his hand. Now, due to infighting for succession to the title of Zheng in an earlier generation, there had long simmered a current of resentment between Houwan’s family, and their relatives of the house of Mengjin 盟津 (see below). Houwan’s uncle Zhu
Youzhan 朱祐橏, of Mengjin, saw an opportunity for revenge. He submitted a memorial to the Emperor, accusing Houwan of 40 crimes. Most of Youzhan’s trumped-up charges were dismissed by the Imperial counsellors, but Emperor Shizong took this as an excuse to vent his own anger against Houwan. Houwan was demoted to commoner, and sent to the prison for royal clansmen at Fengyang 鳳陽, called High Walls 高墙. This calamitous blow occurred in 1550, and Zaiyu was 15 years old.

In silent protest, Zaiyu now exiled himself from the Prince’s palace, and made an adobe outside its walls, where he abode for the next 17 years, not returning to the palace until his father was eventually released from prison in 1567. During this most critical time of his life, when his family was in disgrace, he immersed himself in study, and acquainted himself with the writings of He Tang 何瑭 (1474–1543), a highly respected scholar of a more senior generation from his home region of Huaiqing. But more importantly in retrospect, this free time gave him an opportunity to detach himself from the sheltered life of a prince, to see the outside world from a commoner’s point of view, and to experience the materially poor but spiritually free life outside the Prince’s palace, unencumbered by all its strict Confucian protocols and proprieties. He associated with the monks at the Shaolin monastery at nearby Dengfeng, studied Buddhism, and became particularly good friends with the monk Songgu 松谷. His musical studies bore fruit in his first treatise, the *Sepu* 《瑟譜》 [Notes on the se], to which he wrote the Preface on 6 July 1560. His Buddhist activities and even Daoist leanings at this time is witnessed by a remarkable creation, the 〈Hunyuan sanjiaojiuliu tu zan 混元三教九流圖贊 [Drawing and ode / To the fusion of the 3 religious sects and 9 philosophical schools]〉 [Fig. 1: 1]. The 3 religious sects of the title are Confucianism, Buddhism, and Daoism. The ode urges acceptance of diverse schools of thought in an inclusive harmony, as the various philosophies all have a common source and a common goal for the common good. Below the ode is a picture of a rotund personage, who on more careful inspection is seen to be a combination of 3 faces in 1, wearing the caps and garb of a Confucian scholar, a Buddhist monk, and a Daoist priest. This valuable holograph from Zaiyu’s hand is engraved on a monument at the Shaolin Monastery at Dengfeng, signed and dated 1 April 1565. The obverse of the monument, a curriculum vitae and eulogy to the abbot of the monastery Chan (Zen) Master Xiaoshan 小山禪師 (1500–1567), and written by Zaiyu’s brother Zaiheng, is also engraved in Zaiyu’s calligraphy. This monument stands at the Dengfeng monastery to this day.
Fig. 1:1 〈Hunyuan sanjiaojiuliu tu zan 混元三教九流圖贊
[Drawing and ode / To the fusion of the 3 religious sects and 9 philosophical schools]
[A: Zhu / Li F2013: Vol. 1: Fronticepiece].
On 23 January 1567, Emperor Shizong died. On his accession, the new Ming Emperor Muzong immediately set about to reverse his father Shizong’s worst excesses. A general amnesty was proclaimed, and on 20 February 1567 Houwan was released from prison, and restored to his Prince’s title and his fief at Henei. His annual stipend was increased to 10 400 dan (of rice).

According to the Regulations Governing the Royal Fiefs, sons and daughters of the royal clan should marry when they reach 15 years of age. Zaiyu was now well over 30, but still unmarried. He had rejected all suggestions of marriage while his father was still in prison. Now this self-imposed restriction was lifted, and on 1 June 1670, at the mature age of 35, he married the granddaughter of He Tang. They produced a son Zhu Yixi 朱翊錫, but unfortunately Consort He did not live long. After her death, Zaiyu married Lady (or Consort?) Wang 王. Lady Wang bore his 2nd son Zhu Yitai 朱翊鈦 (> 1571 – < 1635), and a daughter (name unknown). The daughter later married a local scholar Sun Kexiao 孫克肖.

While Zaiyu’s father Houwan was imprisoned at High Walls, he had leisure to amuse himself by reading and playing the qin 琴. There he had pondered questions of singing and qin playing, and he conceived the idea of prolonging the singing voice with zither figurations derived from qin tuning exercises, called caoman 操縵 (see Ch. 3). While still in prison, he had drafted a treatise Xiangge yaozhi 《弦歌要旨》 [Essentials of song with string accompaniment], laying out his ideas. On his return home to Henei in 1567, he showed all this to Zaiyu, and together they worked out the details of the concept. Zaiyu diligently and respectfully recorded his father’s treatise Xiange yaozhi, enlarged upon it with his own researches and ideas, and the results became the 2 works Caoman guyue pu 《操縵古樂譜} [Ancient music with zither figurations], and Xuangong heyue pu 《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches] (see [A: Yuelü quanshu: 〈Jin Lüshu zoushu 进律書奏疏 〈Petition to present the Lüshu〉 : 1a; A: Lüli jingyi / FENG 1998: 〈Jin Lüshu zoushu 进律書奏疏〉 : 1]). Thus, according to Zhu Zaiyu’s account, these 2 works were the earliest ones to be written among the 14 titles which would later make up the Yuelü quanshu 《樂律全書》 [Comprehensive treatise on music and music theory].

When Zhu Houwan saw his son’s work, he was highly pleased. He then directed Zaiyu’s attention to deeper questions in music theory. He pointed out problems and contradictions with the theory of tuning in historical works, in particular the treatises of Liu Xin 劉歆 (−46 – +23), as they appear in Hanshu 《漢書》 [History of the (Former) Han dynasty (−206 – +9 – +23)] 16, and of Cai Yuanding 蔡元定 (1135–1198) 17. In earlier years, at the time of Sepu 《瑟譜》 (1560), Zhu Zaiyu had not been greatly interested in music theory. 18 But his interest in the subject was aroused by his father’s encouragement, as well as by his own mathematical inclinations, and he applied himself to his new theoretical studies with vigour. The treatise Lüli rongtong 《律曆融通》 [The concordance of music and calendar] was drafted, and its Preface was written on Chinese New Year’s Day in 1581 (4 February 1581). This treatise
actually is not concerned with music as much as it is with the calendar. This was followed by a draft of *Lüxue xinshuo* 《律學新說》 [*A new discourse in musical metrology*], with a Preface written on Chinese New Year’s Day 3 years later (12 February 1584). In its final printed form (< 1606), *Lüxue xinshuo* contains a definitive statement of the principle of 12-tone equal tuning using the ratio $2^{1/12} = 1.059463094 \ldots$, and a listing of the lengths, diameters and other dimensions of 12 pipes tuned in the new equal tuning. Zhu Zaiyu calls $2^{1/12}$ the ‘precise ratio [密律 *milü*]’. 

On (about) 17 February 1591, Zhu Houwan died. Zaiyu is due to inherit his father’s title as Prince of Zheng. Astonishingly, he refuses, and wishes to abdicate his succession and yield the title to his cousin Zhu Zaixi 朱載壐 (> 1536 – 1606 – ?). Zaixi is the grandson of the very Zhu Youzhan whose calumny in 1550 had caused Zaiyu and his father so much distress. This story is complicated, and its discussion is deferred to p. 18 below.

On 25 July 1595, Zhu Zaiyu writes the 《Jin Lishu zoushu 进曆書奏疏》 [*Petition to present the Lishu*], and dispatches his Right Administrator Guan Zhizheng 關志拯 to present his calendrical opus to the Emperor [A: *Yuelü quanshu* 《樂律全書》: 《[Petition to present the Lishu 进曆書奏疏] (Lishu: Fasc. 1: 1–14b)]. This comprises 3 titles, copied in manuscript (see p. 36) and bound in 10 Fascicles:

- *Lüli rongtong* 《律曆融通》 [*The concordance of music and calendar*]
- *Shengshou Wannian li* 《聖壽萬年曆》 [*Imperial Longevity Perpetual calendar*]
- *Wannian li beikao* 《萬年曆備考》 [*Research notes for the Perpetual calendar*]

*Lüli rongtong* had already been drafted in 1581, and the other treatises are recent works. This opus contains 2 newly-calculated calendars, which Zhu Zaiyu proposes for adoption by the Imperial court: the 《Huangzhong calendar 黃鍾曆》 in *Lüli rongtong*, and the 《Imperial Longevity Perpetual calendar 聖壽萬年曆》. Not long afterwards, on 5 February 1597 a similar proposal for calendar reform was submitted by Xing Yunlu 邢雲路 (? – c. 1623). Their proposals met with a mixed reception. Zhu Zaiyu collected 5 memorials on the matter by the court officials concerned (Fan Qian 范謙 21 October 1595 (commends Zhu Zaiyu), Xing Yunlu 邢雲路 5 February 1597, Li Yingce 李應策, Zhang Yinghou 張應候 (hostile to Xing Yunlu), and Fan Qian 范謙 again (defends Xing Yunlu)), and in an emotionally-worded remark, he expressed his frustration at Zhang’s obstructionism. All these documents are appended to the end of Fascicle 1 in the later printed edition of the *Lishu* [A: *Yuelü quanshu*: Lishu: Fasc. 1: 116b–119b, 122a–124b]. From this time he and Xing Yunlu became good friends, although they met personally only 2 times, once in 1595, and the 2nd and last time in 1610.

In 1595, a notice arrived at Henei from the Imperial court, announcing a project to compile an official history of the Ming dynasty, and inviting the royal Princes to submit books for the project if they
will. By this time Zhu Zaiyu had already written a large corpus of musical and musicological works, and he set about to revise them for submission. On Chinese New Year’s Day 1596 (29 January 1596), he penned the Preface to Lüli jingyi 《律吕精義》 [Precise principles of the musical pitches]. In this work Zhu Zaiyu gives a complete exposition of his new theory of 12-tone equal tuning, which he calls the ‘New method of the Precise ratio [Xinfa milü 新法密律]’. From the Precise ratio

\[ 2^{1/12} = 1.059463094359295264561825 , \]

the lengths, diameters, volumes, and other dimensions of pipes for all 12 fundamental pitches are calculated, to the extraordinary precision of 25 significant figures. Such precision lies far beyond any possible discernment by human hearing, and it can serve no practical musical purpose. Yet these numbers possess a mystical and cosmological significance for Zhu Zaiyu, beyond their use in practical music-making. Other parts of the treatise contain comments on various historical and contemporary musical writings, organological descriptions, music scores in all 12 transpositions, and a dance choreography. It is Zhu Zaiyu’s single most important work.

Zhu Zaiyu had more treatises and music scores and dance choreographies stocked up in his bookcase. He gave them all a careful revision, and, fearing for copyist errors, had them engraved in preparation for the Imperial submission. This laboriously protracted task was finally completed on 7 September 1603, when the last page of Suanxue xinshuo 《筭學新說》  [A new discourse on computation] was engraved.

Everything was ready in 1606. This must have been a most satisfying year for Zhu Zaiyu. His persistent efforts to relinquish the principality of Zheng was finally rewarded on 26 June, when his cousin ZHU Zaixi was installed as Prince of Zheng. For his efforts, Ming Emperor Shenzong 明神宗 awarded Zaiyu with a commendation and an arch of honour [yuyin fang 玉音坊] erected at Henei. On 12 August Zhu Zaiyu writes the presentation petition (Jin Lüshu zoushu 进律書奏疏 [Petition to present the Lüshu]), and dispatches his Right Administrator LI De 李德 to present his musical opus to the Emperor. This comprises 11 titles, bound in 20 finely-printed Fascicles:

- Lüli jingyi 《律吕精義》 [Precise principles of the musical pitches]
- Lüxue xinshuo 《律學新說》 [A new discourse in musical metrology].
- Yuexue xinshuo 《樂學新說》 [A new discourse on music]
- Suanxue xinshuo 《筭學新說》 [A new discourse on computation]
- Caoman guyue pu 《操縵古樂譜》 [Ancient music with zither figurations]
- Xuangong heyue pu 《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches]
- Xiangyin Shiyue pu 《鄉飲詩樂譜》 [Songs of the 《Shijing》 for performance at the Country Banquet]
- Liudai xiaowu pu 《六代小舞譜》 [Choreography for the minor dances of the 6 ancient dynasties]
• 《小舞鄉樂譜》 [Music of the country to accompany the minor dances]
• 《二佾綴兆圖》 [Diagrams of dance steps for 2 rows of dancers]
• 《零星小舞譜》 [Choreography for the minor dances at the Lingxing Temple]

These 11 titles fall into 3 groups, and Zhu Zaiyu himself refers to each group by an informal reference or title which is not found in the body text of the works themselves. In his presentation petition he writes, “Humbly and sincerely, with my works Lülü jingyi (1 copy in 6 fascicles), Lüxue xinshuo (1 copy in 6 fascicles), Yuewu quanpu (1 copy in 8 fascicles), all bound in volumes totalling 3 cases and wrapped under lock and key, I specially dispatch my Right Administrator Li De to bear it, and to present it for [your Majesty’s] attention. 謹以所撰律呂精義壹部計陸冊律學新說壹部計陸冊樂舞全譜壹部計捌冊裝潢成帙共三函鎖鑰袱全專差右長史李德齎捧隨本進獻以聞’ [A: Yuelü quanshu: 〈Jin Lüshu zoushu 進律書奏疏 [Petition to present the Lüshu]: 4b; A: Lülü jingyi / FENG 1998: 〈Jin Lüshu zoushu 進律書奏疏): 4]. The huge theoretical treatise Lülü jingyi, which takes up 6 Fascicles all by itself, makes 1 group. Although the formal title found in the body of the treatise is Lülü jingyi, the less formal running title Lüshu 《律書》 [Treatise on musical pitch] is printed in its page center margins (Fig. 1: 2). 3 musicological treatises (as we would call them today) make up the 2nd group with another 6 Fascicles. They are all New discourses: Lüxue xinshuo 《律學新說》 [A new discourse in musical metrology], Yuewu xinshuo 《樂舞全譜》 [A new discourse on music], and Suanxue xinshuo 《筭學新說》 [A new discourse on computation]. (In the Petition, Zhu Zaiyu simply says Lüxue xinshuo to include all 3 titles, because it is the biggest work of the 3, and its 4 Books takes up 4 Fascicles already.) The music scores and dance choreographies for practical performance fall into the 3rd group of 8 Fascicles. Zhu Zaiyu refers to them collectively as the Yuewu quanpu 《樂舞全譜》 [Complete score and choreography for music and dance], but this is again only an informal title. This group comprises 7 individual works, 2 of them being Caoman guyue pu 《操縵古樂譜》, and Xuangong heyue pu 《旋宮合樂譜》. Both scores have been mentioned earlier as the first fruits of Zaiyu’s musical collaboration with his father Houwan. Inside a copy of Caoman guyue pu at the library of Princeton University, I discovered a rarely-seen title slip bearing the actual title Yuewu quanpu: Part 2?3 《樂舞全譜》: 下 [Fig. 1: 3].

In his old age, Zhu Zaiyu retired to a modest residence on the outskirts of Henei, beneath the Jiufeng Mountains 九峰山 on the banks of the River Dan 丹水. It appears that he had moved out from the Prince’s palace even before he relinquished his title to Prince in 1606. He remained Prince Heir for life, and he retained an annual stipend of 1000 dan, as would be the rule if he were a Commandery Prince [Junwang 郡王]. But such worldly vanities meant nothing to him now. He lived the life of a common farmer, tended pigs, watered the mulberries, enjoyed his garden, and often shared a cup of wine with his neighbours and visitors. As we saw on p. 3, music remained a central part of his life, as well as study. In 1610, when he was already 75 years old, he completed 2 more treatises on music theory, respectively Lülü zhenglun 《律呂正論》 [Correct theory of the musical pitches], and Jialiang suanjing
《嘉量算經》 [Mathematical treatise of the measuring vessel], as well as a short mathematical tract Gu Zhoubi suanjing / Yuanfang gougu tujie《古周髀算經 / 圓方句股圖解》 [The ancient 《Zhoubi suanjing》 / Diagrammatic explication of the circle, square, and right triangle], all in the space of 5 months from April to August. Another short tract on music, Lülü zhiyi bianhuo《律呂質疑辨惑》 [Replying to doubts and clarifying misconceptions about the musical pitches] was most likely also written at this time. These late treatises do not introduce any new ideas, but simply revisit the old, and some passages are simply lifted from Lülü jingyi. Even so, they demonstrate an undiminished intellectual vigour to the very end.

On [18] May 1611, Zhu Zaiyu died after a short illness, aged 76 years. In January 1612, the Imperial court conferred on him the honorific title Duanqing 端清. In April 1612, his remains were interred beneath the Jiufeng Mountains near his residence outside Henei.
Fig. 1: 3  *Yuewu quanpu: Xia* 《樂舞全譜》: 下
[Complete score and choreography for music and dance. Part 2?3].
(Exemplar at Princeton University Geist Library TA141/278 v.11)

Fig. 1: 2  *Lülü jingyi* 《律呂精義》
[Precise principles of the musical pitches].
[A: *Lülü jingyi*: Inner Bk. 1 (*Lüshu*: Fasc. 1: 7a)
(Exemplar at Princeton University Geist Library TA141/278 v.5)]
### TABLE  Chronology of Zhu Zaiyu

<table>
<thead>
<tr>
<th>Date</th>
<th>Emperor Reign</th>
<th>Year</th>
<th>Age</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1519</td>
<td>Wuzong 武宗</td>
<td>year 13</td>
<td>13</td>
<td>Zaiyu’s father Zhu Houwan 朱厚烷 born.</td>
</tr>
<tr>
<td>1527-10-20</td>
<td>Shizong 世宗</td>
<td>year 6</td>
<td></td>
<td>Zhu Houwan installed as Prince of Zheng 鄭王.</td>
</tr>
<tr>
<td>1536</td>
<td></td>
<td>year 15</td>
<td>15</td>
<td>Zhu Zaiyu 朱載堉 born at Huaiqing prefecture 懐慶府: Henei county 河內縣, seat of the fief of Zheng.</td>
</tr>
<tr>
<td>1538</td>
<td></td>
<td>year 17</td>
<td>3</td>
<td>Zaiyu’s mother Consort Gao 高 dies.</td>
</tr>
<tr>
<td>1539-03-06</td>
<td></td>
<td>year 18</td>
<td>4</td>
<td>Zhu Zaiyu 朱載堉 name officially conferred.</td>
</tr>
<tr>
<td>c. 1541</td>
<td></td>
<td>year 20</td>
<td>6</td>
<td>Zaiyu’s brother Zaiheng 載陞 born.</td>
</tr>
<tr>
<td>1546-01-22</td>
<td></td>
<td>year 24</td>
<td>10</td>
<td>Zaiyu installed as Prince Heir of Zheng 鄭世子.</td>
</tr>
<tr>
<td>1548</td>
<td></td>
<td>year 27</td>
<td>13</td>
<td>Zaiyu’s brother Zaiheng 載陞 born.</td>
</tr>
<tr>
<td>1548-08-11</td>
<td></td>
<td>year 27</td>
<td>13</td>
<td>Zhu Houwan presents a memorial critical of Emperor Shizong.</td>
</tr>
<tr>
<td>1550-10-31</td>
<td></td>
<td>year 29</td>
<td>15</td>
<td>Zhu Houwan is calumniated by his uncle Zhu Youzhan 朱祐橏, demoted to commoner, and imprisoned at High Walls 高墙. In protest, Zaiyu makes his abode in an adobe outside the Prince’s palace.</td>
</tr>
<tr>
<td>1551-01-30</td>
<td></td>
<td>year 29</td>
<td>15</td>
<td>Zaiyu’s brother Zaiheng installed as Prince of Deqing 德慶王.</td>
</tr>
<tr>
<td>1554-05-31</td>
<td></td>
<td>year 33</td>
<td>19</td>
<td>Zaiyu deprived of Prince’s cap and belt.</td>
</tr>
<tr>
<td>1560-07-06</td>
<td></td>
<td>year 39</td>
<td>25</td>
<td>Sepu 《瑟譜》 Preface.</td>
</tr>
<tr>
<td>1565-04-01</td>
<td></td>
<td>year 44</td>
<td>30</td>
<td>〈Hunyuan sanjiaojiuliu tu zan 混元三教九流圖贊〉.</td>
</tr>
<tr>
<td>1567-02-20</td>
<td>Muzong 穆宗</td>
<td>year 1</td>
<td>32</td>
<td>Zhu Houwan restored to Prince and fief [Zaiyu returns to Prince’s palace].</td>
</tr>
<tr>
<td>1567-06-04</td>
<td>Longqing 隆慶</td>
<td>year 2</td>
<td>33</td>
<td>Zaiyu’s Prince’s cap and belt restored.</td>
</tr>
<tr>
<td>1568-05-23</td>
<td></td>
<td>year 2</td>
<td>33</td>
<td>Zaiyu’s brother Zaiheng installed as Prince of Chongde 崇德王.</td>
</tr>
<tr>
<td>1570-06-01</td>
<td></td>
<td>year 4</td>
<td>35</td>
<td>Zaiyu marries the granddaughter of He Tang 何瑭 (1474–1543).</td>
</tr>
<tr>
<td>1571</td>
<td></td>
<td>year 5</td>
<td>36</td>
<td>Zaiyu’s brother Zaiheng dies, age 24 years.</td>
</tr>
<tr>
<td>Date</td>
<td>Emperor Reign</td>
<td>year</td>
<td>Age</td>
<td>Event</td>
</tr>
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<tr>
<td>1580-09-24</td>
<td>Shenzong 神宗</td>
<td>year 8</td>
<td>45</td>
<td>Zaiyu sends servants to Goathead Mt. [Yangtou Shan 羊頭山] to find millets.</td>
</tr>
<tr>
<td>1581-02-04</td>
<td>year 9 month 1</td>
<td></td>
<td>46</td>
<td>Lüli rongtong《律曆融通》 Preface.</td>
</tr>
<tr>
<td>1584-02-12</td>
<td>year 12 month 1</td>
<td></td>
<td>49</td>
<td>Lüxue xinshuo《律學新說》 Preface.</td>
</tr>
<tr>
<td>1588</td>
<td>year 16</td>
<td></td>
<td>53</td>
<td>Zaiyu’s brother Zaiheng dies, age c. 48 years.</td>
</tr>
<tr>
<td>1591-02-17</td>
<td>year 19</td>
<td></td>
<td>56</td>
<td>ZHU Houwan dies, age 73 years.</td>
</tr>
<tr>
<td>1593 –</td>
<td>year 21 month 1</td>
<td></td>
<td>58–</td>
<td>〈Rangguo zhenglun shu 議國正倫疏〉</td>
</tr>
<tr>
<td>1594</td>
<td>year 22</td>
<td></td>
<td>59</td>
<td>Zaiyu petitions the throne to permit royal clansmen to compete in the civil serve examinations, and to be appointed as civil officials if successful.</td>
</tr>
<tr>
<td>1595-07-25</td>
<td>year 23 month 6</td>
<td></td>
<td>60</td>
<td>Zaiyu presents his calendrical opus to the throne in 〈Jin Lishu zoushu 進曆書奏疏〉. This comprises 3 titles, copied in manuscript and bound in 10 Fascicles:</td>
</tr>
<tr>
<td></td>
<td>month 6 day 19</td>
<td></td>
<td></td>
<td>• Lüli rongtong《律曆融通》</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Shengshou Wannian li《聖壽萬年曆》</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Wannian li beikao《萬年曆備考》.</td>
</tr>
<tr>
<td>1595</td>
<td>year 23</td>
<td></td>
<td>60</td>
<td>Zaiyu receives a visit from XING Yunlu 邢雲路 (? – c. 1623), and they discuss calendrical and astronomical problems together.</td>
</tr>
<tr>
<td>1596-01-29</td>
<td>year 24 month 1</td>
<td></td>
<td>61</td>
<td>Lüli jingyi《律呂精義》 Preface.</td>
</tr>
<tr>
<td>1603-09-07</td>
<td>year 31</td>
<td></td>
<td>68</td>
<td>Suanxue xinshuo《筭學新說》 engraving complete.</td>
</tr>
<tr>
<td>1606-01-01</td>
<td>year 33</td>
<td></td>
<td>70</td>
<td>Zaiyu presents his 7th petition to abdicate and relinquish the Zheng principality, and his request is granted.</td>
</tr>
<tr>
<td>1606-06-22</td>
<td>year 34</td>
<td></td>
<td>71</td>
<td>For his magnanimity Zaiyu receives a commendation from Emperor Shenzong, and an arch in his honour is built at Henei [yuyin fang 玉音坊].</td>
</tr>
<tr>
<td>Date</td>
<td>Emperor Reign</td>
<td>year</td>
<td>Age</td>
<td>Event</td>
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<tr>
<td>1606-08-12</td>
<td></td>
<td>year 34</td>
<td>71</td>
<td>Zaiyu presents his musical opus to the throne in 〈Jin Lüshu zoushu 进律書奏疏〉. This comprises 11 titles, bound in 20 finely-printed Fascicles:</td>
</tr>
<tr>
<td></td>
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<td>month 7</td>
<td></td>
<td>• Lülü jingyi 《律呂精義》</td>
</tr>
<tr>
<td></td>
<td></td>
<td>day 9</td>
<td></td>
<td>• Lüxue xinshuo 《律學新說》</td>
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<td>• Suanxue xinshuo 《筭學新說》</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>• Caoman guyue pu 《操縵古樂譜》</td>
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<td>• Xiangong heyue pu 《旋宮合樂譜》</td>
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<td>• Liudai xiaowu pu 《六代小舞譜》</td>
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<td>• Xiaowu xiangyue pu 《小舞鄉樂譜》</td>
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<td></td>
<td></td>
<td>• Eryi zhuizhao tu 《二佾綴兆圖》</td>
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<td>• Lingxing xiaowu pu 《零星小舞譜》</td>
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<tr>
<td>1607-01-30</td>
<td></td>
<td>year 35</td>
<td>72</td>
<td>Zaiyu returns his musical instruments and books to the Prince’s palace in Henei.</td>
</tr>
<tr>
<td>1610 Mar</td>
<td></td>
<td>year 38</td>
<td>75</td>
<td>Zaiyu receives a 2nd visit from XING Yunlu.</td>
</tr>
<tr>
<td>1610-04-07</td>
<td></td>
<td>year 38</td>
<td>75</td>
<td>Zaiyu writes Preface for Gujin lüli kao 《古今律曆考》 by XING Yunlu.</td>
</tr>
<tr>
<td>1610</td>
<td>Apr–Aug</td>
<td>year 38</td>
<td>75</td>
<td>Lülü zhenglun 《律呂正論》</td>
</tr>
<tr>
<td></td>
<td></td>
<td>month 3–7</td>
<td></td>
<td>Jialiang suanjing 《嘉量算經》</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gu Zhoubi suanjing / Yuanfang gougu tujie 《古周髀算經 / 圓方句股圖解》.</td>
</tr>
<tr>
<td>1610-05-02</td>
<td></td>
<td>year 38</td>
<td>75</td>
<td>Zaiyu succeeds in making the Jialiang 嘉量 measuring vessel, and writes a note to mark his success in Jialiang suanjing.</td>
</tr>
<tr>
<td>1610-11-10</td>
<td>[1610]</td>
<td>year 38</td>
<td>75</td>
<td>Jialiang suanjing engraving complete.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[year 38]</td>
<td></td>
<td>Lülü zhiyi bianhuo 《律呂質疑辨惑》</td>
</tr>
<tr>
<td>1611-05-[18]</td>
<td></td>
<td>year 39</td>
<td>76</td>
<td>ZHU Zaiyu dies.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>month 4</td>
<td></td>
<td>[day 7]</td>
</tr>
<tr>
<td>Date</td>
<td>Emperor Reign</td>
<td>year</td>
<td>Age</td>
<td>Event</td>
</tr>
<tr>
<td>----------</td>
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<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1612-01-16</td>
<td></td>
<td></td>
<td>39</td>
<td>Honorific title Duanqing 端清 conferred on Zaiyu.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td>Zaiyu’s remains interred near Jiufeng mountains 九峰山 near his residence outside He-nei.</td>
</tr>
<tr>
<td>1635</td>
<td>Sizong 思宗</td>
<td>8</td>
<td></td>
<td>Zaiyu’s grandson Zhu Changjie 朱常潔 accedes as Prince of Dongyuan 東垣王.</td>
</tr>
<tr>
<td>1644</td>
<td>Chongzhen 崇祯</td>
<td>17</td>
<td></td>
<td>Fall of Ming dynasty.</td>
</tr>
</tbody>
</table>
Abdication of the title to Zheng

Fig. 1: Genealogy of the Principality of Zheng with subsidiary houses Mengjin and Dongyuan. 
In order to understand the circumstances behind Zhu Zaiyu’s abdication, it is necessary to go into some detail about the genealogy of the Princes of Zheng (please refer to the genealogy in Fig. 1: 5). The 1st Prince of Zheng, ZHU Zhanjun the Prince Jing 睿王朱瞻埈 (27 March 1404 – 1424 – 8 June 1466, dates of title in bold) was the 2nd son of Ming Emperor Renzong 明仁宗 (reign Hongxi 洪熙 1425), and he was enfeoffed as the 1st Prince of Zheng in 1424. Zaiyu was his grandson of the 6th generation. The lineage of the Zheng Princes was not uninterrupted however. The 2nd Prince, ZHU Qiying the Prince Jian of Zheng 郑简王朱祁鍈 (1431 – 1468 – c. 15 September 1495), had 12 sons. But the 3rd Prince, Qiying’s grandson ZHU Youxin the Prince Kang 康王朱祐枔 (8 May 1474 – 1497 – c. 11 April 1507) died without issue, and on his death, it became necessary to reach back to descendants of an earlier generation to find an heir. The most senior branch in line was then the house of Mengjin 盟津, headed by ZHU Jiansong the Prince Gongyi 恭懿王朱見濍 (c. 1460? – 1474–1484 – 16 September 1509), 3rd son of Qiying by a secondary wife. But this branch at that time was disinheritenced, because Jiansong had been demoted to commoner for his crimes. (The study of Zhu Zaiyu’s 〈Petition to relinquish the principality and rectify family relationships 让国正倫疏〉 (p. 20) will go into the details concerning Jiansong.) The next most senior and eligible heir must then be chosen from the house of Dongyuan 東垣, descended from Jiansong’s younger brother ZHU Jian’gan the Prince Duanhui 端惠王朱見橅 (1464 – 1474 – c. 1503), who was the 4th son of Qiying, by a secondary wife. In this way Zhu Zaiyu’s grandfather ZHU Youzhai the Prince Yi of Zheng 郑懿王朱祐檡 (1484–1509–1521), who was at that time already Prince of Dongyuan, leapfrogged over the house of Mengjin, and succeeded Youxin to become the 4th Prince of Zheng in 1509. In 1527, the title passed to his son ZHU Houwan the Prince Gong of Zheng 郑恭王朱厚烷 (1519–1527–1550 / commoner / 1567 – c. 17 February 1591, dates of title in bold). Zaiyu, as Houwan’s eldest son by his primary wife, was already Prince Heir of Zheng [Zheng Shizi 郑世子]. On the death of Houwan in 1591, by rights it was his turn to succeed to the title.

There is one complication however. In 1531 Jiansong was granted an amnesty for his crimes, and posthumously reinstated to his title of Prince of Mengjin. According to the rules of feudal practice, this means that his descendants had also regained their rights of succession. Zaiyu, the conscientious Confucianist, considered these rules to to be the very basis of family relationships, heaven-ordained and inviolable. He felt that while it was entirely correct for his grandfather and father to possess the title to Zheng in 1509 and 1527, by 1591 the situation had changed, due to the reinstatement of Jiansong in 1531. Zaiyu, his father Houwan, and grandfather Youzhai all stemmed from the house of Dongyuan. Dongyuan was the more junior branch in the genealogy, and Mengjin the more senior branch. If he now succeeded to the title of Zheng, he would be usurping the rights of inheritance which the descendants of Mengjin had regained. Therefore he must abdicate the succession, and yield the title of Zheng to his cousin ZHU Zaixi 朱載壐 (> 1536 – 1606 – ?), the great-grandson of Jiansong, who had been the 1st Prince of Mengjin.
At least, that is ostensibly the reason for abdicating which Zhu Zaiyu gives in his petition, and the reason to which the counsellors in the Ministry of Rites [libu 礼部] must give answer. For a conscientious person deeply inculcated in the mores of Confucian philosophy, as Zhu Zaiyu was, this could well have been a genuinely sincere reason. A 2nd reason given by Zaiyu is his poor state of health. He pictures himself as one who might die any day. While we may accept that his health was frail, Zaiyu’s self-depiction has the air of a self-serving excuse and exaggeration, for he continued to live for 18 more years after his petition. But with our overview of his whole life, and reading between the lines of his petition, we can sense a 3rd and very deep-seated reason, which Zaiyu never holds up explicitly. He had suffered from and seen at first hand the selfishness, vanity, pettiness, and vindictive malice of Youzhan, Jiansong, Lady Zhang, and their like in the Prince’s household, and he was thoroughly disgusted by it all. During his 17 years of self-imposed exile outside the Prince’s palace, he had come to know the fresh air of other philosophical outlooks, Buddhism and Daoism, and experienced the freedom of life outside the gilded cage of the Prince’s palace, guarded by its suffocating Regulations Governing the Royal Fiefs 宗藩條例. This was what his spirit longed for. In his old age, he chose to live a simple life like a commoner, instead of the rich but burdensome and restricted life of a Prince. Abduction was the solution which would give himself this ultimate freedom, and for his descendants, permanent protection from an endless cycle of vengeance and revenge between his own family and the house of Mengjin. A true magnanimity shines through his act, and it is with good reason that the people of his day saw this as an extraordinary deed worthy of praise and admiration. The reader must read Zhu Zaiyu’s own words, and make its own judgement.
THE PETITION TO ABDICATE

Petition to relinquish the principality and rectify family relationships / by ZHU Zaiyu, Prince Heir of Zheng

28 Your Imperial subject’s ancestor, Zhanjun Prince of Zheng 鄭王瞻埈, had 4 sons. His 1st son by the primary wife was Qiying the Prince Jian 简王祈鍈; the other 3 lineages are all extinct today. Prince Jian had 12 sons. His 1st son by the primary wife was Jianzi the Prince Xi 僕王見滋; the other sons were all born of secondary wives. At the present time, [Prince Jian’s] only surviving male descendants are those from his 3rd, 4th, 9th, and 10th sons; the other lineages are all extinct. Prince Xi had only 2 sons. His 1st son by the primary wife was Youxin the Prince Kang 康王祐枔; his 2nd son Youyi 祐檍 died before marriage. Prince Kang had no son, nor any nephew by a younger brother. In year 2 of reign Zhengde 正德 [1507], Prince Kang passed away, and his direct line became extinct. His line could be continued only by succession from a branch line. If we examine the order of seniority in the family, Prince Jian’s 2nd son had died before he was given any name; and his 3rd son, Jiansong Prince of Mengjin 盟津王見濁, was then the most senior, so he should be inheriting the title as Prince of Zheng.

Tracing back to earlier events, years previously, there had been some discord between him (Jiansong) and Lady Zhang 張夫人, one of his father’s (Prince Jian’s) secondary wives 34, 35, and they often offended each other in speech. Lady [Zhang] harboured grudges [against Jiansong], and, arrogantly relying on her favoured position [with Prince Jian], she sought to influence the Prince by slander, falsely accusing [Jiansong] of verbally abusing his father without regard for filial respect 36 … and so forth. [As a result,] the title of Prince was removed from him. 37, 38 After he had undergone a course of study and learned the proper manners and ritual practices 39, he [was] again falsely accused of casting magical curses 40, murder, etc. He was demoted to the status of commoner, and sent to High Walls Prison. 41 Not long afterwards, the Imperial court discovered that he had been unjustly accused, and issued a special edict to return him to his former Prince’s residence. 42 Although the contemporary papers in the case are by now worn and damaged or destroyed, yet [2 documents] survive to testify to the facts: an Imperial edict of the 24th day of the 8th month in year 22 of reign Chenghua 成化 [21 September 1486] 43, and a letter under Imperial seal dated the 18th day of the 12th month in year 23 of reign Chenghua [1 January 1488] 44. The Imperial edict was a reprimand from Emperor Xianzong 憲宗 to Prince Jian, 45 warning him against his mistake in heeding biased reports; and the Imperial letter, from Emperor Xiaozong 孝宗, advised Prince Jian on the virtues of harmonious relationships. Both Imperial missives are extant, and can be consulted. After he received 46 these heavenly
words, Prince Jian repented of his former errors, made peace [among his family], and harmony was restored. From Prince Jian to the time of Prince Kang, 8 petitions were submitted to the throne, begging to reinstate Mengjin to his original rank [of Prince]. The ministry concerned found no precedent, and the petitions were denied. 47

Thus, when Prince Kang died without heir, and Mengjin had not been reinstated, posing a barrier to his succession, a compromise solution was made, to have the son of his younger brother (Prince Jian’s 4th son, by a secondary wife), Jian’gan the late Prince Duanhui of Dongyuan, accede to the title as Prince of Zheng. This was Youzhai the Prince Yi 羿王祐檡, the grandfather of your Imperial subject. The date was the 15th day of the 5th month in year 4 of reign Zhengde [2 June 1509]. In the same year, on the 3rd day of the 9th month [16 September 1509], Mengjin died of an illness, leaving behind a young son. 50 Then, in year 16 of reign Zhengde [1521], Prince Yi passed away. In year 6 of reign Jiajing 嘉靖 [1527], your Imperial subject’s father, Houwan the Prince Gong 勝王厚烷, succeeded to the title.

In year 9 of reign Jiajing [1530], great sacrificial altars were newly built on the southern and northern outskirts [of the capital]. 52 After the ceremony [to Heaven], an Imperial decree was announced, that any members of the royal house who had suffered an injustice, may submit petitions to argue and re-decide their cases. 53 Youzhan 祐橏, the surviving son of Mengjin, responded to the decree to plead his father’s case. Referring to one article of law, 54 “If a grandparent or a parent had been swayed by the words of a younger wife or a beloved son who intrigued to inherit an official position by deceit, or to seize some wealth or property, etc, or if any had suffered from falsely fabricated charges, physical or verbal abuse, no matter how many times — in all such cases, arguments will be heard and dealt with.” By Imperial order. Respectfully following the Imperial order, [Youzhan] submitted 3 petitions, in tones earnest and sincere. Emperor Shizong 世宗 was moved in sympathy, and in the 8th month in year 10 of his reign Jiajing [1531], the Imperial court granted permission to reinstate his father (Jiansong) to his original rank. 55 The honorific posthumous title Gongyi 恭懿 was conferred on him, he was granted the Princely certificate and seal, and honoured with all fitting funerary and ancestral rites. In year 33 of reign Jiajing [1554], Youzhan died of illness. His son Houwei 厚煒, and his surviving grandsons Zaixi 載壐 and others, are today all commoners, living retired lives as farmers and scholars, with a meritorious reputation among the folk. In terms of genealogy, they are really descendants of royalty. The royal genealogical register can be inspected — hardly would I dare to be making this up.

Thus the injustice suffered by [the house of] Mengjin reaches back to deep roots, and is not just the work of one day. Today the people of Huaiqing 懷慶 say that, the official opinion of
the time feared that if Jiansong were permitted to be reinstated posthumously, then Youzhan would surely beg for a further Imperial favour to inherit, and the repercussions among members of the royal house would not be slight. They counselled that since the father of your Imperial subject had already inherited the title [as Prince of Zheng], such propositions should not be taken lightly, but events must wait until he had passed away, and then perhaps there might be room for further discussion. These sayings have been circulating for 60 years now. So it stands to reason, that now is the time to examine the order of family relationships, and rectify the feudal titles. If your Imperial subject fails to put forth his views and give voice to the public opinion at this time, then the people of the whole prefecture would suspect my father and grandfather of usurping his (Mengjin’s) family of their title to the principality of Zheng, so that his sons and grandsons are deprived of what they deserve. Your Imperial subject would be truly ashamed to bear such an unrighteous appellation [of usurper], and to implicate my father and grandfather in dishonour as well. If this were publicized at the marketplace, then your Imperial subject would suffer an injustice even greater than the other (Mengjin’s) ! Therefore I submitted 3 petitions in all earnestness, firmly resigning from the affairs of the Prince’s court. Yet the counsellors still harboured doubts that your Imperial subject was chary of losing [his high position], so they assigned to me a job beyond my powers to perform, thus further adding to my inexpressible anxieties and mortification, without being able to help myself. More has been left unsaid, which your Imperial subject wishes [now] to narrate to Your Majesty, and I beg your holy judgement to find a solution acceptable to all.

In the ancient time, the people of Jin 晉 tried to help Jiezi 捷菑 force an entry into the state Zhu 邾 [and establish him as the ruler there], but because Jueqie 獻且 was the elder [brother], they could make no entry. The Chunqiu《春秋》 [Spring and Autumn annals] lauded this fact, that they could make no entry. Kuaikui 蒯聵 of Wei衞 was condemned by his father, and [his son] Zhe 輒, respecting his grandfather’s wish, opposed him. [When Confucius was asked his opinion on this,] he insisted on rectifying names, for though Kuaikui’s father condemned him, Confucius did not. Yijiu 宜臼, Shensheng 申生, Boqi 伯奇, Xiaosi 孝巳 … none of these were not initially condemned, but in the end it turned out that none of them were guilty of their alleged crimes. In terms of the present case, Prince Gongyi of Mengjin is like Jueqie, and Prince Duanhui of Dongyuan is like Jiezi. Although the one was condemned, he was not guilty. And though the other was meritorious, it was not right to uphold his inheritance. Why? When establishing succession, the criterion is to choose the son of the primary wife, and not on seniority in age; and when establishing the inheritance of the sons of the secondary wives, the criterion is on seniority in age, and not on their relative merits.
not the son of the primary wife, and Mengjin was really the senior. The difference between primary and secondary, the order of senior and junior, the rules of human conduct, and the heaven-ordained bonds of family relationships — these principles are respected today as of old. In the great ethics of the Chunqiu, rectifying names comes foremost. 71 “If names are not correct, then speech will not correspond with the facts nor sound reasonable; and if speech does not correspond with the facts nor sound reasonable, then affairs will not succeed.” Therefore Zuozhuan 《左傳》 [(Spring and Autumn annals) / with commentary by Zuo] says, 72 “When their speech sounds reasonable but we go against it, it will be inauspicious.” It refers precisely to this.

In the ancient time, the Lord of Lu 魯侯 had an elder son called Kuo 括, and a younger son called Xi 戲. King Xuan of Zhou 周宣王 chose Xi to succeed the Lord of Lu, and afterwards, Kuo’s son Boyu 伯御 killed Xi and made himself Lord [instead]. 73 Commentators blame King Xuan, but they do not realize that Xi brought the disaster upon himself. Does the Shijing 《詩經》 [Classic of poetry] not say,

74 People who have no conscience
Repine against each other from their own little corners.
One accepts some high aristocratic office, and will not yield —
Till finally they come to ruin.

This is a mirror of the past, [casting its light] on the present. Reflect and take heed!

When Prince Yi, the grandfather of your Imperial subject, acceded [to the principality of Zheng], Mengjin was still living, but as a commoner. When Prince Gong, the father of your Imperial subject, came to the succession, although he (Mengjin) was no longer living, he had not yet been reinstated to his Princely rank. The cases of your Imperial subject’s grandfather and father both came before [the promulgation of] the Regulations 75, and so there were no reasonable obstacles [to their inheritances]. But now, he (Mengjin) has been reinstated to his original rank, an honorific posthumous title has been conferred on him, in the family order he was the most senior, and his descendants are virtuous and capable. The succession of your Imperial subject then occurs after the Regulations, and thus obstacles exist. Your Imperial subject’s situation, and that of my father and grandfather, differ in time. As the matter is suspect, it should be avoided, and that is exactly how it is at present.

The Exegesis says, 76 “If, on self-examination I find that I am in the wrong, then even though [I am confronting only] a common fellow in his coarse garments, should I not be afraid? If, on self-examination I find that I am in the right, then even [against] thousands of men, I go
forward.” Just to speak of your Imperial subject’s own self, to inherit the title [as Prince of Zheng], on self-examination I find that I am in the wrong. To renounce the title, on self-examination I find that I am in the right. [Mengjin’s great-grandson] Zaixi and others like him may be compared to the “common fellow in his coarse garments”. The 5 generations of your Imperial subject’s family, from my great-grandfather down to my son, with their works and accomplishments, may be compared to the “thousands of men”. Your Imperial subject’s father, when he was living, enjoyed the special munificence of the preceding reign; and in death, he was grateful for the solicitude of Your Majesty. He might be considered a giant among the royal fiefs. Wherefore make my father and your Imperial subject to be the first to violate the Essential Regulations newly promulgated by Your Majesty, and to offend the whole world? Your Imperial subject truly fears that if, in generations hence, a royal clansman should ever usurp the place of a primary son by a secondary, or a junior member should transgress over a senior, they would point to my father and your Imperial subject as an excuse, and we would then betray the gracious favours bestowed on us by Your Majesty, much to our shame and disgrace. For “there are joys to be found even as one abides by the teachings of proper conduct.” Why must one cling to the principality of Zheng as if it were one’s private possession, against right and reason, trespassing over one’s proper limits, in order to find one’s satisfaction and glory?

Moreover, in recent days your Imperial subject’s old illness has quite flared up. Day and night I cough up blood without cease, I eat and drink little, my vitality feels hollow, my fluids feel flooded, my muscles are wasted, and I am but a bag of skin and bones. Any day and your Imperial subject may die, and when I can barely preserve my own body, how should I be adequate to the task of managing the affairs of the Prince’s court? Therefore for the 4th time, I beg of your heavenly grace, to permit your Imperial subject to renounce my title [to the principality of Zheng], so that I may tend to my poor health. If your Imperial subject might just relax among the woods, nourish my natural harmony, with mind serene and body at ease … [if I could but] face heaven and earth with a free conscience, live without strife and die at peace with no regrets … would that not be a blessing indeed! Otherwise, to cast down the principles of family relationships ordained by heaven, to confound the rules of human conduct, invite reproach for contentious disputes, debauch traditions of courtesy and humility, malign fellow kinsmen with insults, and drag ancestors into dishonour — such actions will do only harm and no good. [I would then] live in constant illness with gloomy worries, passing my days in anxiety without joy. When I quietly contemplate such a prospect, I must shy away from it in shame. I should rather follow in the steps of [Zi]zang and [Ji]zha, escape and hide myself in a rocky cave, to wither away and die alone, in the hope of keeping faith to myself to the end. Then I would die as I have lived. Would that not be the best?
Your humble subject prostrates himself, and only [awaits] the scrutiny and judgement of your holy wisdom, with infinite gratitude and the most earnest of hopes.

Another (supplementary) petition 又疏

MEMORIAL  [by an anonymous Imperial counsellor, in response to Zaiyu’s petition above, and quoted by Zaiyu]

In the matter of complying with the Essential Regulations, rectifying family relationships, and presenting the royal genealogical charts: the 4th petition for your heavenly grace, to take pity on his illness, to condescend to grant him leave to nurse his health, so as to extend the remaining days of his life.

Referring to the Imperially-decreed Essential Regulations Governing the Royal Fiefs, article concerning succession by sons of secondary wives: “If an Imperial Prince or a Commandery Prince has a number of concubines, no matter when they entered his household, and they give birth to a son either after or before their investiture [as a secondary wife], the son is regarded as a secondary son. If the son by the primary wife has a problem, and a secondary son succeeds to the father’s title instead, the succession must fall to the eldest secondary son. In cases where [a son] seizes succession out of order, or presents murky memorials to interfere with the succession, the offender shall be dealt with and punished by his own clan, and the guidance officer(s) and other co-conspirators shall be handed over to the Imperial Regional Inspector for criminal investigation.”

The Imperial subject concerned first submits that his grandfather entered into the family lineage [of the Zheng principality] from a branch line, but now when the succession passes to him, the situation has changed. The former occurred before the Regulations, and there was no violation nor obstacle [to his inheritance]; the latter comes after the Regulations, and this makes it a violation and poses an obstacle. He begs Your Majesty to order an investigation, so that the popular opinion may be duly expressed. As to the matter of the subject’s illness of many years, and his unfit condition to manage the affairs of the Prince’s court, etc, we report following the Imperial directive, “Have the inspecting officer make a careful investigation and report back. By Imperial order.” Respectfully following the Imperial order, the investigation has found the subject’s petition to be entirely according to fact, and no foul play is involved. The recommendation remains, that the subject
should administer the affairs of the Prince’s court, but at ceremonial occasions, the subject’s son may stand in for him instead. 93

[SUPPLEMENTARY PETITION  by Zhu Zaiyu]

On hearing this recommendation, your Imperial subject is much perturbed. I would suggest 3 great objections against it. I cannot help but respectfully give an account of the matter from beginning to end, and prostrating myself, request your holy judgement.

As your Imperial subject understands, the Essential Regulations Governing the Royal Fiefs are legal commands decreed by Your Majesty, to be observed by your subjects. If Your Majesty issues a command, but is the first to disregard these Regulations, how are you to enjoin the royal fiefs under you [to obey the Regulations]? If your subject, in observing your command, is the first to violate these Regulations, how am I to keep the members of my court under control? Your Imperial subject humbly submits this as the 1st great objection. If your Imperial subject’s great-grand-uncle Prince Gongyi of Mengjin was really guilty, then why did Emperor Xiaozong grant him a special letter under Imperial seal, to explain his innocence? And why did Emperor Shizong confer on him a special honorific posthumous title, to extol his goodness? But if he was actually innocent, then his descendants should naturally inherit their ancestral title, and in this way rectify the order of family relationships. We must not let the people of Huaiqing prefecture entertain a suspicion that your Imperial subject’s grandfather had intrigued against the house of Mengjin, secretly to deprive them of their inheritance. The dead would suffer an injustice against which he cannot defend himself, the living would bear the reproach of unrighteousness, blameless reputations would be sullied, and the great principles of family relationships would be confounded. This is the 2nd great objection. The Imperial court, ever deeply solicitous of its family and relatives and attentive to every detail [of their welfare], has never but desired the longevity and health of its members. Your Imperial subject has been chronically ill with a consumptive heart disease. At the slightest provocation, I throw up blood, and fall unconscious. After ten days or a month, I recover somewhat, and then again relapse. Perhaps if I might rest and quietly nurse my health, the disease would abate somewhat. But if I am burdened with mental exertions, plagued by worries, and oppressed by the passions, then the illness takes a turn for the worse. It has reverted back and forth like this for years. Once I heard that I was assigned the task of managing the affairs of the principality, my fears redoubled, and my illness has markedly deteriorated. The counsellors love your Imperial subject but vainly, when they assign to me the affairs of the court, without considering that it may cost your Imperial subject his life. With all respect, I am afraid that this cannot be the kind intention of Your Majesty, in your loving solicitude for your subject. This is the 3rd great objection.
Because of these 3 great objections, your Imperial subject has not been able to contain himself. I submitted 3 petitions to beg your heavenly grace, and only then was permission granted. The ministry concerned issued a memorandum, explicitly stating that some person of merit should be nominated to stand in and manage affairs. Only that the nominee must be vouched for by letters of certification from his kinsmen and kinsfolk by marriage, and a reply should be made to the Office of the Administrator concerned. Following the instructions of the memorandum and collecting together [the letters of] the Princes and kinsfolk, by general acclaim all recommend Houguang Prince of Luijiang, 卢江王厚光. Outstanding by his seniority in age and virtue, and long noted for his merit and ability, he is well qualified to manage the affairs of the [Zheng] court. If you consider your Imperial subject myself, I have truly been ill for many years; and your subject’s son Yixi,翊锡, is truly a timid mediocrity — neither is capable of managing the affairs of the court. If you just take any of the kinsfolk of the Commandery Princes, none is supported by a letter of certification, in agreement with what your Imperial subject has submitted. Yet when all this is relayed to the counsellor, he fails to note that your Imperial subject’s illness reverts back and forth, and just happening to see a slight temporary recovery, he suggests that all will be well with some bed rest. His recommendations see-saw about inconsistently and indecisively, and matters are dragged out in delays. Your Imperial subject’s fears are greatly increased, and the old illness suffers a relapse, I vomit blood without cease, and my life hangs in the balance. If I do not make a petition, I truly fear that the business of the court will still be my undoing, and my life may be forfeit. Therefore I make bold to beg of your heavenly grace for the 4th time, prostrating myself before Your Majesty in the hope that you may allow your Imperial subject’s request, and condescend to grant a special edict, to command the nomination of a meritorious member of the royal house to administer the affairs of the [Zheng] court. Hopefully that will work out for the best.

Regarding your Imperial subject’s younger cousin Zaixi, 载壐 [Note 57], he truly is the great-grandson in the primary line of descent of Prince Gongyi of Mengjin. According to the royal genealogical register, he is the most senior in the family order. For years he has been suffering from injustice, but his plight is already known to the ancient sages; he is languishing in hardship with none to turn to, but he has long held the sympathy of the common folk. The Imperial court, in its benevolence and mercy, should first extend its consideration to him. And regarding your Imperial subject’s kinsman-uncle Houguang Prince of Luijiang, personally he is faithful and honest, in his family he is filial and friendly, and long recognized as virtuous and capable, he is universally respected among the royal kinsfolk and the general populace. Although he is junior in the family order, in age and virtue he is uniquely the senior. The Imperial court, in its veneration of the virtuous and respect for the able, should select for office one
such as he. By public consensus, these 2 are the sole nominees: the one to inherit the princely
fief, the other to administer the affairs of the court.

Nevertheless, your humble subject dares not decide matters on my own authority, but re-
quests your superior judgement. Prostrating myself before Your Majesty, I hope that you will
issue an edict, directing the ministry concerned to make a fair investigation. If what your Impe-
rial subject says is found to be true, I beg that first an edict be granted to Houguang, that he
should stand in and administer the affairs of the [Zheng] court. When that is satisfactorily set-
tled, then an order may be issued for Zaixi to succeed to the title as Prince of Zheng. Perhaps
then, the public debate would find its resolution, the affairs of the principality would attain their
orderly execution, your Imperial subject would be enabled to tend to private concerns of my
health and prolong the days of my life, the Imperial laws would be obeyed, my grandfather
would be absolved from unjust accusations, principles of human relationships would be clarified,
and tenets of integrity, courtesy, and humility would be observed. If so, then not only would
your Imperial subject be indebted to your great favour, as bestowing on me a new lease on life,
but even my grandfather from his grave would be forever grateful for your holy grace. Your
Imperial subject with my whole family, in life and in death, look up to you with inexpressible
and unbounded gratitude.
Fig. 1: 6a Petition to relinquish the principality and rectify family relationships / by Zhu Zaiyu, Prince Heir of Zheng

鄭世子朱載堉讓國正倫疏

хИЖ Рутфіт 1660 Ж Ілю 39 Ж 38 фі (ІЖ Рутфіт 1660 . А2011Ж Мцдю 2Ж 268)ъ
Fig. 1: 6b  Petition to relinquish the principality and rectify family relationships / by ZHU Zaiyu, Prince Heir of Zheng

郑世子朱載堉讓國正倫疏

Fig. 1: 6b  Petition to relinquish the principality and rectify family relationships / by ZHU Zaiyu, Prince Heir of Zheng

郑世子朱載堉讓國正倫疏
Fig. 1: 6c  Petition to relinquish the principality and rectify family relationships / by Zhu Zaiyu, Prince Heir of Zheng
&  Another (supplementary) petition
鄭世子朱載堉讓國正倫疏 又疏
хИЖ Рутфйт 1660Ж Илю 39Ж 39фй (ИЖ Рутфйт 1660. А2011Ж Мшлйо 2Ж 269)ъ
Fig. 1: 6d  Another (supplementary) petition & Petition to rectify family relationships according to seniority

又疏 議正倫齒疏

[B: Henan 1660: Bk. 39: 40ab (B: Henan 1660 / F2011: Vol. 2: 270)]
Fig. 1: 6e  Petition to rectify family relationships according to seniority

議正倫齒疏

[B: Henan 1660: Bk. 39: 41ab (B: Henan 1660 / F2011: Vol. 2: 270)]
Fig. 1: 6f  Petition to rectify family relationships according to seniority
議正倫齒疏
[B: Henan 1660: Bk. 39: 42a (B: Henan 1660 / F2011: Vol. 2: 271)]
THE WORKS OF ZHU ZAIYU

With the publication in 2013 of Zhu Zaiyu’s *Collected works* in a facsimile edition [A: Zhu / Li F2013], almost all of his extant writings are now readily available in one source. Of the writings not extant, some may truly be lost, but many are likely to be bibliographic errors or phantom titles. It will be a futile waste of time to embark on a wild goose chase after them. General surveys of Zhu Zaiyu’s works are available in the monographs by CHEN, DAI, and WU Zihui, and it would serve no purpose to repeat their work here in a formal and perfunctory manner. Most of Zhu Zaiyu’s extant works have already been described in the previous biographical sketch, in the context of his life. Bibliography A at the end of this study provides an exhaustive list of Zhu Zaiyu’s published writings and representative editions, with brief notes on dates. In this section I clarify a long-standing confusion concerning the printing history of the *Yuelü quanshu* 《樂律全書》, offer some cautionary remarks on the chronology of Zhu Zaiyu’s works, and give a preview of my re-discovery of a fragment of the treatise *Xiantiantu zhengwu* 《先天圖正誤》 [Correcting errors in the a priori diagram of the 《易經》].

(At this stage of study, it would be very useful to compile a catalog of all the musical compositions by Zhu Zaiyu, listed according to title, and showing all their various arrangements scattered throughout Zhu Zaiyu’s works. This is not difficult to do, but time constraints preclude it.)

**Printing history of the Yuelü quanshu 《樂律全書》**

The principal compendium of Zhu Zaiyu’s writings is the *Yuelü quanshu* 《樂律全書} [Comprehensive treatise on music and music theory] [A: Yuelü quanshu]. This title should first be explained. It is an informal title, which does not appear as such in any of its constituent works. It is hinted at in a remark in *Lüli jingyi*, [A: *Lüli jingyi*: Inner Bk. 7: (Lüshu: Fasc. 3: 17a); A: *Lüli jingyi* / FENG 1998: 424] “Theory embodies the principles, and music consists in their practice. When both principles and practice are taken together, then we may have something close to a comprehensive treatise 律者體也 樂者用也體用兼備庶幾全書”. The actual name *Yuelü quanshu* is only mentioned by Zhu Zaiyu in his very last works written in 1610, to refer to his earlier musical treatises in general [A: *Jialiang*: Bk. 3: 33a (see p. 3); A: *Lüli zhenglun*: Bk. 2: 5b, Bk. 3: 5b]. Today the title has come to include the totality of Zhu Zaiyu’s works which he presented to the throne in 1595 and 1606, including both the calendrical and musical works (probably because they are all printed in a uniform format). This is the practice in all modern editions, and most modern bibliographies and catalogs. One older exception is the *Siku quanshu* 《四庫全書》, which applies the title *Yuelü quanshu* only to the 11 works presented in 1606 as Zhu Zaiyu’s musical opus. Considering Zhu Zaiyu’s own meaning and usage, it appears that the *Siku quanshu* is right after all. Nevertheless, to avoid bibliographic confusion, in the present study I
conform to current bibliographic practice, and use the title *Yuelü quanshu* in its inclusive sense to mean all 14 musical and calendrical works taken together.

I mentioned (on p. 9) that when Zhu Zaiyu presented his musical opus to the throne on 12 August 1606, he had taken great pains to make it a handsome presentation engraved in print. He tells us so directly in his *Jin Lüshu zoushu* (Petition to present the *Lüshu*), and we can see the beautiful result in some photographs of the print TA141/2377 from the Gest Library at Princeton University (see Fig. 1: 7, and more photos in Ch. 3, Ch. 4). As to his earlier calendrical opus, the presentation was made on 25 July 1595 in manuscript, bound in 10 Fascicles. We know this from less direct information. The Imperial court requested an extra copy of the work for study by the Directorate of Astronomy [*Qintian jian* 欽天監], and Zhu Zaiyu complied with a 2nd copy delivered to the Ministry of Rites [*Libu* 礼部], accompanied by a note from his Right and Left Administrators GUAN Zhizheng 關志拯 and XIE Tingxun 謝廷訓 dated 20 December 1595, saying that *Wannian li beikao* 《萬年曆備考》: Appendix (*Lishu* Fasc. 1: 121a) “the *Lishu*, originally in 10 Books, is now re-copied into 2 Fascicles 历书原藁十卷今謄錄作二册”. If the *Lishu* was already in print at the time, no re-copying would have been necessary, and so we infer that it could only have been in manuscript. Today we cannot see these manuscript copies anymore, but all extant copies are printed, and in a uniform format like those works presented in 1606. The 3 calendrical titles are bound in 2 Fascicles, with the informal running title *Lishu* 《曆書》 [Treatise on the calendar] printed in the page center margin, just as described in the note. The most likely scenario is that Zhu Zaiyu made these prints himself too, but after the more pressing workload of 1606 was finished. That is, they would be printed sometime between 1606 and 1610.

Extant prints of the *Yuelü quanshu* are not all as beautifully made as TA141/2377 from the Gest Library. The print TA141/278, from the same library, is printed on paper of mediocre quality from a smudged and deteriorated printing block, and much poorer in quality (see other photos in this dissertation). Prints from various libraries also differ among themselves in corrections of a few misprints, although they are similar enough in all other aspects to be made from the same printing blocks. This shows that the same set of printing blocks have been used to make repeated impressions over many years. A later resident of Henei, FAN Taiheng 范泰恒 (fl. 1745 – d. 1775), writes that 111 “The printing blocks have been kept for generations by the SUN family in our town.” The SUN family were the descendants of SUN Kexiao 孫克肖, the local scholar who married Zhu Zaiyu’s daughter (p. 7). DAI tells us that the blocks survived until the 1950s, preserved all this time in the SUN family home. 112 Up until the advent of facsimile printing in the modern era 113, this one set of printing blocks, originally made by Zhu Zaiyu himself, has served as the source for all printed editions of the *Yuelü quanshu*, and its one and only Urtext.
Concerning the printing history of the *Yuelü quanshu*, a misconception has prevailed among bibliographic circles for some 100 years, which it is well to clear up at this point. It concerns a hypothetical (Ming) palace treasury edition [*neifu ban 内府版*] of this work. The thread winds through the 2 prints held at the Princeton University Gest Library, TA141/278 and TA141/2377, and it centers on their slight difference in size.

(1) The (*Qinding* Tianlulinlang shumu 《(欽定)天祿琳琅書目》 [(Imperial) catalog of the Tianlulinlang Library] (Qing dynasty, 1775) records a copy of the *Yuelü quanshu* in 47 Books, including both musical and calendrical works, *stored* in the Ming palace treasury [*neifu 内府*]. As far as I can tell, this information was correct.

(2) In his *Siku jianming mulu biaozhu* 《四庫簡明目錄標注》 [Notes on the 《Siku quanshu jianming mulu》] (published 1911), SHAO Yichen 邵懿辰 (1810–1861) remarks that there exist 2 engravings of the *Yuelü quanshu* in 38 Books [musical works only], distinguished by slightly different sizes of type. “One was *engraved* at the palace treasury, and one was *engraved* at the [Zheng] principality” [B: SHAOYC 1911: Bk. 4: 13b]. Apparently SHAO was unaware that wooden printing blocks can distort with age, so that the same block can produce slightly different sizes of print in impressions made over many years. His change of wording from “stored 藏” in (1) to “engraved 刻” in (2) introduced the initial error. The error is repeated verbatim in all subsequent editions and revisions of this catalog, up to [B: SHAOYC & SHAOZ 1979: 153].

(3) During 1939–1942, WANG Chung-min 王重民 prepared a catalog of the Chinese rare books in the Library of Congress, later published as *(Meiguo) Guohui Tushuguan cang Zhongguo shanben shulu* 《(美國)國會圖書館藏中國善本書錄》 *(A descriptive catalog of rare Chinese books in the Library of Congress).* In [B: WANGCM 1957: 54–57], WANG quotes SHAO, and imports SHAO’s mistake about the palace treasury edition into his catalog. He identifies the set of *Yuelü quanshu* in 38 Books (musical works) as the Zheng principality engraving, and the set with *Yuelü quanshu* in 38 Books (musical works) & *Lishu* in 10 Books (calendrical works) as the palace treasury engraving, and introduces further confusions in dating the prints. The mistakes are repeated in [B: WANGCM 1983: 47]. (WANG was a scholar of great integrity, who committed suicide in 1975 under persecution by the cultural revolution of Chairman Mao.)

(4) In 1945–1946, WANG drafted a catalog of the Gest Oriental Library at Princeton. WANG’s unpublished draft was revised by CH’Ü Wan-li 屈萬里, and eventually published in 1975 as *Pulinsidun Daxue Geside Dongfang Tushuguan Zhongguen shanben shuzhi* 《普林斯頓大學葛思德東方圖書館中文善本書志》 *(A catalogue of the Chinese rare books in the Gest collection of the Princeton
(5) Similar erroneous statements are perpetrated in recent studies by CHIA and by KERLOUÉGAN. CHIA illustrates her thesis with facsimile pages from the 2 prints of Caoman guyue pu 《操縵古樂譜》 at Princeton [A: Caoman: 1a], labelling TA141/278 as a Zheng principality edition of 1596, and TA141/2377 as a neifu reprint of 1603 (made from the same printing block, but refur-ished). 115 KERLOUÉGAN cites CHIA, but dates the supposed palace treasury edition at 1607 or later. 116

To lay the ghost of the hypothetical neifu palace treasury edition to rest and correct these mistakes once and for all, let us look at Fig. 1: 7, which shows a page from Caoman guyue pu 《操縵古樂譜》 in the 2 prints TA141/2377 and TA141/278 at Princeton. The difference in quality between the 2 prints is evident, TA141/2377 being much the superior. The top photograph show the slight difference in size between the 2 prints, the page frame of TA141/278 being a few mm shorter than TA141/2377. In spite of this difference in size, the prints were made from the same engraved block. TA141/2377 shows a small incipient crack at the right margin, cutting across the text character 磽. In the deteriorated print TA141/278, this crack has widened on the character 磽, and extended leftwards into the page by 3 or 4 columns. The presence of the same crack in the 2 prints gives conclusive proof that they were made from the same block, and their differences in size and quality are the results of deterioration of the wooden printing block with age. (This question is taken up again in Ch. 4, with quantitative measurements of size.)
Fig. 1: 7 Comparing 2 prints of Caoman guyue pu 《操缦古樂譜》.
[A: Caoman: 42a]

Exemplars at Princeton University Gest Library: TA141/2377 v.11, TA141/278 v.11
All this argument about the hypothetical *neifu* palace treasury edition may be no more than a
moot storm in a teacup. At the present time, the Princeton Library catalog gives a cautionary note that
both TA141/2377 and TA141/278 are in fact one and the same edition \(^{117}\), and the Chinese library cata-
logs noted in Note 109 only mention a Zheng Principality edition of the *Yuelü quanshu*.

**Some remarks on chronology**

3 major treatises by Zhu Zaiyu are headed by Prefaces with definite dates:

1. *Lüli rongtong*《律曆融通》 *The concordance of music and calendar*. Preface dated *Wanli* 萬曆 reign year 9 month 1 day 1 = 4 February 1581;
2. *Lüxue xinshuo*《律學新說》 *A new discourse in musical metrology*. Preface dated *Wanli* 萬曆 reign year 12 month 1 day 1 = 12 February 1584;
3. *Lülü jingyi*《律呂精義》 *Precise principles of the musical pitches*. Preface dated *Wanli* 萬曆 reign year 24 month 1 day 1 = 29 January 1596.

There are other specific dates recorded at various places in Zhu Zaiyu’s writings, as noted in the chron-
ological table in Fig. 1: 4. Despite such guideposts, the detailed chronology of Zhu Zaiyu’s writings is
not known, and it is a difficult subject reserved for further study.

When we consider the chronology of Zhu Zaiyu’s works, it is generally assumed, rather naively,
that the dates of his Prefaces represent the latest possible dates for the ideas he expresses in his treatises.
Since certain numerical data deriving from his 12-tone equal tuning calculations appear in the Appendix
to *Lüli rongtong*, which carries a 1581 Preface, most Chinese musicologists accept 1581 as the terminus ante quem for Zhu’s invention of 12-tone equal tuning. \(^{118}\) Dai has further speculated that Zhu Zaiyu
had already composed *all* of his treatises on tuning theory (within the *Yuelü quanshu*) during 1567–
1581. \(^{119}\) Yet if we read the Prefaces to *Lüli rongtong* (1581), *Lüxue xinshuo* (1584), and *Lülü jingyi* (1596),
we find that 12-tone equal tuning is mentioned in neither the 1581 nor the 1584 Preface, whereas the
1596 Preface does prominently highlight this as a new invention by Zaiyu, with inspiration from his
father from years earlier. Even more puzzlingly, references to the presumably later treatises *Lülü jingyi*
and *Suanxue xinshuo* can be found scattered among the texts of the presumably earlier treatises *Lüli*
rongtong and *Lüxue xinshuo*, and vice versa. The conclusion seems inescapable, that Zhu Zaiyu had
revised his texts, perhaps quite drastically, after they were first completed, and the dates of his Prefaces
cannot apply to everything contained in their respective treatises. A similar conclusion was also
reached by Feng Wenci 馮文慈 \(^{120}\), but the full extent of the revisions remains to be clarified. A closer
reading of all the sources will help us to reconstruct the layers of revisions, and to postulate a chronol-
ogy. It is not a reliable procedure to jump to conclusions about the development of Zhu Zaiyu’s major
conceptions (like 12-tone equal tuning) on the basis of scattered cross references. 121 These can be added any time up to the time of printing, which for most of his works was done many years after the work’s composition. Instead, it is necessary to trace the trajectories of his large-scale ideas in order to comprehend his intellectual evolution. For example, Zhu Zaiyu’s ideas on ‘watching for the ethers [houqi 候氣]’ underwent radical changes over the years, beginning with a sceptical or disdainful acceptance, to end with total rejection. This sort of change may possibly give us a handle to map out some sort of chronology. My investigations so far incline me to believe that the date for Zhu Zaiyu’s formulation of 12-tone equal tuning was not 1567 nor 1581, but most likely some later time between 1584 and 1595.

**Xiantiantu zhengwu 《先天圖正誤》**  [Correcting errors in the a priori diagram of the 《Yijing》]

I draw the reader’s attention to a fragment of a long-lost work by Zhu Zaiyu, which I have newly-rediscovered. This is Xiantiantu zhengwu 《先天圖正誤》  [Correcting errors in the a priori diagram of the 《Yijing》]. It is not included in Zhu Zaiyu’s Collected works, and it is discussed in this study for the 1st time. (Regrettably, time constraints do not permit a fuller account of this discovery.)

The title Xiantiantu zhengwu 《先天圖正誤》 is mentioned in quite a few bibliographies of Zhu Zaiyu’s works, including the 〈鄭端清世子賜葬神道碑 [Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng]〉 by Wang Duo 王鐸, written in 1624. But the Henei xian zhi 《河內縣志》 [Gazetteer and history of Henei county] of 1825 already declared it to be lost 122, and nobody has since laid eyes on this work.
Fig. 1.8: Xiantiantu zhengwu 《先天圖正誤》 [Correcting errors in the a priori diagram of the 《Yijing》].

x16Kyiuiuiumm 1660K Liao 12K 21K 22K (b: Huaiqing 1660 / F1209: 191–194)
In 2013 I discovered a fragment of this work in the *Huaiqingfu zhi* [Gazetteer and history of Huaiqing prefecture] of 1660 (Fig. 1: 8). It is clearly not the complete work, but appears to be a remark by Zhu Zaiyu attached after it. Despite its fragmentary nature, the find is valuable. Not only does it confirm the existence of this work, it further allows us to determine the nature of its contents, even if that content itself is still lacking. Now we know that *Xiantiantu* refers to the a priori diagram of the *Yijing*, a concept adumbrated by *Shao Yong* 邵雍 (1012–1077) in *Huangji jingshi shu* 《皇極經世書》 [Book of the supreme kingly principle which runs like a warp through the fabric of the ages], and more concretely developed by *Zhu Xi* 朱熹 (1130–1200) in *Yixue qimeng* 《易學啓蒙》 [Introduction to the study of the *Yijing*] and in *Zhouyi benyi* 《周易本義》 [The original meaning of the *Zhouyi*]; it is not the numerological diagrams *Hetu* and *Luoshu* 河圖洛書, nor even some astronomical object, as has been speculated. Yet, what is it about the a priori diagram that Zhu Zaiyu is saying? What are its errors, and how does Zhu Zaiyu propose to correct it? Unfortunately the fragment does not tell us.

In *Lüli rongtong* 《律曆融通》, we can find a number of diagrams, showing different arrangements of the *Yijing* hexagrams (Fig. 1: 9, Fig. 1: 10). Zhu Zaiyu attributes the Horizontal Diagram to He Tang. The Rectangular Diagram he claims to be his own creation, inspired by the diagram of He Tang. It is in fact a modification of the Rectangular Diagram of *Zhu Xi*. Zhu Zaiyu says [A: *Lüli rongtong*: Bk. 3 (Lishu: Fasc. 2: 69b) “Now I correct it, following He. It naturally agrees with the a priori diagram. 今依何氏改定自與先天圖合” I believe that the Rectangular Diagram of Fig. 1: 10 is the missing a priori diagram of the lost treatise *Xiantiantu zhengwu* 《先天圖正誤》.
Fig. 1: 9  Vertical & horizontal diagrams.

Horizontal diagram 橫圖 of Zhu Zaiyu.  [A: Lüli rongtong: Bk. 3 (Lishu: Fasc. 2: 68a)
(A: Zhu / Li F2013: 4255)]
Fig. 1.10 Rectangular diagram  方圖 of Zhu Zaiyu.

[A: Liji tongzong, Bk. 3 (Lishu, Fasc. 2: 68b–69a) (A: Zhiu / L1 F2013: 4256–4257)]
NOTES

1 Please see the Bibliography for some remarks on the bibliographical style adopted in this study.

2 I am leaving aside the much-debated question of whether Zhu Zaiyu’s ideas had been transmitted to Europe privately via his contemporary Jesuit missionaries in China, most notably Matteo Ricci (1552–1610). My opinion is that they were not, but this is the subject for a separate study.

3 The study of [C: CHO 2003] is often cited. Regrettably, it is a work of mostly derivative scholarship, and replete with errors.

As evidence for his hypothesis that Ricci had been instrumental in transmitting knowledge of Zhu Zaiyu’s works to Europe, CHO claims that Ricci had discussed Zhu Zaiyu’s proposals for calendar reform in his journal [C: CHO 2003: 260–261, 275–277]. CHO is entirely mistaken. What he imagines to be entries by Ricci in his journal are really editorial notes by D’Elia, the editor of the journal in Fonti Ricciane [C: Ricci 1942–1949: Vol. 2: 8, 285–286]. In support of his claim, CHO points out that Ricci’s supposed journal entry corresponds to a certain unspecified passage in the Siku quanshu《四庫全書》(which contains about 3,460 titles in some 79,000+ Books, making the reference difficult to verify). No wonder, since D’Elia’s note on p. 285–286 is a translation from that very work [B: Siku zongmu: Bk. 106: 16b–17b]. CHO’s pernicious error has been reproduced by [B: DUJL 2006: 129–131; C: GIMM 2007; B: DAINZ 2008: 258–259; B: DAINZ 2011: 216–217; A: Zhu / Li F2013: Vol. 1: 5, 34–35; etc].

A cursory search of Ricci’s letters [C: Ricci 2001] has not revealed any mention of Zhu Zaiyu either.

4 The fou缶 is a crude percussion instrument, something like a clay pot.

5 [B: Mingshi《明史》[History of the Ming dynasty] / by Zhang Tingyu 張廷玉 (1672–1755) et al / Zhonghua 1974: (Bk. 103) 2853–2856, (Bk. 119) 3627–3628].

6 [B: Henei 1693; Henei 1825; Huaiqing 1660; Huaiqing 1789; Henan 1660; Henan 1735; etc.]

7 For example, we find this story related by Wang Shizhen 王士禛 (1634–1711) in Chibei outan《池北偶談》[Anecdotes from the studio on the north side of the pond] [B: Chibei: (Bk. 25) Anecdote 1213 (Prince Heir Duanqing of Zheng 鄭端清世子); B: Chibei / Jin 1982: 605] “In his [ZhuZaiyu’s] palace there was a box, which he personally locked and sealed. Each year he added 1 sealed item to it, with instructions to open in case of emergency. It passed to his grandson the Prince Shouping 壽平王 [=? Zhu Changjie 朱常潔 (see Fig. 1: 5)]. When [during the collapse of the Ming dynasty] Hebei was overrun by bandits, Prince Shouping opened the box, and he found 5 worn and broken shirts, 1 big and 4 small. The Prince was stout, and his 4 younger brothers were small. They
donned the shirts and escaped. Another year, when they had returned after the rebellion was put
down, an old hand from the Prince’s court suddenly came across Duanqing in the mountains. He
warned, ‘Go tell my grandsons they must leave quickly, they can stay in their homes no longer.’
Shouping and his brothers thought this was absurd and paid no heed. Not long thereafter, they
came to their disastrous end.”

8 [B: CHENWN 1986]. I am perhaps failing to give proper credit to [C: HSÜEH 1973] and [C: ROBINSON
& FANG 1976], both of whom had earlier noticed the source [B: 〈Zheng shendaobei〉/ Huaiqing
1789]. Both HSÜEH and ROBINSON & FANG used this source to try to find Zhu Zaiyu’s date of death
(see Note 14). Unfortunately neither writer advertised their source loudly enough, and nobody no-
ticed its significance until CHEN called attention to it in [B: CHENWN 1986; B: CHENWN 1992: 28–33].

9 [B: 〈Zheng shendaobei〉].

10 [B: ZHANGHJ 1995; B: DAINZ 2008: 83–84].


12 The analysis that leads to this dating of 1593–1954 should be presented here, but regrettably time
constraints do not permit me to do this.


14 The month and day of Zhu Zaiyu’s birthday is not known. The article on Zhu Zaiyu by GIMM in
Die Musik in Geschichte und Gegenwart (MGG) gives the date 7 June 1536, but this stems from a chain
of misunderstandings [C: GIMM 2007]. In the Dictionary of Ming biography 1368–1644《明代名人
傳》, ROBINSON & FANG write thus: [C: ROBINSON & FANG 1976] “CHU Tsai-yü 朱載堉 … 1536-May
19, 1611”. CHEN Wan-Nai 陳萬鼐 misreads “1536-May 19” as 1 date, but translates it into the Chi-
nese calendar, and writes thus: [B: CHENWN 1992: 1] “Zhu Zaiyu … born in the Jiajing 嘉靖 reign,
year 15 month 5 day 19, in the Western calendar 7 June 1536”. GIMM then copies this error into
MGG.

ROBINSON & FANG give Zhu Zaiyu’s date of death as 19 May 1611. This date is deduced from
the source [B: 〈Zheng shendaobei〉/ Huaiqing 1789], and it is a very good piece of detective work.
[C: HSÜEH 1973: 4] a few years earlier had already used this source to find Zhu Zaiyu’s date of death,
which he gives to be Shenzong 神宗 reign, year 39 month 4 day 9 [20 May1611]. But I think that
the determination by DAI, from the same source, is the most accurate, and it is 18 May 1611
[B: DAINZ 2008: 340–341]. In brief, Zhu Zaiyu was born in 1536, and died on 18 May 1611.

15 Regulations Governing the Royal Fiefs See Note 75.

16 [B: Hanshu《漢書》: Bk. 21 〈Treatise on the musical system and calendar 治曆志〉: Pt. 1; B: Hanshu
LIU Xin’s work has not been independently transmitted, and it is known only through its record in *Hanshu*. *Hanshu*’s author BAN Gu (32–92) acknowledges LIU Xin’s contribution in the opening paragraph of his 〈Treatise〉.

17 CAI Yuanding (1135–1198), author of *Lülü xinshu* 《律呂新書》 [New treatise on the musical pitches], with Preface by ZHU Xi 朱熹 (1130–1200) dated 1187 [B: *Lülü xinshu*].

18 [A: *Sepu* Bk. 10: 5b].

19 Zhu Zaiyu never defines the precise ratio as the 12th root of 2 in so many words (because there was no common terminology nor mathematical notation in use for the concept), but the calculations in *Lüxue xinshuo* leave no doubt that he fully understands its meaning and significance. See also Note 22.

*Lülü rongtong* contains an Appendix, in which Zhu Zaiyu also mentions some numerical values of his new equal tuning [A: *Lülü rongtong*: Appendix (*Lüshu*: Fasc. 2: 127b–128b)]. I believe that these numbers were added after the Preface to *Lülü rongtong* was written in 1581, but again this is a complex subject which requires a separate study.

20 17 February 1591 is the date ZHU Houwan’s obituary is entered in the day-to-day Imperial record *Ming shilu* [B: *Ming shilu*: [11] Shenzong 《明神宗實錄》 [Veritable records of Ming Emperor Shenzong] / Sinica 1964–1968: Bk. 231: Wanli 萬曆 year 19, month 1, day xinyou 辛酉 / 4284]. It takes some days for news to travel from Henei to Beijing, so the date is qualified by ‘about’. Usually, I dispense with such a pedantically careful distinction, unless the precise date is critical to the discussion.

21 Also see [B: DAINZ 2008: 250–258].

22 The mathematical derivation of the numerical value of the Precise ratio is fully demonstrated in [A: *Lüli jingyi*: Inner Bk. 1: 〈Ch. 3 Not to use the method of reduction and augmentation by 1/3 不用三分損益第三〉 (*Lüshu*: Fasc. 1: 9a–13b); A: *Lüli jingyi* / FENG 1998: 6–15], and the arithmetical steps of the root extractions on the abacus are detailed in [A: *Suanxue xinshuo*: 〈Question 2–7 第二問 — 第七問〉 4b–18a].

23 The formal title of a book is usually printed at the top right corner (top of 1st column) of the 1st page of the main text (see Fig. 1: 2). Otherwise the title would be regarded as informal. Because the titles or references *Lishu* 《曆書》, *Lüshu* 《律書》 and *Yuewu quanpu* 《樂舞全譜》 are only informal, almost no bibliographies mention them, and the reader is likely to be confused.

24 As in the exemplars at Princeton University, Harvard University, and according to the description by LIU Fu 刘復. The grouping of the 7 titles in 8 Fascicles is thus [A: *Yuelü quanshu* (Princeton U Gest) TA141/278: v.11–18; A: *Yuelü quanshu* http://nrs.harvard.edu/urn-3:FHCL:3744719 : v.10–17; B: LiuF 1933: 301–303].
(1) Caoman guyue pu 《操縵古樂譜》 1 Bk. in 1 Fascicle
(2) Xuangong heyue pu 《旋宮合樂譜》 1 Bk. in 1 Fascicle
(3) Xiangyin Shiyue pu 《鄉飲詩樂譜》 6 Bk. in 2 Fascicles
(4) Liudai xiaowu pu 《六代小舞譜》 1 Bk. in 1 Fascicle
(5) Xiaowu xiangyue pu 《小舞鄉樂譜》 1 Bk.
(6) Eryi zhuizhao tu 《二佾綴兆圖》 1 Bk.
(5) and (6) are bound in 1 Fascicle
(7) Lingxing xiaowu pu 《零星小舞譜》 1 Bk. in 2 Fascicles

25 The title slip is inserted into one of the inner pages of the fascicle, inside the last leaf of 《進律書奏疏》: 5ab, just before the 1st leaf of Caoman guyue pu 《操縵古樂譜》: 1ab. It is only placed on the cover for the photograph.

26 Commandery Prince  See Notes 42, 70.

27 SOURCES This translation of Zhu Zaiyu’s 〈Petition to relinquish the principality and rectify family relationships 請國正倫疏〉& 〈Another (supplementary) petition 又疏〉 [A: 〈Rangguo〉] is based on the versions printed in 2 editions of Henan tongzhi 《河南通志》 [General gazetteer and history of Henan province], compiled under government auspices, one in 1660 (α), and the other in 1735 (β). With page references, they are:

α  [B: Henan 1660 / F2011: Bk. 39 〈Literature 藝文: Pt. 5〉: 37a–40b / Vol. 2: 268–270] (Fig. 1: 6a–d)
β2  [B: Henan 1735 / Siku: Bk. 76 〈Literature 藝文: Pt. 5〉: 36b–40b]

Neither edition α nor β is an Urtext of Zhu Zaiyu’s petitions, but α has the advantage of priority. For this study, the 1660 (α) edition, in its 2011 facsimile reprint of a supplemented reprint of 1670, is taken as the principal source, and collated with the 1735 (β) edition. The 1735 edition itself has been reprinted several times. Besides the 1969 facsimile reprint (β1), it is also available as a facsimile ebook http://books.google.com/books?id=D3wrAAAAYAAJ, and the Siku quanshu 《四庫全書》 contains another edition of this edition (β2). The print and ebook facsimiles of edition β1 are reproduced from re-impressions of the same blocks, made respectively in 1882(?) and 1902, and they differ in a few small details which I have not collated; neither have I relied on leaf 26ab of the print version, which is defective. There exist other editions of Henan tongzhi compiled at other times, but the 1660 edition is the earliest one which might possibly contain Zaiyu’s petitions, as all earlier editions were compiled before the petitions were written. The other editions (not consulted) are rare books available only at a few libraries, and the interested reader can find a full listing of them in the catalog Zhongguo difangzhi lianhe mulu 《中國地方志聯合目錄》 [Union catalog of Chinese gazetteers] [B: Zhongguo Kexueyuan Beijing Tianwentai 1985: 555–556].
The differences between the editions ($\alpha$, $\beta_1$, $\beta_2$) are not great, but occasionally, small differences of wording can cause big differences in meaning. To avoid overburdening an already excessive apparatus, except in cases of doubt, minor misprints which do not affect the meaning are tacitly passed over.

The petition begins very abruptly. Some introductory formalities may have been deleted when the petition was excerpted into *Henan tongzhi*. Zhu Zaiyu’s final date and signature are also missing.


**ZHU Qiying the Prince Jian of Zheng** 鄭簡王朱祈鍈 (1431 – 1468 – c. 15 September 1495) See [B: *Mingshi* / *Zhonghua* 1974: (Bk. 103) 2853, (Bk. 119) 3626–3627; B: *Ming shilu*: [7] Xianzong 《明憲宗實錄》 / *Veritable records of Ming Emperor Xianzong* / Sinica 1964–1968: Bk. 103: Hongzhi 弘治 year 8, month 8, day dingchou 丁丑 / 1895]. Qiying’s brief obituary in *Ming Xiaozong shilu* gives his death in 1495, birthday in 1431, and his age as 60 years. The dates are right but the age is wrong; his real age of 65 years is confirmed by [B: *Yanshantang* / WEI 1985: (Bk. 33) 583]. If further corroboration is needed, there are records in *Ming shilu* of events early in Qiying’s life – a letter from Emperor Yingzong 英宗 (reign Zhengtong 正統 1436–1449) of 1442, commanding and advising him to manage the affairs of the Zheng court during his father’s illness, his investiture as Prince Heir [Shizi 世子] in 1443, his wedding to Consort Han 韓妃 in 1447, etc. – which would be consistent with a birthday in 1431, but not one 5 years later if his age was only 60 years [B: *Ming shilu*: [5] Yingzong 《明英宗實錄》 / *Veritable records of Ming Emperor Yingzong* / Sinica 1964–1968: (Bk. 90) 1086–1087, (Bk. 102) 2056, (Bk. 158) 3082].

**ZHU Jianzi the Prince Xi of Zheng** 鄭僖王朱見滋 (1452 – c. 15 September 1495) Jianzi died before his father Qiying, so in life he was ever Prince Heir and never Prince. His title Prince Xi was conferred on him posthumously in 1499, on application by his son Youxin, who had then succeeded as Prince. See [B: *Mingshi* / *Zhonghua* 1974: (Bk. 103) 2853, (Bk. 119) 3626]; brief obituary in [B: *Ming shilu*: [6] Xianzong / Sinica 1964–1968: Bk. 189: Chenghua 成化 year 15, month 4, day guichou 癸丑 / 3372; [7] Xianzong: (Bk. 154) 2736].

**ZHU Youxin the Prince Kang of Zheng** 鄭康王朱祐枔 (8 May 1474 – 1497 – c. 11 April 1507) See [B: *Mingshi* / *Zhonghua* 1974: (Bk. 103) 2853, (Bk. 119) 3627]; brief obituary in [B: *Ming shilu*: [8]

33 ZHU Jiansong the Prince Gongyi of Mengjin 盟津恭懿王朱見濊 (c. 1460? – 1474–1484 – 16 September 1509) 3rd son of Qiying the Prince Jian, by a secondary wife, and enfeoffed in 1474 [B: Mingshi / Zhonghua 1974: (Bk. 103) 2858–2859, (Bk. 119) 3627]. Jiansong died a commoner, so he has no obituary in Ming shilu to provide us with his dates of birth and death. Neither is Yanshantang bieji any help, for it records Jiansong’s age as 33 years, an obvious mistake [B: Yanshantang / WEI 1985: (Bk. 36) 638]. Jiansong’s birthday must have been sometime between 1452 (birth of Qiying’s eldest son Jianzi [Note 31]) and 1464 (birth of Qiying’s 4th son Jian’gan [Note 48]); and he married his Consort Li 李妃 in 1476 [B: Ming shilu: [6] Xianzong / Sinica 1964–1968: (Bk. 157) 2875]. If his mother was indeed Prince Jian’s favoured concubine of 1460 (see Note 35), a good guess for his birthday would be c. 1460. His date of death is provided by Zhu Zaiyu himself on p. 21; the date of death given in Mingshi is in error [Note 50].

34 ZHU Jianjin the Prince Gongding of Fanchang 繁昌恭定王朱見寖 (1477–1488–1533) 9th son of Qiying the Prince Jian, by his secondary wife Lady Zhang 張夫人, and enfeoffed in 1488. His name 見寖 is written in several variant forms in the sources; I have followed the way as it is usually written in Ming shilu. His birthday is inferred from his date of death and age of 57 years, as given resp. in [B: Mingshi / Zhonghua 1974: (Bk. 103) 2863–2864; and B: Yanshantang / WEI 1985: (Bk. 36) 638].

35 Qiying the Prince Jian was embroiled in quite a bit of trouble with his wives and sons.

His primary wife was Consort Han 韓妃, mother of the Prince Heir Jianzi 見滋, whom he married in 1447. He treated both of them badly. Consort Han died in 1456, not long after the birth of Jianzi in 1452. In 1460 Qiying tried to renounce her, and to set up a favoured concubine (of unknown name) as his primary wife instead. As this would have altered the line of Princely succession, he was reprimanded by Emperor Yingzong 英宗 (reign Tianshun 天順 1457–1464), and summoned to Beijing for disciplinary action [Note 39]. (Subsequent Ming law (1460 – c. 1505) made it into an explicit rule, that if a Prince already has a son, he may not marry any 2nd consort (2nd primary wife) [B: Daming huidian 1510 / Siku F2008《大明會典》 [Collected ordinances of the Great Ming dynasty] / ed. Li Dongyang 李東陽 (1447–1516) et al: Bk. 54: 14b–15a; B: Daming huidian 1587 / ed. SHEN Shixing 申時行 (1535–1614) et al: Bk. 57: 5a–6a].) For his ill-treatment of the Prince Heir (and of themselves), officials in Qiying’s court complained to Emperor Xianzong 憲宗 (reign Chenghua 成化 1465–1487), who admonished him about it on 3 separate occasions, in 1470, 1471, and 1473. In 1479, at age 28, Jianzi died of frustration and sorrow, even before his father died. See [B: Mingshi / Zhonghua 1974: (Bk. 119) 3627; B: Ming shilu: [5] Yingzong / Sinica 1964–1968: (Bk. 158) 3082, (Bk. 262) 5594,
Prince Jian’s favourite was his secondary wife, the mother of his 3rd son Jiansong 見淵, who schemed to get her own son established as the Heir. (Her name is unknown — was she the concubine of 1460?) See Zhu Zaiyu’s narrative following, and Notes 38 and 41.

Prince Jian had in his harem 2 secondary wives by the name of Zhang. (The identities of the 2 Zhangs are analyzed below.) The older of the two, whom I shall call Ms Zhang 張氏 (she had no title of nobility), had a daughter, the Princess Ji’an 棘安郡主, but no son. She was neglected by Prince Jian — they had not seen each other since 1460 (probably on account of the Prince’s infatuation with his favoured concubine at that time) — and in 1463 Prince Jian took a fancy to another servant girl in his court. In her jealous fury, Ms Zhang banded together other servant girls in the palace, and they bullied Prince Jian’s servant lover until the girl hanged herself. See [B: Ming shilu: [5] Yingzong / Sinica 1964–1968: (Bk. 359) 7146]. The younger wife was Lady Zhang 張夫人, mother of Prince Jian’s 9th son Jianjin 見寖, and the lady of whom Zhu Zaiyu is speaking here. She was a bossy woman who grabbed control of the family affairs. She spoke ill of the other princes, and most likely slandered Jiansong, in her insistent attempts to get Jianjin chosen as the Heir. This came to a head during the infighting for succession following the death of Youxin the Prince Kang in 1507, but in January 1508 the Imperial court ruled her out of order, and as penalty Jianjin’s stipend was slashed by ⅓. See Note 49, and [B: Ming shilu: [8] Wuzong / Sinica 1964–1968: (Bk. 33) 818].

**ANALYSIS  Ms Zhang 張氏 and Lady Zhang 張夫人**

(Because of its detail and its cross-references to later events, this analysis may be omitted on a first reading.) The preceding account of Ms Zhang and Lady Zhang is a reconstruction, inferred from several sources. In the historical texts, the wives of Prince Jian are always referred to by their maiden surnames only (if they are named at all), and never by their personal names. So when more than 1 wife shared the same surname, confusion is apt to arise. In this analysis, I shall try to distinguish between Prince Jian’s 2 (or more?) wives named Zhang. In the sources, I have found 6 independent references to Prince Jian’s wives Zhang, and they are listed below in chronological order of the events they describe.

A  In 1463, “Prince Heir Qiying’s Consort Zhang 世子祈鍈妃張氏” was reported to have bullied a servant girl to death, as described above in Ming Yingzong shilu. Now ‘Consort [Fei 妃]’ was the official title for a primary wife of a Prince [B: Daming huidian 1587: Bk. 55: 2b]. As already noted, Qiying’s primary wife was Consort Han, not Zhang. Consort Han was never deposed by Zhang nor by any other wife, since her grandson Youxin eventually succeeded Qiying as Prince of Zheng. Indeed, Qiying’s attempt in 1460 to replace her by another concubine met with an Imperial rebuke. Moreover, since the jealous wife Zhang was neglected by Qiying, he
would not have elevated her to the status of Consort. We can be quite sure then, that the reference to “Consort Zhang” is a careless mistake, and she was really plain Ms Zhang or perhaps Lady Zhang.

B In 1507, Jiansong petitioned to be reinstated as Prince of Mengjin, claiming that he had been slandered by a “concubine Zhang 宫婢張氏” 24 years previously, i.e. in 1484, and lost his title of Prince as a result. See Note 47.

C In the present petition (1593, see p.xx), Zhu Zaiyu mentions a “Lady Zhang 張夫人” who feuded against Jiansong, saying (or implying) that she had slandered him, causing him to be unjustly demoted to commoner (see Note 37). The 〈Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng 鄭瑞清世子賜葬神道碑〉, written by WAN G Duo 王鐸 (1592–1652) in 1624 [B: 〈Zheng shendaobei〉], has a condensed paraphrase of the same story. These events happened in 1484 and 1486, as described in Notes 38 and 41. Obviously, B and C refer to the same person and the same events.

D In September 1486, Ming Emperor Xianzong 明憲宗 reprimanded Prince Jian in an edict, in which he mentions “a woman in [your] court, named Zhang 宮人張氏”, who made an unauthorized excursion, under an honour guard, to visit her married daughter in town. See Note 41.

E In 1500, the Prince of Zheng (at that time Youxin) petitioned to confer the title of ‘Lady [Furen 夫人]’ on his grandfather’s (Prince Jian’s) secondary wife Zhang, on the ground that she had a daughter who was already ennobled as the Princess Ji’an. The petition was denied, because the title of ‘Lady’ was conferred on a concubine of an Imperial Prince [Qinwang 親王] if she had borne a son, but not if she had only a daughter. This rule is enshrined as law in [B: Daming huidian 1510: Bk. 53: 2a], and Youxin’s unsuccessful petition is recorded in Libu zhi gao 《禮部志稿》 / compiled by YU Ruji 俞汝楫 (fl. 1620) et al: Bk. 74 [B: Libu / ctext 2006–: http://ctext.org/wiki.pl?if=gb&chapter=65514: para. 100–101]. These facts tell us that the secondary wife in this case must be the untitled Ms Zhang, and furthermore she had no son.

F In 1507–1508, “Lady Zhang, wife of Prince Jian 簡王夫人張氏” and mother of Jianjin, petitioned repeatedly to get her son chosen to succeed Youxin as Prince of Zheng, but failed. This story from Ming Wuzong shilu is already told above.

Gathering all these threads together, we can say for certain that • Concubine Zhang B and Lady Zhang C were the same person, and • Ms Zhang E, who had no son, and Lady Zhang F, whose son was Jianjin, were 2 different persons. Other conclusions can be inferred with less certainty. Wives C and F are both referred to as “Lady Zhang”, and Jianjin’s mother F had a strong motive to be Jiansong’s slanderer B = C, so B, C, and F were most probably one and the same Lady Zhang. The jealous “Consort Zhang” A can be identified with some plausible conjectures. Since she and Prince
Jian were so badly antagonized against each other in 1460–1463, they were unlikely to have later reconciled to give birth to Jianjin in 1477, so she would not be his mother Lady Zhang F, but in the presumably more amicable early years of their marriage, they might have produced a daughter, the Princess Ji’an, and in this case she would be the untitled Ms Zhang E. The identity of D, the “woman in [Prince Jian’s] court, named Zhang”, who had a married daughter in 1486, remains questionable. She could have been the mother of the Princess Ji’an 棘安郡主, in which case she would be Ms Zhang E; or, if the daughter was the Princess Guangning 廣寧郡主, circumstances would then point to Lady Zhang B = C as her more likely mother (see Note 38); or the daughter could have been some other unknown Princess. The nondescript address “woman” signifies nothing, as both Ms Zhang and Lady Zhang were untitled in 1486 — by a rule of 1491 [B: Daming huidian 1510 / Siku F2008: Bk. 53: 2b; B: Libu / ctext 2006– : Bk. 74 http://ctext.org/wiki.pl?if=gb&chapter=65514: para. 108], Lady Zhang acquired her title of ‘Lady’ only upon the investiture of her son Jianjin as Prince, in 1488. Two other circumstances, however, suggest that the woman was most likely Lady Zhang B = C. She is mentioned in Emperor Xianzong’s edict in connection with complaints against Jiansong, who might have retaliated against his accuser (Lady Zhang B = C) with a counter-accusation of an unauthorized excursion; and she travelled with an honour guard, in a vain parade of pomp befitting her favoured status in Prince Jian’s court (see Note 37), whereas Ms Zhang A = E was out of favour with the Prince, and might not have been granted this privilege. Nevertheless these remain no more than plausible conjectures. To sum up: if we adopt the simplest compatible hypothesis, and assume that Prince Jian had no more than 2 wives named Zhang, we arrive at the account of the 2 Zhangs, as presented on p. 20:

- Prince Jian had 2 secondary wives by the name of Zhang, and
  1. the older wife was Ms Zhang mother of the Princess Ji’an, mentioned in A, (D??), and E,
  2. the younger wife was Lady Zhang the mother of Jianjin, mentioned in B, C, (D?), and F.

36 ‘Verbally abusing one’s grandparents or parents 罵祖父母父母’ was a grave crime in Ming law. It falls under the rubric of ‘unfilial behaviour [buxiao 不孝]’, which ranks 7th on the list of the ‘10 villainies [shi'e 十惡]’, and for commoners, it was punishable by death by strangulation or hanging [B: Daming huidian 1510 / Siku F2008: Bk. 127: 4a, Bk. 131: 13a, Bk. 144: 5b; identically in B: Daming huidian 1587: Bk. 160: 4b, Bk. 169: 15a, Bk. 174: 5a]. However, as a Prince, Jiansong enjoyed immunity from such cruel punishments [B: Huangming zuxun 《皇明祖訓》 [Ancestral injunctions of the Imperial Ming dynasty] / by ZHU Yuanzhang 朱元璋 (Ming Emperor Taizu 明太祖, reign Hongwu 洪武 1368–1398): 26ab 〈Laws 法律〉].

37 In this passage, editions α and β differ in 2 words, but this small difference alters the sense of the whole passage significantly. They are quoted below, with the variant words in bold and with punctuation added editorially, followed by their respective translations.
Tracing back to earlier events, years previously, there had been some discord between him (Jiansong) and Lady Zhang, one of his father’s (Prince Jian’s) secondary wives, and they often offended each other in speech. Lady [Zhang] harboured grudges [against Jiansong], and, arrogantly relying on her favoured position [with Prince Jian], she sought to influence the Prince by slander, falsely accusing [Jiansong] of verbally abusing his father without regard for filial respect … and so forth. [As a result,] the title of Prince was removed from him.

The crucial word is 相犯 in α, vs. 見犯 in β. In α, “相犯 = to offend each other” is a reflexive verb which can only take as object ‘each other’. The phrase break then comes before “夫人 = Lady [Zhang]”, who becomes the subject of the next clause, and the slanderer. Jiansong’s crime of verbally abusing his father was thus a false accusation by Lady Zhang. In β, “見犯 = to offend” naturally takes a transitive object, which can only be “夫人 = Lady [Zhang]”. The phrase break then comes after “Lady”, leaving the next clause without an explicit subject, and so the implied subject defaults to the same Jiansong throughout the whole sentence. He was not only a slanderer — as he could not very well have slandered himself, the crime of verbally abusing his father had to be another guilty act of his.

So, who was slandering whom, and how guilty was Jiansong? Pro reading α, if we consider the sweep of Zhu Zaiyu’s whole argument, he is saying that Jiansong was unjustly accused, so it fits the sense if he claims that Lady Zhang was the slanderer, and Jiansong her innocent victim. Lady Zhang is on record as having maligned Prince Jian’s 4th son Jian’gan 見gan, in order to promote her own son Jianjin 見寢 as the heir to Zheng in 1507 (see Note 49), so it would not surprise us if she had in earlier years similarly slandered Jiansong (cf. Notes 41 & 47). Yet the facts could just as well have been the other way round, or more likely, Jiansong and Lady Zhang both slandered each other. Jiansong was certainly not as innocent as Zhu Zaiyu would have us believe (see Notes 38 and 41). Thus, pro reading β, quite a few documents attest that Prince Jian’s favourite wife was Jiansong’s
mother; and on that basis, if anyone had arrogantly relied on his/her favoured position with the Prince to slander others, Jiansong and his mother would be the prime suspects. See the edict of Emperor Xianzong in Note 41; and [B: Mingshan cang《名山藏》] by He Qiaoyuan 何喬遠 (1558–1632): Bk. 39: 12a; B: Mingshi / Zhonghua 1974: (Bk. 119) 3627.

Of Lady Zhang’s favoured status with the Prince, we have only Zhu Zaiyu’s word for it in reading α—but perhaps, he is telling us something that no other writer had known about, that Lady Zhang too, was a favoured wife of Prince Jian? The evidence for reading α or β, with its associated question of Zhu Zaiyu’s reliability as a witness, is not conclusive either way; but in any case, his testimony in the present petition provides primary evidence from a knowledgeable member about his own family, and as such is not to be lightly dismissed.

(With this Note, one sorely laments the ambiguities caused by the lack of punctuation in classical Chinese texts. It generates as much headache for the reader as the lack of barlines does in the early mensural notation of European music!)

Jiansong’s alleged crimes, as mentioned by Zhu Zaiyu, were serious enough (by Ming standards), but they are exposed in an even more severe light (by modern standards) in [B: Ming shilu: [6] Xianzong / Sinica 1964–1968: Bk. 251: Chenghua 成化 year 20 month 4, day wuyin 戊寅 [16 May 1484] / 4253–4254; B: Ming shilu: [6] Xianzong / ctext 2006–: http://ctext.org/wiki.pl?if=gb&chapter=353416: para. 46]; with a précis in [B: Mingshi / Zhonghua 1974: (Bk. 119) 3627]. Conspiring together with his mother (Prince Jian’s favourite wife), Jiansong stole the Prince Heir’s golden certificate, and when he returned to get the Prince Heir’s golden seal, he was confronted by Prince Jian. Prince Jian demanded the stolen certificate from Jiansong, but he refused to return it (this was a likely juncture at which he would have verbally abused his father). Moreover, he had assembled a personal militia guard of over 300 men, far in excess of the allowed quota of 30 for his rank of Commandery Prince [Junwang 郡王, see Note 70] [B: Daming huidian 1587: Bk. 144: 6a]; and in further rampages, Jiansong set fire to the private belongings of his younger [half]-sister the Princess Guangning 廣寧郡主, kidnapped other girls and forced them to be his servants and concubines, etc. (It is not clear how the Princess Guangning enters into this affair, but given the hostility between Jiansong and Lady Zhang, and his attack on the princess, it would make sense if they were mother and daughter.) Totally unable to control his unruly son, Prince Jian reported him to Emperor Xianzong. After an investigation, Emperor Xianzong rebuked Prince Jian for spoiling his son, took away Jiansong’s title of Prince, and meted out heavy punishments to his cohorts. Cf. Note 41.

The Essential Regulations Governing the Royal Fiefs 宗藩要例 (see Note 75) stipulate that if the son of a Prince commits an offence, he must submit to a course of study and learn the proper manners and ritual practices 讀書習禮, under the supervision of a guidance officer [fudao guan 輔導官, see Note 89]. This rule was passed in 1489 [B: Daming huidian 1587: Bk. 57: 33b]; but the rule does not appear in Daming huidian 1510. Yet Jiansong submitted to this discipline for his offences in 1484; and even earlier in 1460, his father Prince Jian (when he was still Prince Heir) was summoned to
Beijing to undergo the same discipline (see Note 35). By its mention in the early *Ming shilu*, and by Zhu Zaiyu’s account, this sort of disciplinary action was in practice for some time already before it was written into the *Daming huidian*.

40 In Ming law, ‘casting magical curses’ was a grave crime under the rubric of ‘nefarious acts’ [*budao 不道*], which ranks 5th on the list of the ‘10 villainies’ [*shi’e 十惡*]. If done with intent to kill, it was treated as murder, and punishable by decapitation in the case of commoners. See [B: *Daming huidian* 1510 / *Siku* F2008: Bk. 127: 3b, Bk. 129: 12b, Bk. 144: 3a]; identically in [B: *Daming huidian* 1587: Bk. 160: 4b, Bk. 168: 25b, Bk. 174: 3b]. As remarked in Note 36, Jiansong was immune from such punishments by virtue of his royal status.

41 The story of Jiansong continues on [B: *Ming shilu* [6] Xianzong / *Sinica* 1964–1968: Bk. 281: Chenghua 成化 year 22, month 8, day guwei 癸未 [8 September 1486] / 4739–4740; B: *Ming shilu* [6] Xianzong / *ctxtext* 2006–: [http://ctxtext.org/wiki.pl?if=gb&chapter=688925: para. 22]. By this time Prince Jian and Jiansong had turned into bitter enemies, and were hurling accusations at each other. As *Ming Xianzong shilu* says, “Father and son have become foes, human relationships have turned topsy-turvy.” The accusations against Jiansong included feuding against his father, casting magical curses, and beating woman servant(s) in the court to death. He was demoted to commoner, and together with his family (wives and children) was sentenced to the special prison for royal clansmen located at Fengyang 凤陽, called High Walls [*Gaoqiang 高墻*]. ([B: *Mingshi* / *Zhonghua* 1974: (Bk. 103) 2858] puts this sentence in 1484, confusing the present incident with the earlier one of Note 38.) Emperor Xianzong issued an edict to Prince Jian in reprimand and warning.

For the deep-rooted evils of Jiansong, who is to blame? In relation to Jiansong, Prince, you are his father in terms of kinship, and his lord in terms of respect. If you had loved him and knew rightly to teach him, perhaps he might have turned from evil to good. But you, Prince, did otherwise. Because you favoured his mother, from the first you allowed his proper instruction to be neglected. And as you indulged his ways, so now at last a legacy of trouble follows. Moreover, you do not set a correct example yourself. You allowed a woman in [your] court, named Zhang 齐, to leave the palace without authorization. On the excuse of visiting her daughter, she rode in a sedan under an honour guard to the house of her son-in-law, without regard for the negative comments of people outside. If you, Prince, act in this way, can you expect Jiansong to submit to you in deference? As is so aptly said, “If a man himself do not walk in the right path, it will not be walked in even by his wife and children.” Prince, from henceforth you should behave yourself with rectitude, and guard yourself in propriety, in order to deepen familial ties of amicability, and broadly to apply your fatherly instruction. Then in your house, order will reign within and without, harmony will obtain amongst your family, and father, son, and brother will not hurt each other’s affections and bring ruin on each other. Then, you may be an example to the royal kin. If not, the *Ancestral injunctions* stand, and [in that case]
scarcely would I dare to allow private feelings to intervene! Prince, consider and take care!

a On the identity of this “woman in [your] court, named Zhang 宮人張氏”, see the ANALYSIS in Note 35.


c Huangming zuxun《皇明祖訓》 [Ancestral injunctions of the Imperial Ming dynasty] / by ZHU Yu-anzhang 朱元璋 (Ming Emperor Taizu 明太祖, reign Hongwu 洪武 1368–1398). This set of laws, laid down by the founder of the Ming dynasty, contains many strict rules and very harsh punishments. One such rule, for example, imposes the death penalty (by decapitation) on any woman in the Imperial palace who communicates in writing with any outsider, as well as on the recipient, and even extends to any person who merely has knowledge of the communication [B: Huangming zuxun: 29a (Commands of the inner palace 内令)]. Apparently the woman named Zhang, in her excursion to visit her daughter in town, had violated some rule of this sort.

Note that Zhu Zaiyu claims (or implies) that the charges against Jiansong were calumnies fabricated by Lady Zhang (cf. Notes 37 & 47). Although his wording “he [was] again falsely accused of casting magical curses, murder, etc. 又誣奏魘魅人命等情” is ambiguous as to whether Jiansong was the slanderer or the victim of slander, in this instance the record of Ming Xianzong shilu makes clear that he was the accused, and not the accuser. Moreover, the condensed paraphrase of this passage in the 〈Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng〉 plainly says (see p. xx), “Lady Zhang complained to Prince [Jian], falsely accusing [Jiansong] of casting magical curses”. In the poisoned atmosphere of Prince Jian’s household, Jiansong might well have fallen victim to Lady Zhang’s machinations. But, taking the evidence of Note 38 and the present Note together, we can be sure that he was not the blameless innocent that Zhu Zaiyu makes him out to be.

Jiansong’s release is briefly noted in [B: Mingshi / Zhonghua 1974: (Bk. 103) 2859; B: Ming shilu: [7] Xiaozong / Sinica 1964–1968: Bk. 8: Chenghua 成化 year 23, month 12, day dingmao 丁卯 [16 December 1487] / 156]. These records give no reason for his release. Certainly they do not imply his complete rehabilitation. He remained a commoner, and his annual stipend after release was only 36 dan 石, compared to his full stipend of 2 000 dan in his former rank of Commandery Prince. 20 years later, in 1507, he was eventually granted a half stipend (1 000 dan). See [B: Ming shilu: [6] Xianzong / Sinica 1964–1968: (Bk. 50) 1015; [7] Xiaozong: (Bk. 8) 156; [8] Wuzong: (Bk. 28) 716]. This may be contrasted with the treatment of Zhu Zaiyu’s father Houwan, on his release from High Walls Prison in 1567 [Note 77]. We note that in both cases, a new Emperor had recently ascended the throne, and proclaimed a general amnesty. In the case of Jiansong, he was the Emperor Xiaozong 孝宗 (reign Hongzhi 弘治 1488–1505), and his 1st amnesty was announced on 22 September 1487,
followed by a 2nd announcement of further amnesties on 26 October [B: Ming shilu: 7] Xiaozong / Sinica 1964–1968: Bk. 2: Chenghua year 23, month 9, day renyin 壬寅 / 11–24, Bk. 4: Chenghua year 23, month 10, day bingzi 丙子 / 71–76; identically in B: Huangming zhaoling《皇明詔令》 [Decrees of the Imperial Ming dynasty] / compiled by FU Fengxiang 傅鳳翔 (1486 ? 1487 – 1551): Bk. 17: 2a–14b 〈Decree on ascending the throne 即位詔〉, 16a–21a 〈Decree on offering honorific titles to the 2 Empress Dowagers and investiture of the Empress 上兩宮尊號及立中宮詔〉. Quite possibly, Jiansong’s release was only a residual clemency following from these general amnesties, and carried with it no judgement about his guilt or innocence. Of course, this is not what Zhu Zaiyu is saying.

For reference, the regular annual stipend of an Imperial Prince [Qinwang 親王] was 10 000 dan (of rice, or its equivalent). For a newly-enfeoffed Commandery Prince [Junwang 郡王] it was 2 000 dan, and for his successors 1 000 dan; after 1565, all Commandery Princes received 1 000 dan. See [B: Huangming zuuxun 45b–47a 〈Stipends 供用〉; B: Daming huidian 1587: Bk. 38: 1b, 2b, 4b, 6ab]; Libu zhi gao《禮部志稿》: Bk. 73 [B: Libu / ctext 2006–: http://ctext.org/wiki.pl?if=gb&chapter=272183: para. 26, 81–82]. For an explanation of Imperial Prince and Commandery Prince, see Note 70.

The edict is quoted in full in Note 41. Zhu Zaiyu’s date is 13 days later than the record in Ming Xianzong shilu, and probably represents the date when the edict was received at the Zheng court in Henei 河内. More puzzling is the fact that the content of the edict does not quite match Zhu Zaiyu’s description of it, although it is certainly a reprimand and warning, as he says. Their point of contact is the phrase in the edict, “Because you favoured his mother, from the first you allowed his proper instruction to be neglected 既因寵愛其母聼彼失教於前”, vs. Zhu Zaiyu’s phrase, “a reprimand … to Prince Jian, warning him against his mistake in heeding biased reports 責誡簡王偏聼之失”. Their word in common is 聼, but it is used with 2 different meanings: in the edict, 聼 = to allow and tolerate (Jiansong’s early misbehaviour); in Zaiyu’s petition, 聼 = to heed and listen (to Jiansong’s mother, or to Lady Zhang). Zhu Zaiyu is bending his narrative, perhaps unconsciously, to help convey the idea that Jiansong was the victim of malicious slander.

This letter appears to be not extant. The close proximity in date of the letter and the release of Jiansong [Note 42] indicates that they were 2 parts of the same act of clemency.

Edition α writes 責誡 = to reprimand and warn; editions β1 = β2 write 責成 = to admonish, a somewhat milder rebuke. The edict’s concluding invocation of the Ancestral injunctions is an ominous warning to Prince Jian (see Note 41), and α conveys the seriousness of his offence better than β.

Edition α writes 簡王既蒙天語 = After Prince Jian received these heavenly words; editions β1 = β2 write 簡王及蒙天語 = Prince Jian, on receiving these heavenly words.

2 such unsuccessful petitions, both made by Jiansong shortly after the death of Youxin the Prince Kang in April 1507, are recorded in Libu zhi gao: Bk. 74 [B: Libu / ctext 2006–:
The earlier petition, submitted in August 1507, is also recorded in [B: Ming shilu: {8} Wuzong / Sinica 1964–1968: (Bk. 28) 716]. Jiansong claims that 24 years previously (in 1484), he was slandered by a concubine named Zhang 張 who had grabbed control of affairs at the Zheng court, and lost his Princely title as a result (cf. Notes 37, 38, 41). He begs to be reinstated as Prince of Mengjin. Emperor Wuzong 武宗 (reign Zhengde 正德 1506–1521) denied his petition, but as an act of clemency increased his pay to half of the full stipend (see Note 42). Jiansong repeated his petition in December the same year, and met the same denial. Note that this was just the crucial time when the succession to the Zheng principality was being fought out (see Note 49), and Jiansong’s flurry of petitions reveals his desperation. Had he succeeded, he would have inherited the principality of Zheng. As it turned out, he lost his bid, and Zheng slipped out of his grasp for the next 99 years, until it was eventually passed to his great-grandson Zaixi 載𡍣 in 1606, by the generosity of Zhu Zaiyu.

48 Zhu Jian’gan the Prince Duanhui of Dongyuan 東垣端惠王朱見濬 (1464 – 1474 – c. 4 August 1503)
Jian’gan was the 4th son of Qiying the Prince Jian, by a secondary wife, and Zhu Zaiyu’s great-grandfather; he was enfeoffed in 1474. Jian’gan was not free from trouble. In 1483, he had a homosexual affair with a slave boy in his court named WU An 吳安, and together they plotted to poison Jian’gan’s Consort, but unsuccessfully. Jian’gan was stripped of his prince’s cap but retained his title, while WU An was beheaded. (Such was the inequality of feudal laws, see Note 36.) See [B: Ming shilu: {6} Xianzong / Sinica 1964–1968: (Bk. 246) 4168].

49 Zhu Youzhai the Prince Yi of Zheng 鄭懿王朱祐檡 (1484–1509–1521)
See [B: Mingshi / Zhonghua 1974: (Bk. 103) 2853–2854, (Bk. 119) 3627; B: Yanshantang / WEI 1985: (Bk. 33) 583]. Youzhai has no obituary in Ming shilu; his birthday is inferred from his date of death and age of 38 years, as given in Mingshi and Yanshantang bieji resp.

Zhu Zaiyu’s grandfather Youzhai was the eldest son of Jian’gan Prince of Dongyuan, and he first succeeded his father as Prince of Dongyuan in 1506 [B: Ming shilu: {8} Wuzong / Sinica 1964–1968: (Bk. 8) 263–264]. Then, with the death of Youxin the Prince Kang of Zheng in April 1507 [Note 32], the fight for succession to Zheng among the sons of Qiying (Prince Jian) boiled over, with a rancour which I have touched on in earlier Notes, but Zhu Zaiyu’s brief and sanitized narrative barely hints at. Qiyings’s 3rd son, the disinherited Jiansong [Note 33], laid the blame for his present sorry plight on Lady Zhang’s slanderers of years ago, while repeatedly pressing for his own reinstatement (see Note 47); while Qiyings’s 9th son Jianjin [Note 34], with his mother Lady Zhang, sought to advance their own claims by attacking Qiyings’s 4th son Jian’gan (= Youzhai’s late father) over his youthful crimes and indiscretions (see Note 48). But, as Zhu Zaiyu is at pains to explain, the rules were really on the side of Youzhai. He was quickly appointed to administer the affairs of the Zheng court, and
in August–September 1507 he was permitted to take up residence in the Zheng palace for that purpose. On 30 January 1508 the Imperial court settled the dispute in Youzhai’s favour. Finally, on 2 June 1509, he was officially installed as Prince of Zheng, as Zhu Zaiyu relates. See [B: Libu / ctext 2006–: Bk. 78 http://ctext.org/wiki.pl?if=gb&chapter=493301: para. 83; B: Ming shilu: [8] Wuzong / Sinica 1964–1968: Bk. 33: Zhengde 正德 year 2, month 12, day dingyou 丁酉 / 818].

50 According to Mingshi, Jiansong (formerly Prince of Mengjin) had died in 1491, and it was his son Youzhan 祐橏 who should have been next in line to the Zheng principality when Prince Kang died in 1507 [B: Mingshi / Zhonghua 1974: (Bk. 103) 2859, (Bk. 119) 3627]. Zhu Zaiyu’s narrative corrects this error of Mingshi. Jiansong died in year 4 of reign Zhengde 正德 [1509], and not year 4 of reign Hongzhi 弘治 [1491].


52 Edition α writes 大祀 = great sacrificial altars. Editions β1 = β2 write 天祀 = altar to Heaven, which is slightly inaccurate, since there were 2 altars, one to Heaven, and one to Earth.

In 1530, after a big debate, Ming Emperor Shizong 明世宗 (reign Jiajing 嘉靖 1522–1566) reverted to an ancient tradition, and made separate the sacrificial ceremonies to Heaven and to Earth (which had been worshipped together since 1377). Heaven was worshipped on the Winter Solstice at the southern outskirts of the capital, and a new altar to Heaven, the Round Mound Altar [Yuanqiu Tan 圓丘壇], was built there. Earth was worshipped on the Summer Solstice at the northern outskirts of the capital, and a new altar to Earth, the Square Pond Altar [Fangze Tan 方澤壇], was built there. See [B: Mingshi / Zhonghua 1974: (Bk. 47) 1226–1228, (Bk. 48) 1247–1250]; the ancient tradition dates back to Zhouli 《周禮》 [Rites of Zhou]: <Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Grand Director of Music [Dasiyue 大司樂] > [B: Zhouli / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36973; B: Zhouli / ZHENG et al 2000: Vol. 8: 689; C: [Zhouli] T1851: Tome 2: 34–35].

DIGRESSION The ceremonial reforms that Ming Emperor Shizong made in 1530 are well-documented. [B: Daming huidian 1587: Bk. 82: 32ab–34ab, Bk. 83: 10ab–11ab] show beautifully-drawn plans of the Round Mound and Square Pond, and [Bk. 84: 15ab] shows a picture of the grand Daxiang Temple 大享殿 of 1545. The liturgies and music of the new ceremonies to Heaven and to
Earth are detailed in Taichang xukao 《太常續考》 [Handbook of the Court of Imperial Sacrifices / Sequel] (compiled c. 1643) [B: Taichang / Siku F2008: Bk. 1: 16a–60b ◎, 61b–86a □]. For the ceremony at the Round Mound, [C: LAM 1998: 23–28, 141–145] gives a summary of the proceedings, and provides transcriptions of the music in staff notation. The complete music of the Round Mound and Square Pond ceremonies are transcribed in numeral notation in [B: Zhongguo minzu minjian qiyuequ 1992–: 〈Beijing juan 北京卷〉: 1540–1542 ◎, 1543–1544 □]. (NB This transcription writes the music in the wrong key throughout, with gongche 工尺 shang 上 = 1. The correct transcription should read he 合 = gong 宫 = 1 instead. See Ch. 3 for a brief explanation of the notation.)


The decree was part of a general amnesty with many associated clemencies, proclaimed after the ceremony to Heaven at the Round Mound on the Winter Solstice (12 December 1530 = Jiajing 嘉靖 year 9, month 11, day jiyou 己酉). It reads [B: Ming shilu [9] Shizong / Sinica 1964–1968: (Bk. 119) 2847; B: Ming shilu [9] Shizong / ctext 2006–: http://ctext.org/wiki.pl?if=gb&chapter=345075: para. 48; identically in B: Huangming zhaoling: Bk. 21: 16a 〈Decree on clemencies granted on completion of the ceremony at the southern outskirts of the capital 南郊禮成寬恤詔〉] :

Members of the royal house who have committed crimes and are now serving sentences at High Walls Prison, and any Commandery Princes, Generals of the State, and Commandants of the State, a who for any reason have been demoted to commoner or have had their stipends reduced, and those implicated in the aftermaths of the Zhifan 安化王朱寘鐇 b and Chenhao 晉憲 c rebellions — if family members submit petitions to argue their cases, and [it appears that] indeed injustice has been done, the local Imperial Regional Inspector d will conduct a fair investigation and make a report, and the cases will be re-decided.

a Commandery Prince [Junwang 郡王], General of the State [Jiangjun 將軍], Commandant of the State [Zhongwei 中尉] These titles of the Ming royal nobility are explained in Note 70.

b ZHU Zhifan Prince of Anhua 安化王朱寘鐇 (1454 – 14 March 1511) In 1510 ZHU Zhifan led a revolt, ostensibly to protest against the excesses of the Imperial court eunuch LIU Jin 劉瑾 (1451–1510). The revolt erupted on 12 May, and was put down on 30 May, when Zhifan was captured
by the Ming loyalist commander Qiu Yue 仇銓 (1465–1521). On 14 March 1511 Zhifan was commanded to commit suicide. See [B: Mingshi / Zhonghua 1974: (Bk. 117) 3590–3591, (Bk. 175) 4660–4661; B: Mingshi jishi benmo《明史紀事本末》 [Events in Ming history / narrated from beginning to end] / by Gu YingtaI谷應泰 (1620–1690): Bk. 44 〈The rebellion of Zhifan寘鐇之叛〉; Wikipedia：〈Prince of Anhua rebellion〉 http://en.wikipedia.org/wiki/Prince_of_Anhua_rebellion，accessed 2013-9-5; C: David M. Robinson 2012 (in-depth narrative); Zhifan’s birthday is inferred from his date of death and age of 58 years, as stated in [B: Yanshantang / Wei 1985: (Bk. 35) 623].

c Zhu Chenhao Prince of Ning 宁王朱宸濠 (22 July 1477 – 13 January 1521) Zhu Chenhao had harboured designs to usurp the Ming throne for many years. On 10 July 1519 (Zhengde 正德 year 14, month 6, day 14), the morning after his birthday, Chenhao broke out in open rebellion. The revolt was defeated by Imperial forces led by Wang Shouren 王守仁 (1472–1529), who on 20 August 1519 captured Chenhao after a fierce battle on the waters near Nanchang. On 13 January 1521 Chenhao was commanded to commit suicide. See [B: Mingshi / Zhonghua 1974: (Bk. 117) 3593–3596, (Bk. 195) 5162–5165; B: Mingshi jishi: Bk. 47 〈The rebellion of Chenhao宸濠之叛〉 (good narrative); Wikipedia《維基百科》〈Prince of Ning rebellion 宁王之亂〉 https://zh.wikipedia.org/wiki/寧王之亂，accessed 2013-9-5; C: Mote & Twitchett 1988: Vol. 7: 〈Ch. 7 The Cheng-te reign, 1506–1521〉 / by James Geiss: 423–436; Chenhao’s birthday is inferred from his date of death and age of 44 years, as stated in [B: Yanshantang / Wei 1985: (Bk. 32) 575].

d Imperial Regional Inspector [Xun’an Yushi 巡按御史] See Note 90.

54 [B: Daming huidian 1587: Bk. 169: 15ab 〈Verbally abusing one’s grandparents or parents 罵祖父母父母〉] This the same article as cited in Note 36, but the quoted provision appears only in Daming huidian 1587, not in Daming huidian 1510. Since Zhu Zaiyu follows his quote with the words “By Imperial order 欽此 ”, the provision may have originated as an Imperial order of 1530, and then was incorporated into Daming huidian 1587 as a general law.

55 The edict to reinstate Jiansong as Prince of Mengjin is not recorded in Mingshi nor in Ming shilu.

56 [B: Yanshantang / Wei 1985: (Bk. 72) 1359–1360] lists the posthumous title ‘Gongyi 恭懿 ’ as retroactively conferred on Jiansong Prince of Mengjin, and explains that it means “respectful and obedient in service to his superiors, gentle, docile, virtuous, and kind 敬順事上溫柔賢善”. Other manuals of posthumous titles also record this, and give similar meanings for the title [B: Huangming shiji huibian《皇明諡紀彙編》 [Compendium of posthumous titles of the Imperial Ming dynasty] / by Guo Lianghan 郭良翰 (fl. 1614) / Siku: Bk. 2: 12b–13b, 19a, Bk. 11: 26b; B: Lidai mingchen shifa huikao 《歷代名臣諡法彙考》 [A study of posthumous titles of eminent subjects through the ages]: [Pt. 1] Han Jin qi Ming shi huikao《漢晉迄明諡彙考》 [A study of posthumous titles from the Han, Jin, to Ming dynasties]
Jiansong must have turned over a new leaf in his later life … and perhaps he changed into a woman too!


Zhu Zaixi the Prince Jing of Zheng is sometimes confused with another prince of the same name, Zhu Zaixi the Prince Kangxian of Xinle 新樂康憲王朱載𡨨 (? – 1557–1593). Zhu Zaixi Prince of Xinle was the author of several books extolling the Ming royal house [B: Mingshi / Zhonghua 1974: (Bk. 104) 2966–2967, (Bk. 119) 3641; B: Fanxian ji 《藩獻記》 [Contributions from the principalities] / by ZHU Mouwei 朱謀㙔 (1564? – 1624) / Baojingtang: Bk. 3: 10b]. The confusion has been cleared up by [B: DAINZ 2008: 72].

58 The seat of the Zheng principality, and Zhu Zaiyu’s hometown, was Henei county 河内縣 in Huaiqing prefecture 懷慶府, today Qinyang city 沁陽市 in Henan province. Zhu Zaiyu sometimes writes Huaiqing prefecture as 懷慶府, and sometimes calls it informally 懷慶郡.

59 Edition α writes 求思承襲 = to beg, thinking to inherit; editions β1 = β2 write 求恩承襲 = to beg for Imperial favour to inherit. The wording of β is standard usage, and most likely correct.

60 What Zhu Zaiyu mentions were the obvious repercussions within the house of Zheng. As Wu Zihui so perceptively explains [C: Wu 2008: 38–45], the reinstatement of Jiansong as Prince of Mengjin, allowing the house of Mengjin potentially to depose ZHU Houwan as Prince of Zheng, had political ramifications extending beyond the principality of Zheng, all the way up to Ming Emperor Shizong 明世宗 himself (ZHU Houcong 朱厚熜, 1507–1521–1567). Emperor Shizong, like Zhu Zaiyu’s grandfather Zhu Youzhai, came to the throne not as the son of the previous ruler Emperor Wuzong 武宗 (ZHU Houzhao 朱厚照, 1491–1505–1521), but as his cousin from a branch line, descended from their common grandfather Emperor Xianzong 憲宗 (ZHU Jianshen 朱見深, 1447–1464–1487). The early years of Emperor Shizong’s reign were consumed by the political struggle over legitimizing his succession and his parents’ ritual status in the Ming dynastic lineage, known as the Great rites controversy (Dali yi 大禮議, 1521–1524–…). Jiansong’s reinstatement came soon after, in 1531. In this political climate, any hint of deposing an incumbent ruler descended from a branch line was a highly sensitive issue, to be prudently avoided if possible.

This sentence seems to provide a clue to dating the petition. Jiansong was reinstated as Prince of Mengjin in 1531, and it is now 60 years hence. If “60 years” is meant precisely, then this dates the present petition to 1591. However, there are other indications that this petition was really submitted in 1593, so “60 years” is only a round number. See p. xx.

故投臣以不拔之業 My translation is tentative, interpreting ‘拔’ = ‘to conquer’ (usually refers to military conquest of a city). The counsellors denied Zaiyu’s earlier petitions, and insisted that he continue to administer the affairs of the Prince’s court, and this is the “job beyond my powers to perform” = unconquerable job = 不拔之業. However, there is some confusion as to whether Zaiyu is referring to some past denial by the counsellors (in 1591), or talking about the present situation (1593). See the supplementary petition following, and the discussion on p. xx.

For the Ming princes, the basic rules of feudal succession were established by the founding Ming Emperor Taizu 明太祖, and stated in his Ancestral injunctions《皇明祖訓》 [B: Huangming zuxun: 34a–36a 〈Official positions 職制〉]. The rules are spelled out more systematically in the Collected ordinances《大明會典》. Some relevant articles from [B: Daming huidian 1587: Bk. 55: 1b–2b] are quoted below, and see also p. 25.

- The eldest son by the primary wife [di zhangzi 嫡長子] of an Imperial Prince, on reaching the age of 10 years, shall be invested as the Prince Heir. […] The Prince Heir shall inherit the title of Imperial Prince. The Imperial court will send representatives to carry out the investiture ceremony.

- If there is no eldest son by the primary wife, the eldest son by a secondary wife [shu zhangzi 庶長子] shall inherit.
The younger sons of the primary wife, and sons by the secondary wives of an Imperial Prince, on reaching the age of 10 years, shall all be invested as Commandery Princes.

And there are similar rules for the sons of Commandery Princes.

It will be helpful to understand some of the nomenclature of Ming feudal rank. The male descendants of an Emperor are ranked in a strict hierarchy of nobility as follows:

1. **Imperial Prince** [Qinwang 親王] A son of the reigning Emperor (other than the Crown Prince [Huang Taizi 皇太子] who will succeed as Emperor), and all his heirs. Imperial-Princely titles have only 1 syllable. The Prince of Zheng 鄭王 was an Imperial Prince. [B: LÜZL 2015: 671; C: HUCKER 1985: No. 1186].

2. **Commandery Prince** [Junwang 郡王] A son of No. 1 above (other than the Prince Heir [Wang Shizi 王世子] who will succeed as Imperial Prince), and all his heirs. Commandery-Princely titles have 2 syllables. The Prince of Mengjin 盟津王, and the Prince of Dongyuan 東垣王 were Commandery Princes. [B: LÜZL 2015: 704; C: HUCKER 1985: No. 1800].


5. **Supporter-General of the State** [Fengguo Jiangjun 奉國將軍] A son of No. 4 above. [B: LÜZL 2015: 496; C: HUCKER 1985: No. 1999].


7. **Bulwark-Commandant of the State** [Fuguo Zhongwei 輔國中尉] A son of No. 6 above. [B: LÜZL 2015: 798; C: HUCKER 1985: No. 2074].

8. **Supporter-Commandant of the State** [Fengguo Zhongwei 奉國中尉] A son of No. 7 above, and all his male descendants. [B: LÜZL 2015: 496; C: HUCKER 1985: No. 2000].

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71 *Lunyu* 《論語》 / *Analects of CONFUCIUS* / compiled by disciples of CONFUCIUS 孔子 (~551 – 479); (Ch. 13 Zilu 子路). See Note 65.


73 伯御
In many editions of the *Shijing*, the line “至于己斯亡 = Till finally they come to ruin” is written as “至于己斯亡 = Till he himself comes to ruin” [B: *Shijing* / MAO et al 2000: (Bk. 15) Vol. 5: 1059–1060; etc]. All editions (α, β1, β2) of Zaiyu’s petition write instead 至于巳斯亡. This is merely a matter of careless printing — see Note 69, and the same mistake in the facsimile [Fig. 1: 6d: lines 40a.6, 40b.3]. Indeed, [C: WILKINSON 2015: §2.9.2] observes that in many early manuscripts and prints, the characters 己 巳 巳 are often written indiscriminately, and they can be identified only by their meanings in context. Since in the other cited instances of 巳 on the facsimile, only the character 巳 can be meant, so 巳 is also taken to be Zhu Zaiyu’s intended meaning in the present instance. My reading of the poem follows ZHU Xi 朱熹 (1130–1200), and my translation is loosely based on LEGGE. The whole poem （jiao gong） is an admonition to the Zhou King, to guard against internecine strife within the royal house.

The basic laws governing Princely successions, as well as many rules exercising a tight control over members of the Ming royal houses, were first set down by the founding Ming Emperor Taizu 明太祖 (reign Hongwu 洪武 1368–1398) in the *Huangming zuxun 《皇明祖訓》*. In 1565 these rules were consolidated and promulgated as the Regulations Governing the Royal Fiefs 宗藩條例. A further revision was made in 1582, and by Imperial decree the name was changed to Essential Regulations Governing the Royal Fiefs 宗藩要例 [B: *Daming huidian 1587*: Bk. 55: 1a]. The complete Regulations are recorded in [B: *Daming huidian 1587*: Bk. 55–57]. Zhu Zaiyu’s grandfather Prince Yi was installed as Prince of Zheng in 1509, and his father Prince Gong succeeded to the title in 1527, both before the promulgation of the Regulations. Zaiyu himself, writing in 1593, of course comes after the Regulations.

Zhu Zaiyu’s dates about the Regulations are correct, but they are really irrelevant to his argument. The crucial date is not that of the Regulations, but that of Jiansong’s reinstatement as Prince. In 1509 and 1527, Jiansong was a commoner, and this fact alone sufficed to bar him and his family from succession. After he was posthumously reinstated as Prince in 1531, the lines and rights of succession changed, and it is this fact which makes Zhu Zaiyu’s situation in 1593 different from those of his father and grandfather before.

The predecessor of Ming Emperor Shenzong 明神宗 (reign Wanli 萬曆 1573–1619) was Emperor Muzong 穆宗 (reign Longqing 隆慶 1567–1572). As soon as he ascended the throne on 4 February 1567, Muzong proclaimed a general amnesty. On 20 February, Zhu Zaiyu’s father Houwan was released from High Walls Prison, where he had been sentenced since 1550, and restored to his fief as Prince of Zheng. His annual stipend was increased to 10 400 dan 石. In Zhu Zaiyu’s opinion, all this was due to the munificence of Emperor Muzong.

Edition α writes 新頒 = newly promulgated; editions β1 = β2 write 親頒 = personally promulgated.

“名教中自有樂處[地]” Shishuo xinyu 《世說新語》 [A new account of tales of the world] / by LIU Yiqing 劉義慶 (403–444): 〈Ch. 1 Virtuous conduct 德行 第一〉 [B: Shishuo / LIUJ 2011: https://zh.wikisource.org/wiki/世說新語/德行：para. 23; C: [LIU] T2002: 11]. LIU tells an anecdote about some men in recent times (c. 270 – c. 300) who adopted a very unfettered lifestyle, and went about naked. This elicited the wry comment, “There are joys to be found even as one abides by the teachings of proper conduct. Why go to such lengths?”

This tells us that the present petition is Zhu Zaiyu’s 4th one on the subject. He has already mentioned 3 earlier petitions on p. 22.


Edition α writes 天倫 = the principles of family relationships ordained by heaven; editions β1 = β2 write 大倫 = the great principles of family relationships. This sentence is written in paired couplets — heaven : human, invite reproach : debauch traditions, kinsmen : ancestors. Although my translation expresses this meaning, I am afraid it cannot do justice to the paired syntax of the original language. The paired couplets of α make for better literary style, so β is likely a misprint.


See Note 27 on SOURCES.

Essential Regulations Governing the Royal Fiefs See Note 75.

[B: Daming huidian 1587《大明會典》: Bk. 55: 7b].

Imperial Prince and Commandery Prince See Note 70.

If an Imperial Prince commits an offence, he is summoned to the Emperor, who will admonish him during 5 audiences within 10 days, and then deal with him accordingly. If a Commandery Prince commits an offence, he is admonished by his own Imperial Prince; and intractable cases may be
escalated by memorial to the Emperor.  Imperial and Commandery Princes shall deal with lower-ranking members of their own kin.  See [B: Huangming zuxun《皇明祖訓》: 26ab 〈Laws法 警〉; B: Daming huidian 1587: Bk. 57: 32b–34a].

89 Guidance officer [fudao guan 輔導官]  Staff in the Prince’s court, responsible for instructing his household on the observance of Ming feudal law.  They include his Administrators [Zhangshi 長史; see Note 100], and Instructors [Jiaoshou 教授] [B: LÜZL 2015: 782; C: HUCKER 1985: No. 740].  If the Prince misbehaves, his guidance officer is often punished for it [B: Daming huidian 1587: Bk. 57: 33b].

90 Imperial Regional Inspector [Xun’an Yushi 巡按御史]  An Imperially-appointed official, who tours the province and regions under his jurisdiction, inspecting all aspects of government activity, receiving complaints from the populace, and reports back to the Emperor.  See [B: LÜZL 2015: 440; C: HUCKER 1985: No. 2713].

91 Inspecting officer [fu’an guan 撫按官]  An informal reference to the Imperial Regional Inspector.

92 Edition α writes 查勘; editions β1 = β2 write 查看.  Both mean the same thing, = to investigate.

93 These recommendations are not new.  On 24 November 1581, in reply to a petition from Zhu Zaiyu’s father Houwan 厚烷 or from Zaiyu, pleading illness of both, the Ministry of Rites [Libu 礼部] allowed that Houwan’s grandson ( = Zaiyu’s son) Yixi 翼錫 [Note 102] may stand in for Houwan at state sacrificial ceremonies, in proper ceremonial attire.  On 24 July 1591, another memorial by the inspecting officer for Henan province repeated the instruction that Zaiyu may not resign from administering the affairs of the Zheng court, but at ceremonial occasions, his son may stand in for him instead.  See [B: Ming shilu [11] Shenzong《明神宗實錄》 [Veritable records of Ming Emperor Shenzong] / Sinica 1964–1968: Bk. 117: Wanli 萬曆 year 9, month 10, day jiwei 己未 / 2209, Bk. 237: Wanli year 19, month 6, day wuxu 戊戌 / 4390], and the discussion on p. xx.  To have a son or grandson perform ceremonial duties for a sick parent was accepted practice of the time, and it was even stated as a policy by the Ministry of Rites in 1509 [B: Libu zhi gao《禮部志稿》 / ctext 2006– : Bk. 77 http://ctext.org/wiki.pl?if=gb&chapter=275266 : para. 21].

94 Edition α writes 奏行, a meaningless misprint.  Editions β1 = β2 correct this to 奉行 = to obey and follow.

95 Edition α writes correctly 曾伯祖 = great-grand-uncle; editions β1 = β2 write in error 曾祖 = great-grand-father.

96 See p. 20.

97 See p. 21.

98 Huaiqing prefecture  See Note 58.
‘Consumptive heart disease’ is a literal translation, but it should probably not be interpreted in a literal medical sense. From Zhu Zaiyu’s description of his symptoms, his disease sounds more like tuberculosis.

Office of the Administrator (of the Prince’s court) [(Wangfu) Zhangshi Si (王府)長史司]  This is the chief executive office of the Prince’s court, and also the liaison office between the Prince’s court and the Imperial court in Beijing. It is headed by a Left Administrator [Zuo Zhangshi 左長史] and a Right Administrator [You Zhangshi 右長史], who are appointed by the Imperial court, and over whom the Prince has no authority. Rather, they are the Emperor’s means of keeping a watch over his often errant or rebellious fiefs. See [B: Mingshi / Zhonghua 1974: (Bk. 75) 1836–1837; B: LÜZL 2015: 100, 185; C: HUCKER 1985: No. 185, 186; B: CHENWN 1992: 4–6; B: DAiNZ 2008: 9–11].

For example, when Zhu Zaiyu presented his Lishu 《曆書》 [Treatise on the calendar] to the Imperial court in 1595, the presentation was done by his Right Administrator GUAN Zhizheng 關志拯, and Left Administrator XIE Tingxun 謝廷訓 [A: Yuelü quanshu 《樂律全書》 [Comprehensive treatise on music and music theory]: 〈Petition to present the Lishu 進曆書奏疏 (25 July 1595)〉 (Lishu: Fasc. 1: 10b), 〈Memorial to present the Lishu 進曆書表 (1 December 1595)〉 (Lishu: Fasc. 1: 120b)]. When he presented his musical works to the Imperial court in 1606, the presentation was done by his Right Administrator, now LI De 李德 [A: Yuelü quanshu: 〈Petition to present the Lüshu 進律書奏疏 (12 August 1606)〉: 4b–5a].

In all editions (α, β1, β2), 厚光 here is misprinted as 原光, but on the next page all write the correct name 厚光. The variant form 厚充 is also used [Fig. 1: 6d: line 40b.6; B: Mingshi / Zhonghua 1974: (Bk. 103) 2864].

The principality of Lujiang 廬江 descends from ZHU Jiannan the Prince Yijian of Lujiang 廬江懿簡王朱見漸 (1479–1490–1537), who was the secondary 10th son of ZHU Qiying the Prince Jian of Zheng 鄭簡王朱祁鍈 [Note 30], and enfeoffed in 1490. See [B: Mingshi / Zhonghua 1974: (Bk. 103) 2864–2865; B: Yanshantang / WEI 1985: (Bk. 36) 638]. Jiannan’s son, ZHU Youang the Prince Rongmiao of Lujiang 廬江榮繆王朱祐梴 (1523–1543–1564), had managed the affairs of the Zheng court during 1552 to 1562, when Zhu Zaiyu’s father Houwan 厚烷 was demoted to commoner and imprisoned at High Walls [B: Ming shilu: [9] Shizong / Sinica 1964–1968: (Bk. 392) 6880]. From 1562 until the reinstatement of Houwan as Prince of Zheng in 1567, Zaiyu’s younger brother Zaiheng 載леп [Note xx] took over the Zheng court administration. (The date 1562 follows Henan tongzhi 《河南通志》 [General gazetteer and history of Henan province] [B: Henan 1660: Bk. 10: 18b]; identically in [B: Henan 1735: Bk. 20: 19a]. But [B: DAiNZ 2008: 37] notes that the 1597 edition of Henei xian zhi 《河内縣志》 [Gazetteer and history of Henei county]: Bk. 1 records the date as 1554 instead.) ZHU Houguang 朱厚光 (? – 1573 – < 1618), whom Zhu Zaiyu is nominating to manage the Zheng court affairs, was the son of Youang, and of the same generation as Zaiyu’s father Houwan [B: Ming shilu: [11] Shenzong / Sinica 1964–1968: (Bk. 12) 402; B: Mingshi / Zhonghua 1974: (Bk. 103) 2864]. His son
ZHU Zaiyin 朱載堙 (? – 1618–1644) succeeded him as Prince of Lujiang in 1618 [B: Ming shilu: [11] Shenzong / Sinica 1964–1968: (Bk. 571) 10757]. During the collapse of the Ming dynasty in 1644, Zaiyin was killed when he stoically faced the rebels in his court at Huaiqing [B: Mingshi / Zhonghua 1974: (Bk. 119) 3628].

102翊錫

The meaning of the word 扶 in this context is unclear to me, and the translation “none is supported by a letter of certification” is tentative.

104The counsellor, i.e. the inspecting officer = the Imperial Regional Inspector [Notes 90 and 91].

105Edition α writes 閔齒, a meaningless misprint. Editions β1 = β2 correct this to 齦歔, metaphorically meaning inconsistent and contradictory.

106The principality of Lujiang descends from the secondary 10th son of ZHU Qiying the Prince Jian of Zheng, that is the youngest surviving line among the sons of Prince Jian. It is therefore junior in the family order. See Note 101.

107See [B: CHENWN 1992: Ch. 8; B: DaiNZ 2008: 84–96; B: DaiNZ 2011: 45–53; C: Wu 2008: 52–58]. These bibliographical surveys include discussions of lost and doubtful works, which should complement the information on the extant works given in Bibliography A. They are not free from small inaccuracies and omissions, and for the extant works, they should be checked against the information given in Bibliography A at the end of the present study.

108This observation was first made by [B: CuiFZ 1982: 48].

109In the complete copy of the original print at Princeton University (Gest TA141/278 v.1–20), all 14 titles (including both calendrical and musical works) are enclosed in 2 cases under the uniform title Yuelü quanshu 《樂律全書》. The title Yuelü quanshu is similarly used with this inclusive meaning in all facsimile editions [A: Yuelü quanshu / FR1968; _____ / F[1988]; _____ / F1995; _____ / F2013: Vol. 1: 6]. WorldCat https://www.worldcat.org/search?q=樂律全書 uses the title in the same inclusive sense. The catalog [B: Guojia Tushuguan 1996: Classics division 經部: no. 00740] similarly lists no. 00740 Yuelü quanshu in 48 Books comprising all 14 titles, and describes it as “printed at the Zheng Principality during the Ming Wanli reign 明萬曆間鄭藩刊本”. The catalog [B: Zhongguo guji 1989–1998: Classics division 經部: no. 2356, 2357] lists no. 2356 Yuelü quanshu in 39 Books with the 11 musical titles of 1606 only, describing it as a “print engraved at the Zheng Principality during the Ming Wanli reign 明萬曆鄭藩刻本”, and no. 2357 Yuelü quanshu in 49 Books with the 11 musical titles of 1606 & the 3 calendrical titles of 1595, describing it as an “augmented edition 增修本”; this description, though not entirely correct, comes closest to Zhu Zaiyu’s meaning.
In the *Siku quanshu*, the *Yuelü quanshu* comprising 11 musical titles in 42 Books is placed under the Classics division: Music category 經部:樂類, and the 3 calendrical titles with 9 Books & 2 Appendices are placed as a group under the Philosophy division: Astronomy & mathematics category 子部:天文算法類. The total number of Books is greater than the correct number of 47 Books & 2 Appendices, because some of the longer Books of Zhu Zaiyu are split up into 2 in the *Siku quanshu*.

〈Postcript to the 〈Memorial stele for Prince Heir Duanqing of Zheng〉書鄭端清世子神道碑記後〉/ by FAN Taiheng 范泰恒 (fl. 1745 – d. 1775). In *Yanchuan ji* [Yanchuan anthology] [B: Yanchuan / FAN 1809: Bk. 12: 3b]. The author is full of admiration for Zhu Zaiyu’s abdication of Zheng.

The first modern facsimile edition of the *Yuelü quanshu* is that in the series *Wanyou wenku* 萬有文庫 [Universal library], published by the Commercial Press 商務印書館 in Shanghai in 1931. This has been reprinted in facsimile as [A: *Yuelü quanshu* / FR1968].

This idea was first proposed by [B: LiCY 1980; B: LiCY 1985a].


Such a method leads to many contradictions. Just to give one example:

1. If we follow [B: LiCY 1980], then we have: *Lüli rongtong* is prefaced 1581, its Appendix mentions numbers derived from 12-tone equal tuning and *Lüli jingyi* [A: *Lüli* (Lishu: Fasc. 2: 127b–128b)] together, therefore the theory of 12-tone equal tuning was developed and *Lüli jingyi* was fully drafted before 1581.

2. [A: *Lüli jingyi*: Outer Bk. 1: (Lishu: Fasc. 4: 21b); A: *Lüli jingyi* / FENG 1998: 862] quotes from the 〈Petition to present the *Lüshu* 進律書奏疏〉, which is clearly dated 1606, therefore *Lüli jingyi* was written after 1606.

3. Therefore 1606 comes before 1581.

[B: *Henei* 1825: Bk. 19: 7ab].
Chapter 2

The ceremonials

Most of the music of Zhu Zaiyu is written for ceremonial use. The principal ceremonies are described in the Confucian classics, and they follow a long and ancient tradition. Their ceremonial function imposes a certain uniformity of musical style. All of the music features the voice, sometimes solo, but more usually in chorus. Some of the scores are accompanied by explicit dance choreographies, and in other pieces the dance is present as a conceptual background. (Zhu Zaiyu’s dance falls outside the scope of this study, and it is discussed only briefly in Ch. 3 as an adjunct to the account of caoman 操縵.) In this chapter, the ceremonials are described in their historical context.

The country banquet and the country archery meet of Yili 《儀禮》

The banquet and archery ceremonies in the Zhou dynasty

In ancient China, ritual and ceremony [li 礼] held a place of importance which may not be readily appreciated by a person in the modern age. According to the traditional narrative, ritual was instituted by the Duke of Zhou 周公 (fl. −1042 − 1036), creator of the Chinese feudal system in the Zhou dynasty (−1045 − 256). The Duke formulated the formalities of ritual to serve both a social function and to act as a tool of government (or more probably, ritual developed to embrace these 2 functions). The performance of ritual clearly demarcated the differences of social rank between members of the feudal classes, and thus it impressed upon each participant of his proper station in that society. Confucius (−551 − 479) held ritual in high regard, and viewed it as one of the essential accomplishments of the cultured gentleman. 3 texts of the Confucian canon are especially relevant to the subject of ritual in the Zhou feudal system: Yili 《儀禮》 [Protocol and ceremonial], Zhouli 《周禮》 [Rites of Zhou], and Liji 《禮記》 [Book of rites]. 3 All 3 are of anonymous authorship and uncertain date. Their received texts were compiled during the Former Han dynasty (−206 − 8), but based on much earlier source materials from the Zhou. ZHU Xi 朱熹 (1130–1200), in his study of the classic texts on ritual, considered Yili to be basic, and his monumental Yili jingzhuan tongjie 《儀禮經傳通解》 [Comprehensive exegeses on Yili] [B: Yili tongjie] is built around Yili as its core text, with Liji and other historical works as its exegeses. 4 The 17 Chapters of Yili 5 describe the rites and ceremonials applicable to officials of the aristocracy during Zhou times. 6 The Country Banquet 鄉飲酒禮 (Ch. 4) and the Country Archery
Meet 乡射禮 (Ch. 5) are 2 of these ceremonies, appropriate for high officials of the rank of Dafu 大夫. The corresponding ceremonials for a Duke [Gong 公] are the [Great] Banquet 燕禮 (Ch. 6) and the Great Archery Meet 大射 (Ch. 7) respectively. These 4 ceremonies all include significant components of music, and their music programs share many common features.

Zhu Zaiyu takes these 4 Chapters of Yili as the model for his ceremonial music. For the present study, focussed as it is on the music, a comparative study of all 4 of these ceremonials of Yili would represent too complicated a digression. In Xiangyin Shiyue pu《鄉飲詩樂譜》 [Songs of the 《Shijing》 for performance at the Country Banquet], Zhu Zaiyu has set to music songs from all these 4 Chapters of Yili, but as its title implies, the bulk of the music is intended for the Country Banquet. In his treatise Lüli jingyi《律呂精義》 [Precise principles of the musical pitches], Zhu Zaiyu simplifies his discussion of ceremonial to a detailed comparison between only Yili: (Ch. 4 The Country Banquet) and (Ch. 5 The Country Archery Meet) [A: Lüli jingyi: Outer Bk. 6 (Lüshu: Fasc. 6: 6b–18a); A: Lüli jingyi / FENG 1998: 1014–1030]. I shall hence follow his example, and limit my discussion concerning the general ceremonial program to only these 2 ceremonies of Yili. But for the musical sections of the ceremonials, the discussion is extended to consider all 4 ceremonies (p. 94).

The Country Banquet and the Country Archery Meet of the Zhou dynasty were community festivities, charged with both social and political functions. 7 The ‘Country [Xiang 鄉]’ was a large administrative region comprising 12,500 families, 8 governed by a high official (Xiang Dafu 鄉大夫) 9. According to Zhouli, 10 every 3 years, the Xiang Dafu would conduct an examination or census of his Country, and invite the elders and men of merit and ability to a banquet at the Country school. This would be the ceremony described in Yili: (Ch. 4 The Country Banquet). He would observe his guests, take suggestions from the elders, and the next morning he submits recommendations to the King or feudal lord (for appointments or rewards). Then he would hold the archery meet, 11 observe the deportment and skill of the archery contestants, take in the public opinions about their performances, (and make further recommendations.) Thus the banquet and archery meet provided an occasion for the populace to come together in an atmosphere of amiability and mutual respect, the government would recruit men of ability, and the people would have a voice in their own governance.

Similar ceremonies, on a lesser scale and at more frequent intervals, were held in the smaller administrative regions. In the Townships [Zhou 州 = 2,500 families], twice each year in the-spring and autumn, the Township Chief [Zhou Zhang 州長] 12 would assemble the residents and hold a banquet-cum-archery meet at the Township school. 13 This might be coordinated with seasonal sacrifices, and a pronouncement of laws to the assembly. The smaller scale of the occasion probably meant that the festivities were all completed within 1 day, making it fit the format described in Yili: (Ch. 5 The
Country Archery Meet. A banquet (without archery) was also held in each Ward [Dang 隸 = 500 families] every year in the 12th month, to coincide with the worship ceremony for 8 agricultural deities called the Zha sacrifice 蜡祭. (The banquet was hosted by the Ward Chief [Dang Zheng 隸正], the Zha sacrifice was a different ceremony conducted by the King or feudal lord.) The purpose of this banquet was to honour the local elders, making it somewhat different from the ceremonies described in Yìli, but we may expect it to be roughly similar to the Country Banquet.

The archery meet that went with these banquets was not primarily an athletic event. Like the banquet, its paramount functions were political and ceremonial. In the Country meet (presided by the Xiang Dafu), contestants were judged on their carriage and deportment, on their correct observance of the ceremonial protocols, on how well their shooting coordinated with the music (ARCHERY ROUND 3, p. 88), on their dance, and on their marksmanship. Actual shooting skill (marksmanship) counted for only 1 among several criteria, on which the Xiang Dafu would make his recommendations to the King or feudal lord. Liji tells us of an occasion on which Confucius himself hosted an archery meet. He had his student assistants announce to the crowd of spectators and competitors, that they were forbidden from entering if they were a defeated general, an official of a defunct feudal lord, or a member of a family in which he was not a direct descendant by blood. They were invited to enter if they were young and filial (age 20 years), strong and fraternal (age 30 years), or elders who loved ritual and learning without cease, avoided the profane, and all through life cultivated in character without deviating from the correct way until they were 100 years old. After these announcements, almost the whole crowd left, and only a few remained.
The ceremonial space

Before describing the ceremonial proceedings, it will be helpful to get some idea of the spatial setting for the ceremonies, and the dispositions of the celebrants and participating musicians in that ceremonial space.

Fig. 2:1 Etching on a bronze basin of the Warring States period (~475–~221), showing a feast scene. Excavation from Fenshuiling, Changzhi, Shanxi in early 1970s; bronze basin diameter 450 mm.
[B: Zhongguo yinyue wenwu daxi 2000: 〈Shanxi juan 山西卷〉: 286]
In the two banquet halls at right, guests are playing a game of pitch-pot [touhu 投壺]. (In the game of pitch-pot, players try to pitch arrows into a flagon, and the loser gets to drink wine as penalty. The game is played to the accompaniment of rhythmic music. See [B: Liji 《禮記》: 〈Ch. 40 Pitch-pot 投壺第四十〉; B: Liji / ctext 2006–: http://ctext.org/liji/tou-hu/zh?en=on; C: [Liji] T1885: Vol. 28: 397–401; B: Dadai liji 《大戴禮記》: 〈Ch. 78 Pitch-pot 投壺第七十八〉].) In the courtyard at center left, a set of 5 bells is being played by 2 kneeling musicians, and 5 stone chimes are played by another 2 players, one of whom has been obliterated. The scene might be like that described in [B: Yili 《儀禮》: 〈Ch. 4 The Country Banquet 鄉飲酒禮〉 or 〈Ch. 6 The [Great] Banquet 燕禮〉]. (The Chinese caption says the ceremony is one 大嵬礼, but I am afraid I do not know what this means.)
Fig. 2: Etching on a 2nd bronze basin of the late Warring States period (−475 – −221), showing another feast scene.

Excavation from Zhaogu, Huixian, Henan 河南輝縣趙固 in 1951; bronze basin diameter 452 mm.

[B: Zhongguo Kexueyuan Kaogu 1956: 116]

Two banquet halls are shown at center. In the courtyard at right, a set of 5 stone chimes (2 of them obliterated but suspensions still visible) is being played by 2 standing musicians; at left, a set of 5 bells is being played by another 2 players. The whole scene depicts an archery meet with music, as might be described in [B: Yili 《儀禮》：〈Ch. 5 The Country Archery Meet 鄉射禮〉 or 〈Ch. 7 The Great Archery Meet 大射〉].
According to Yili《儀禮》 (and other classic texts), the hall and courtyard for the banquet and archery meet, where ceremonial music was performed, was divided into 2 areas. There was an upper court at the northern end, and a lower court at the southern end, with steps leading between the 2 courts on their eastern and western sides. The musicians were similarly divided into 2 groups. Those playing the softer-sounding instruments like the zither se瑟 sat on the upper court [tangshang yue堂上樂], while the louder instruments like drums and winds played in the lower court, standing up [tangxia yue堂下樂]. Fig. 2: 1 and Fig. 2: 2 are drawings taken from etchings on 2 bronze basins [jian鉴] of the Warring States period (~475 – ~221), showing scenes from 2 ceremonial feasts. The drinking feast shown in Fig. 2: 1 might be like that described in Yili:〈Ch. 4 The Country Banquet〉 or 〈Ch. 6 The [Great] Banquet〉, while the archery meet depicted in Fig. 2: 2 might be as described in〈Ch. 5 The Country Archery Meet〉 or 〈Ch. 7 The Great Archery Meet〉. We see bells and stone chimes being played in a courtyard in front of the banquet hall, presumably as part of the orchestra in the lower court. However, neither etching shows any musicians inside the banquet hall, where the upper-court ensemble would be expected to sit (although Fig. 2: 1 does not show the hall completely, and in Fig. 2: 2 some areas inside the hall may have been obliterated)— and this may perhaps cast some doubt on the accuracy of the Yili. Nevertheless the division of the orchestra into 2 ensembles, one sitting on the upper court and another standing in the lower court, appears well established in the classic texts.

During the great flourishing of music under the reign of the Tang Emperor Xuanzong 唐玄宗 (reigned 712–756), these 2 groups of musicians evolved to become the Sitting Division [Zuobuji坐部伎] and the Standing Division [Libuji立部伎]. 20 Both were employed for the performance of feasting music [yanyue燕樂], whose style combined elements of ceremonial music [yayue雅樂], popular music [suyue俗樂], and foreign musics [huyue胡樂]. In the ceremonial music of later dynasties, court orchestras grew ever more grandiose: the standing division expanded into a huge size involving several hundred performers, and its performances were outdoor spectacles. 21 But after the Tang dynasty (618–907), ceremonial music degenerated into a fossilized form, and it lived on at court only in attempts to re-create the past. Zhu Zaiyu’s ceremonial musical compositions belong in this tradition. His orchestras, of a relatively modest size, are similarly disposed in 2 parts, an ensemble on the upper court and a different ensemble in the lower court.

In modern times, ceremonial music in the style of Zhu Zaiyu is still performed — not in connection with any banquet or archery meet, but at the Confucian temple, during the worship ceremony for Confucius. A look at the setting in this situation can provide a point of reference from a still-living practice. The ritual worship of Confucius has been a more-or-less continuous tradition in China from the Han dynasty about 2000 years ago, up to the present day. The ceremony was suspended during the Maoist years, but in 1984 and 1985 it was revived at Confucius’ hometown of Qufu曲阜 under the
Since then it has grown into a tourist industry, with performances at Beijing and other cities as well. In Taiwan, the principal centers for the Confucian ceremony are Tainan and Taibei, where it was invigorated by reforms led by CHUANG Pen-Li in 1968–1970. Video recordings of the ceremonies in Taibei and Qufu can be seen on the internet, giving the most recent coverage. The division of the performance space into an upper court where the zithers qin and/or se play, and a lower court with the wind instruments, is evident in some (but not all) of the historical orchestral plans. The spatial layout for the modern Confucian ceremony is basically similar. At the Temple to Confucius in Qufu, there is an expansive forecourt corresponding to the lower court, where the dancers and some of the musicians perform. At the Temple to Confucius in Taibei, space is more restricted, and the musicians and dancers perform on a raised platform extending out from the upper court. One difference from Yili’s ceremonials is notable, and that is the presence of dancers. Yili mentions no dancers at its banquets or archery meets, but at the Confucian ceremony, the music is accompanied by a corps of 36 dancers. Zhu Zaiyu’s Xiangyin Shiyue pu 《鄉飲詩樂譜》 [Songs of the Shijing for performance at the Country Banquet] is meant to correspond to Yili, so it too provides for no dancers. But in those pieces of Zhu Zaiyu’s music where he is not emulating Yili directly, the performance is, like the Confucian ceremony, complemented by the dance (see Ch. 3, Ch. 6).
Fig. 2: 3  The Country Banquet: Music for the guests, & toasts for the musicians and sheng players.

[B: Pangong: Bk. 9: 47a (B: Pangong / FENG F1970: 1045)]

An Announcer  D Dignitary  E Elder guest  G1 Principal Guest  G2 2nd Guest
G3 General guest  H Host  W1 Wine assistant  W2 Wash assistant
(1) Master of Music  (2) Singer  (3) Se  (4) Sheng  (5) He  (6) Bofu  (8) Stone chimes

*Italics* H denote temporary positions.
Fig. 2: 4  The Country Banquet: Upper court & front of lower court, with musicians.

[B: Yili tu ZHANG; Bk. 3: 8]
Fig. 2: 5 The Country Archery Meet: General plan.
[B: Pangong: Bk. 10: 54a (B: Pangong / FENG F1970: 1229)]

A Archer  An Announcer  Ap Archer pair  D Dignitary  D1 Dir. of Arms  D2 Dir. of Archery  E Elder guest
G Guest  G3 General guest  H Host  L Low official  M Marker  S Scorer  W Wine assistant
(1) Master of Music  (2) Singer  (3) Se (4) Sheng  (5) He  (6) Bofu  (7) Taogu  (8) Stone chimes  (9) Xun  (10) Chi  (11) Drum
Italics D2, (1) (2) (3) denote temporary positions.
Fig. 2: The Country Archery Meet: Please entertain the guests with music.
[B: Yili tu ZHANG: Bk. 3: 12]
With the perspective gained from this brief diachronic survey, we return to *Yili*. Although *Yili* contains no pictures, from its verbose descriptions scholars have reconstructed plans of the ceremonial space where its banquets and archery meets were held, according to their interpretations. **Fig. 2: 3** and **Fig. 2: 4** show 2 plans of the Country Banquet, and **Fig. 2: 5** and **Fig. 2: 6** show 2 plans of the Country Archery Meet, as drawn by Li Zhizao and Zhang Huiyan respectively. Li Zhizao 李之藻 (1565 ? 1571 – 1630) was a later contemporary of Zhu Zaiyu, and the first scholar to appreciate the importance of his writings and to make a thorough study of them. His *Pangong liyue shu* 《頖宫禮樂疏》 [An itemized exposition of ritual and music in schools] of 1618 is an in-depth investigation of ritual and music, supposedly intended for the curriculum in local schools 28, and it quotes extensively from Zhu Zaiyu’s *Yuelü quanshu* 《樂律全書》 [Comprehensive treatise on music and music theory]. The *Yili tu* 《儀禮圖》 [Diagrams for *Yili*] of Zhang Huiyan 張惠言 (1761–1802) is an interpretation of *Yili* done entirely by graphical means. Zhang’s plans of the Country Banquet and Country Archery Meet are beautifully drawn, and appear to be more realistically proportioned than those of Li Zhizao. As we follow the ceremonial descriptions in *Yili*, it will be helpful to keep these drawings in mind. (The musical instruments mentioned in them, and the instrumental ensembles employed, are discussed in Ch. 5 and Ch. 6.)

**The general ceremonial programs**

The Country Banquet and the Country Archery Meet are often discussed together, because they are often held together. As described in *Yili* 《儀禮》: 〈Ch. 4 The Country Banquet 鄉飲酒禮〉, the banquet may be celebrated as an independent festivity. But according to 〈Ch. 5 The Country Archery Meet 鄉射禮〉, this ceremony is always held in conjunction with a banquet. As we can see from **Fig. 2: 7**, the archery meet is in effect inserted into the middle of the banquet, so that the opening portion of the banquet serves as a prelude to the archery activities, and the closing part of the banquet serves as its postlude. To accommodate such a long program, parts of the banquet are abbreviated, when celebrated in this manner.

In both the banquet and the archery meet, the principal celebrants are the Host [*zhuren* 主人] and the Guest [*bin* 賓], and in the Banquet there is additionally a 2nd Guest [*jie* 介]. Other residents of the Country (or Township or Ward) attend as general guests. The Host is the governing official of the region (the Great Official of the Country 鄉大夫, the Township Chief 州長, or the Ward Chief 黨正, depending on the level of the banquet). The Principal Guest, chosen in consultation with senior and retired local officials, would be some highly respected elder resident in the region, normally a commoner without official title, and the 2nd Guest a similar man of lesser merit. 29 If there are any feudal lords or other high officials (*Dafu* 大夫) in the locality, they may optionally choose to attend as dignitaries [*zunzhe* 遵者, also called *zhuan* 隨].
Zhu Zaiyu, who lived in the Ming dynasty some 1800 years after the end of the Zhou, has adapted the celebrants of Yili to the personnel of his own time [A: Lüli jingyi: Outer Bk. 7 (Lüshu: Fasc. 6: 18ab); A: Lüli jingyi / FENG 1998: 1031]. He suggests thus:

- The Host (1) is simply the person who hosts the ceremony, regardless of rank, age, or virtue. This shows respect for merit and ability.
- The Principal Guest (1) should be the oldest person in the region. The elder guests (3 or any number) should be the next oldest, and they may not be younger than 60 years. This shows respect for age.
- Dignitaries (any number) should be officials in the region, of Rank 5 or above, and age over 50 years. This shows respect for rank.
- The 2nd Guest (1) should be a person of learning and virtue in the region, who may be younger than 50 years. This shows respect for virtue.
- Director of Ceremonies [Sizheng 司正] (1), Master of Music [Yuezheng 樂正] (1), goblet raisers (2), and other staff to be chosen from the students. If the chief of staff is the Host, then his deputy will be the Director of Ceremonies.
- Musicians (4), sheng 笙 (4). Bells, stone chimes, drums, bofu 搏拊 (any number). In ancient times the musicians were blind men. If there are any such in the region, they should be employed, otherwise young students should be chosen and trained in preparation. If the musicians can see, then guides are not required, but the zithers se 瑟 should be carried by helpers who precede the musicians.

Yili’s description of ceremonial procedure is extremely detailed and tedious, and when reading that text, it is easy to miss the woods for the trees. In the following outline, the action of the Country Banquet and Country Archery Meet is divided into 10 segments for easier comprehension (Fig. 2: 7).

1 WELCOMING THE GUESTS (Banquet & Archery)

The ceremony takes place at the local school. The Host meets the guests at the outer gate, and leads the Principal Guest to his place mat on the upper court (Fig. 2: 3, Fig. 2: 4, Fig. 2: 5, Fig. 2: 6). The 2nd Guest (at the Banquet only) and the general guests enter and remain standing in the lower court.

2 DRINKING TOASTS (Banquet & Archery)

For the Principal Guest, the toasting is a 3-step ceremony: the Host toasts the Guest, the Guest returns the toast, and the Host toasts the Guest again, first drinking himself. Offerings of meat, sauce,
and viands are made with the toasts. The Host then invites the 2nd Guest onto the upper court (Banquet only), and his toasting is reduced to 2 steps: toast and return toast. Then the Host simply toasts the 3 elders among the general guests, who ascend to the upper court to drink their toasts, and return to their places in the lower court. Finally the Host toasts all the general guests together as a group. All this ceremony is carried out with many rising ups and sitting downs, bowings, and yieldings of precedence.

Then the 3 elder guests too ascend to take their places on the upper court. 1 member of the staff raises the goblet to the Principal Guest, marking the end of the toasts.

3 ENTRY OF DIGNITARIES (Banquet & Archery — optional)

If any dignitaries (feudal lord or other high officials (Dafu 大夫)) are attending, they are welcomed in at this point. The Host leads them to their place mats on the upper court, their mats being of triple or double thickness. They are toasted with much the same ceremony as for the Principal Guest and 2nd Guest.

4 MUSIC PROGRAM (Banquet & Archery)

The party is now entertained with music. The specific music programs are different for each ceremonial,〈Ch. 4 The Country Banquet〉, 〈Ch. 5 The Country Archery Meet〉, 〈Ch. 6 The [Great] Banquet〉, and 〈Ch. 7 The Great Archery Meet〉 (see below p. 94), but they all employ similar performing forces, although the ceremonies of higher rank and fuss (the [Great] Banquet and the Great Archery Meet) may employ more musicians and instruments. There is an ensemble for the upper court, and a different ensemble for the lower court. To keep the narrative clear, I shall describe the programs in the Banquet and the Archery Meet separately.

- COUNTRY BANQUET

The upper ensemble enters first, led by the Master of Music [Yuezheng 樂正] (Fig. 2: 3, Fig. 2: 4). He is followed by 4 musicians, who include 2 zither players (se 瑟) plus (presumably 2) singers, and the Blind Musicians [Gumeng 瞽矇] are led by Musicians’ Guides [Shiliao 眡瞭] (these are described in more detail in Ch. 6). They perform 3 songs with string accompaniment [xiange 弦歌] 35, sung to lyrics from the Shijing 《詩經》 [Classic of poetry]. After the performance, the Host offers them a toast, which is accepted by the senior musician on behalf of his colleagues. If he is a Grand Master [Dashi 大師] 36, he has the extra honour of having his goblet washed for him. All the musicians receive wine, meat and sauce (for offering), however.
Then Sheng players笙 enter, and take their places in the lower court near the stone chimes (Fig. 2: 3, Fig. 2: 4). They play 3 pieces for sheng [shengzou笙奏]. Yili lists their titles, which can be found in the Shijing, but without any text — the lyrics are lost. After the performance, the Host offers the players a toast, which is accepted by their senior member at the top of the western steps. All the sheng players receive wine, meat and sauce (for offering), however.

The musicians in the upper and lower courts now perform 3 sets of songs alternatim [jiange間歌]. In each set of 2 pieces, the upper ensemble first sings a song with string accompaniment, and then the lower ensemble plays a piece for sheng. For the grand finale, the 2 ensembles join forces to perform 3 sets of songs with concerted music [heyue合樂], ‘concerted’ simply meaning that the 2 ensembles perform together. Each set comprises 2 songs, making 6 songs in all. All the alternatim and concerted songs have lyrics drawn from the Shijing, except again that the sheng pieces have empty titles without any surviving texts.

When all this is finished, the Master of Music announces to the Guest, “The regular songs are complete正歌備”, and descends from the upper court.

COUNTRY ARCHERY MEET

The music program at the Archery Meet is an abbreviated version of that for the Banquet. The Master of Music and upper ensemble of se and singers enter as in the Banquet, followed immediately by the lower ensemble of sheng players (Fig. 2: 5). They then perform the 3 sets of songs with concerted music only (6 songs in all). When these are done, the Master of Music announces to the Guest, “The regular songs are complete”， and descends from the upper court.

The Host offers a toast to the musicians in the upper court, as at the Banquet. After this he does the same for the sheng players in the lower court.

ARCHERY ROUND 1

Now follow 3 rounds of archery (which of course take place only at the Archery Meet). The musicians on the upper court move over to one side in the lower court, to make way for the archers. The archers shoot from their marks on the upper court to a target down south in the lower court, at a distance of 300 chi尺[69.3 m]37. The marker stands near the target behind a protective screen. (Fig. 2: 5, Fig. 2: 6) This 1st round of shooting is only a demonstration round. The Director of Archery [Sishe司射] selects (from the students) 3 archer pairs [san ou三耦] to lead the shooting. The Director first personally does a demonstration shoot. Then the 3 archer pairs shoot in turn. The members of a pair stand side by side on the upper court, and shoot alternately 4 arrows each. The shots are marked, but the results are not tallied competitively.
6 ARCHERY ROUND 2

The 2nd round of shooting is competitive, and the Host, Guest, dignitaries, and other guests may all take part (if they wish). The archers form into pairs, and the 2 members of each pair compete between themselves, shooting 4 arrows each alternately. The 3 archer pairs shoot first. Then the Guest and Host shoot as a pair, followed by the low and high officials in pair(s), and then the general guests. The scorer tallies their scores, using a peculiar deer-shaped tally holder [luzhong 鹿中]. When the round of shooting is done, he reports the scores to the Guest. Then the pairs of archers file onto the upper court in order, where the loser of each pair submits to his penalty—drinking wine (note the cocktail glass at the SW side of the upper court (Fig. 2: 5)).

As a token of appreciation for their work, the Director of Arms offers a 3-fold toast to the marker at the target (with offerings made right, left, & center), and the Director of Archery toasts the scorer at his place with wine and an offering of meat, sauce, & viands.

7 ARCHERY ROUND 3

The 3rd round of shooting forms the climax of the festivities. It is competitive and similar to the 2nd round, with 1 elaboration to enhance the excitement and difficulty—the shooting is accompanied by music. The Director of Archery commands, “A shot does not score unless it matches the rhythm of the drums! 不鼓不釋”, and the Master of Music gives the order, “Play 〈Zouyu 驒虞〉, in uniform rhythm! 閒若一” 〈Zouyu〉 is a song from Shijing, and different songs are specified for different ranks of the archery meet (see below p. 94). How to fit the 4×2 = 8 shots of each pair of archers to the rhythms of the different songs, is a problem for which Zhu Zaiyu and other scholars have enjoyed exercising their creative ingenuity. When all the shooting is concluded, the pairs of archers file onto the upper court in order, and the loser of each pair drinks his penalty. Then all return to their places (as before the archery).

8 DRINKING ROUNDS (Banquet & Archery)

This segment of the proceedings is basically the same for the Banquet and the Archery Meet, but I describe them separately for clarity.

• COUNTRY BANQUET

The ceremonial assistant is appointed as Director of Ceremonies [Sizheng 司正]. The Principal Guest starts off the drinking rounds by toasting the Host with wine. He first drinks himself, then refills the goblet and passes it to the Host. The Host toasts the 2nd Guest, first drinking himself, then refills the goblet and passes it to the 2nd Guest. The guests toast each other in turn, each first drinking himself, then refilling the goblet and passing it on to the next guest, assisted by the Director of Ceremonies.
The Director of Ceremonies had already been appointed just before the archery began. For the 3 archery rounds (proceedings 5, 6, 7), he assumed the duties of Director of Arms [Sima 司馬], and now he reverts as Director of Ceremonies. The Guest starts off the drinking rounds by toasting the Host with wine. He first drinks himself, then refills the goblet and passes it to the Host. The Host toasts the dignitary high official (Dafu 夫) if he is present, or the elder of the general guests if not. He first drinks himself, then refills the goblet and passes it to the high official or elder guest. The guests toast each other in turn, each first drinking himself, then refilling the goblet and passing it on to the next guest, assisted by the Director of Ceremonies.

9 INFORMAL PARTYING (Banquet & Archery)

2 members of the staff raise 2 goblets to the Guest and 2nd Guest (high official), signalling the start of the informal partying. The stands with viands (for offering) are taken away. All remove shoes and sit freely. Food (a cooked dog) is served, and drinks are passed around without measure. The musicians play music ad libitum, without a fixed program and without any formal announcements — what Yili calls the ‘music without measure 無算樂’.

10 GUESTS LEAVE (Banquet & Archery)

When all have had their fill and are more or less drunk, the Host sees the guests out, while the musicians play the song 〈Gai [Xia] 陔[夏]〉 (see below p. 94).

NEXT DAY

There is a postlude to the festivities on the day after. The Host throws an informal reception to thank the Director of Ceremonies. If desired, country music may be performed, i.e. songs of the Shijing, taken from the 〈Airs of Southern Zhou 周南〉 and 〈Airs of Southern Zhao 召南〉 (see below p. 94).

Fig. 2: 7 TABLE  The Country Banquet and the Country Archery Meet of Yili 《儀禮》.

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<tr>
<th>The Country Banquet 鄉飲酒禮</th>
<th>The Country Archery Meet 鄉射禮</th>
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<td><strong>PREPARATIONS (before day of the banquet)</strong></td>
<td><strong>PREPARATIONS (before day of the meet)</strong></td>
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<td>Laying out the place mats and wine vessels, [suspending the musical instruments]</td>
<td>Laying out the place mats and wine vessels, suspending the musical instruments, and setting the target</td>
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<td><strong>DRINKING TOASTS</strong></td>
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<td>The Host toasts the Principal</td>
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<td>Guest with wine and an offering</td>
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<tr>
<td>of meat, sauce, &amp; viands, the</td>
<td></td>
</tr>
<tr>
<td>Guest makes an offering and</td>
<td></td>
</tr>
<tr>
<td>libation, tastes the viands,</td>
<td></td>
</tr>
<tr>
<td>and drinks.</td>
<td>2. 11</td>
</tr>
<tr>
<td>The Guest toasts the Host in</td>
<td></td>
</tr>
<tr>
<td>return.</td>
<td>2. 12</td>
</tr>
<tr>
<td>The Host toasts the Guest</td>
<td></td>
</tr>
<tr>
<td>again with wine, first</td>
<td>2. 13</td>
</tr>
<tr>
<td>drinking himself, but the</td>
<td></td>
</tr>
<tr>
<td>Guest declines to drink.</td>
<td>2. 21</td>
</tr>
<tr>
<td>The Host toasts the 2nd Guest</td>
<td></td>
</tr>
<tr>
<td>with wine and an offering of</td>
<td>2. 22</td>
</tr>
<tr>
<td>meat, sauce, &amp; viands, the</td>
<td></td>
</tr>
<tr>
<td>Guest makes an offering and</td>
<td></td>
</tr>
<tr>
<td>libation, and drinks.</td>
<td>2. 31</td>
</tr>
<tr>
<td>The Guest toasts the Host in</td>
<td></td>
</tr>
<tr>
<td>return.</td>
<td>2. 32</td>
</tr>
<tr>
<td>The Host toasts the 3 elders</td>
<td></td>
</tr>
<tr>
<td>among the general guests with</td>
<td>2. 4</td>
</tr>
<tr>
<td>wine and an offering of meat</td>
<td></td>
</tr>
<tr>
<td>&amp; sauce, they make an offering</td>
<td></td>
</tr>
<tr>
<td>and libation, and drink.</td>
<td>3 41</td>
</tr>
<tr>
<td>The Host toasts all the</td>
<td></td>
</tr>
<tr>
<td>general guests.</td>
<td>3. 1</td>
</tr>
<tr>
<td>1 man raises the goblet to the</td>
<td></td>
</tr>
<tr>
<td>Principal Guest.</td>
<td>3. 21</td>
</tr>
<tr>
<td>A feudal lord is toasted like</td>
<td></td>
</tr>
<tr>
<td>the Principal Guest.</td>
<td></td>
</tr>
<tr>
<td>A high official is toasted</td>
<td></td>
</tr>
<tr>
<td>like the 2nd Guest.</td>
<td>3. 22</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Music Program</td>
<td>Ref.</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
</tr>
<tr>
<td>The Master of Music [Yuezheng 樂正] &amp; 4 musicians (including 2 se 瑟) enter and take their places in the upper court&lt;br&gt;&lt;br&gt;3 songs with string accompaniment [xiange 弦歌]&lt;br&gt;The Host toasts the musicians with wine and an offering of meat &amp; sauce, they pour a libation, and drink&lt;br&gt;&lt;br&gt;Sheng players 笙 enter and take their places in the lower court&lt;br&gt;&lt;br&gt;3 pieces for sheng [shengzou 笙奏]&lt;br&gt;The Host toasts the sheng players with wine and an offering of meat &amp; sauce, they pour a libation, and drink&lt;br&gt;&lt;br&gt;3 sets of songs alternatim [jiange 閒歌]&lt;br&gt;&lt;br&gt;3 sets of songs with concerted music [heyue 合樂]&lt;br&gt;The regular songs are complete</td>
<td>4.22</td>
</tr>
</tbody>
</table>
| The Country Banquet 鄉飲酒禮  
*Yili* Ch. 4 | Ref. | The Country Archery Meet 鄉射禮  
*Yili* Ch. 5 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5. 5</td>
<td>The 1&lt;sup&gt;st&lt;/sup&gt; archer pair shoots, the 2 competitors shooting alternately 4 arrows each. Then the 2&lt;sup&gt;nd&lt;/sup&gt; pair shoots, then the 3&lt;sup&gt;rd&lt;/sup&gt; pair</td>
<td></td>
</tr>
<tr>
<td>5. 6</td>
<td>The arrows are gathered up and put back on the arrow stand</td>
<td></td>
</tr>
<tr>
<td>6 44</td>
<td><strong>ARCHERY ROUND 2</strong></td>
<td></td>
</tr>
<tr>
<td>6. 1</td>
<td>The Director of Archery assigns the archers into pairs: the Guest &amp; Host, the high official(s) (<em>Dafu</em> 大夫) &amp; low official(s) (<em>Shi</em> 士), and the general guests</td>
<td></td>
</tr>
<tr>
<td>6. 2</td>
<td>The 3 archer pairs collect their arrows from the arrow stand, followed by the general guests in pairs</td>
<td></td>
</tr>
<tr>
<td>6. 3</td>
<td>The scorer prepares the tallies</td>
<td></td>
</tr>
</tbody>
</table>
| 6. 41 | The 3 archer pairs shoot (the 2 competitors of each pair shooting alternately 4 arrows each)  
The scorer tallies the scores of each pair, and does the same for all the shooting in this round |  |
| 6. 42 | The Guest & Host shoot as a pair |  |
| 6. 43 | The low & high officials shoot in pair(s) |  |
| 6. 44 | The general guests shoot in pairs |  |
| 6. 51 | The arrows are gathered up and put back on the arrow stand |  |
| 6. 52 | The scorer counts the tallies, and reports the scores to the Guest |  |
| 6. 6 | The pairs of archers file onto the upper court in order, and the loser of each pair drinks wine as penalty |  |
| 6. 71 | The Director of Arms toasts the marker at the target (right, left, & center) with wine and an offering of meat, sauce, & viands, the marker makes the offerings and libations, and drinks |  |
| 6. 72 | The Director of Archery toasts the scorer at his place with wine and an offering of meat, sauce, & viands, the scorer makes an offering and libation, and drinks |  |
|-----------------------------|------|-------------------------------|------|
| 7 45 Archery Round 3         |      | 7 45 Archery Round 3          |      |
| 7.1 The 3 archer pairs collect their arrows from the arrow stand, followed by the Guest & Host, then the low & high officials, then the general guests in pairs |      | 7.1 The 3 archer pairs collect their arrows from the arrow stand, followed by the Guest & Host, then the low & high officials, then the general guests in pairs |
| 7.2 The musicians play 〈Zouyu 騶虞〉 in uniform rhythm |      | 7.2 The musicians play 〈Zouyu 騶虞〉 in uniform rhythm |
| 7.31 The 3 archer pairs shoot (the 2 competitors of each pair shooting alternately 4 arrows each), in rhythm to the music |      | 7.31 The 3 archer pairs shoot (the 2 competitors of each pair shooting alternately 4 arrows each), in rhythm to the music |
| The scorer tallies the scores of each pair: a shot does not score unless it matches the rhythm of the drums. The same is done for all the shooting in this round |      | The scorer tallies the scores of each pair: a shot does not score unless it matches the rhythm of the drums. The same is done for all the shooting in this round |
| 7.32 The Guest & Host shoot as a pair |      | 7.32 The Guest & Host shoot as a pair |
| 7.33 The low & high officials shoot in pair(s) |      | 7.33 The low & high officials shoot in pair(s) |
| 7.34 The general guests shoot in pairs |      | 7.34 The general guests shoot in pairs |
| 7.41 The arrows are gathered up and put back on the arrow stand (= 6. 51) |      | 7.41 The arrows are gathered up and put back on the arrow stand (= 6. 51) |
| 7.42 The scorer counts the tallies, and reports the scores to the Guest (= 6. 52) |      | 7.42 The scorer counts the tallies, and reports the scores to the Guest (= 6. 52) |
| 7.5 The pairs of archers file onto the upper court in order, and the loser of each pair drinks wine as penalty (= 6. 6) |      | 7.5 The pairs of archers file onto the upper court in order, and the loser of each pair drinks wine as penalty (= 6. 6) |
| 7.61 All the archer pairs collect their arrows from the arrow stand, and return them to the staff |      | 7.61 All the archer pairs collect their arrows from the arrow stand, and return them to the staff |
| 7.62 All return to their places (as before the archery) |      | 7.62 All return to their places (as before the archery) |

### Drinking Rounds

The ceremonial assistant is appointed as Director of Ceremonies [Sizheng 司正]

The Principal Guest toasts the Host with wine, first drinking himself

The Host toasts the 2nd Guest with wine, first drinking himself

The guests toast each other with wine one after another, each first drinking himself

8 46 Drinking Rounds

8.11 The Director of Arms reverts as Director of Ceremonies

8.12 The musicians resume their places in the upper court

8.2 The Guest toasts the Host with wine, first drinking himself

8.3 The Host toasts the high official with wine, first drinking himself

8.4 Same as Country Banquet
**The Country Banquet** 鄉飲酒禮

*Yili: Ch. 4*

<table>
<thead>
<tr>
<th><strong>Informal Partying</strong></th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 men raise 2 goblets to the Principal Guest &amp; 2nd Guest</td>
<td>9.47</td>
</tr>
<tr>
<td>The stands with viands (for offering) are removed</td>
<td>9.1</td>
</tr>
<tr>
<td>All remove shoes and sit</td>
<td>9.2</td>
</tr>
<tr>
<td>Food is served</td>
<td>9.3</td>
</tr>
<tr>
<td>Drinking without measure</td>
<td>9.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Music without measure</strong></th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Guests Leave</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The Host sees the guests out, accompanied by the song <em>（Gai [Xia] 陔[夏]）</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Next Day</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The Principal Guest thanks the Host</td>
</tr>
<tr>
<td>The Host thanks the Director of Ceremonies (at an informal reception). If desired, country music may be performed. The Principal Guest &amp; 2nd Guest do not attend</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>The Country Archery Meet</strong> 鄉射禮</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Yili: Ch. 5</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Informal Partying</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2 men raise 2 goblets to the Guest &amp; the high official</td>
</tr>
<tr>
<td>Same as Country Banquet</td>
</tr>
<tr>
<td>Same as Country Banquet</td>
</tr>
<tr>
<td>Drinking without measure: 2 goblets are passed from the Guest and the high official to the Host and the other guests, who drink, refill them, and pass them around in turn</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Music without measure</strong></th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Guests Leave</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Same as Country Banquet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Next Day</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The Guest thanks the Host, who however only meets him outside the gate</td>
</tr>
<tr>
<td>The Host thanks the Director of Ceremonies at an informal reception. If desired, country music may be performed. The Guest does not attend</td>
</tr>
</tbody>
</table>

---

**The music programs**

Fig. 2: 8 list the titles of all the songs specified in *Yili* for the Country Banquet and the Country Archery Meet. Due to the length of the ceremonial program, Zhu Zaiyu suggests that during musical segment 4 (Fig. 2: 7), in both the Banquet and the Archery Meet, only the 1st stanzas of each song should be performed. These will constitute the regular songs. The remaining stanzas may be performed in ceremonial segment 9 *ad libitum*, as the 'Music without measure'. He explains (on the last pages of Bk. 2, 3, and 4 in *Xiangyin Shiyue pu*《鄉飲詩樂譜》) that depending on the length of the day and the number of guests, as many or as few *ad libitum* stanzas may be sung as desired. The Books of *Xiangyin Shiyue pu* are organized to suit this purpose: Bk. 1 contains the 1st stanzas of all the songs 4. 121 – 4. 43AB in order, and Bk. 2–4 contain all the remaining stanzas of the same songs.
### Table: Music programs of the Country Banquet and the Country Archery Meet.

<table>
<thead>
<tr>
<th>Banquet</th>
<th>Archery</th>
<th>REGULAR SONGS [Stanza 1 only]</th>
<th>Fig. 7:</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. 12</td>
<td></td>
<td>♩ 3 songs with string accompaniment [xiange 弦歌]</td>
<td>6b</td>
</tr>
<tr>
<td>4. 121</td>
<td></td>
<td>〈Lu ming 鹿鳴〉</td>
<td></td>
</tr>
<tr>
<td>4. 122</td>
<td></td>
<td>〈Si mu 四牡〉</td>
<td>7b</td>
</tr>
<tr>
<td>4. 123</td>
<td></td>
<td>〈Huanghuangzhe hua 皇皇者華〉</td>
<td>8b</td>
</tr>
<tr>
<td>4. 22</td>
<td></td>
<td>♩ 3 pieces for sheng [shengzou 笙奏]</td>
<td></td>
</tr>
<tr>
<td>4. 221</td>
<td></td>
<td>〈<em>Nangai 南陔</em>〉</td>
<td>9b</td>
</tr>
<tr>
<td>4. 222</td>
<td></td>
<td>〈<em>Baihua 白華</em>〉</td>
<td>10b</td>
</tr>
<tr>
<td>4. 223</td>
<td></td>
<td>〈<em>Huashu 華黍</em>〉</td>
<td>11b</td>
</tr>
<tr>
<td>4. 3</td>
<td></td>
<td>♩ 3 sets of songs alternatim [jiange 閒歌] sing sheng</td>
<td></td>
</tr>
<tr>
<td>4. 31AB</td>
<td></td>
<td>A 〈Yu li 魚麗〉   B 〈<em>You geng 由庚</em>〉</td>
<td>12b 13b</td>
</tr>
<tr>
<td>4. 32AB</td>
<td></td>
<td>A 〈Nan you jiayu 南有嘉魚〉  B 〈<em>Chongqiu 崇丘</em>〉</td>
<td>14b 15b</td>
</tr>
<tr>
<td>4. 33AB</td>
<td></td>
<td>A 〈Nanshan you tai 南山有臺〉  B 〈<em>You yi 由儀</em>〉</td>
<td>16b 17b</td>
</tr>
<tr>
<td>4. 4</td>
<td>4. 4</td>
<td>♩ 3 sets of songs with concerted music [heyue 合樂]</td>
<td></td>
</tr>
<tr>
<td>4. 41AB</td>
<td>4. 41AB</td>
<td>A 〈Guan ju 關雎〉  B 〈Quechao 鵲巢〉</td>
<td>18b 19b</td>
</tr>
<tr>
<td>4. 42AB</td>
<td>4. 42AB</td>
<td>A 〈Ge tan 葛覃〉  B 〈Cai fan 采蘩〉</td>
<td>20b 21b</td>
</tr>
<tr>
<td>4. 43AB</td>
<td>4. 43AB</td>
<td>A 〈Juaner 卷耳〉  B 〈Cai ping 采蘋〉</td>
<td>22b 23b</td>
</tr>
</tbody>
</table>

#### ARCHERY ROUND 3

7. 2 ♩ 〈Zouyu 驚虞〉 in uniform rhythm 閒若一

#### MUSIC WITHOUT MEASURE [Stanzas ad lib]

9. 5 ♩ Remaining stanzas of the regular songs 4. 121 – 4. 43AB | 6b – 23b |

#### GUESTS LEAVE

10 ♩ 〈Gai [Xia] 陔[夏]〉

### NEXT DAY

Country music ad lib

The Host thanks the Director of Ceremonies at an informal reception

ad lib

Shijing 《詩經》: 〈Airs of Southern Zhou 周南〉 & 〈Airs of Southern Zhao 召南〉
THE CEREMONIALS IN LATER HISTORY

The Country Banquet and Archery Meet from the Zhou to Ming dynasties

In dynasties after the Zhou, the traditions of the Country Banquet and the Archery Meet were followed intermittently, with variations adapted to suit the preferences of each age. The most magnificent revival of these ceremonies was done in the Tang dynasty during the Kaiyuan reign (713–741) of Emperor Xuanzong 唐玄宗, a monarch renowned for his love of music and his beautiful Consort Yang. The Datang Kaiyuan li 《大唐開元禮》 [Ceremonials of the Kaiyuan reign of the Great Tang dynasty] [B: Datang] was promulgated in year 732. Bk. 86 describes the ceremonials for the Imperial Archery Meets (皇帝射於射宮, 皇帝觀射於射宮), and Bk. 127 describes the Country Banquet 鄉飲酒. Both ceremonies were celebrated with much music, following the model of Yili.

In the Ming dynasty of Zhu Zaiyu, the Great Archery Meet 大射禮 was officially instituted in 1370. The Country Banquet 鄉飲酒禮 was established 2 years later in 1372, and further regulations were promulgated in 1383. The ceremonials are detailed in Daming jili 《大明集禮》 [Collected ceremonials of the Great Ming dynasty]: Bk. 29 (Banquet) and Bk. 35 (Archery). Ming Emperor Taizu 明太祖 (reign Hongwu 洪武 1368–1398) was not such a great lover of music as Tang Emperor Xuanzong, and all music was omitted from the Ming ceremonies. The political function of the Country Banquet was heavily emphasized. Instead of listening to music, the banqueters now listened to a pronouncement of the laws. Zhu Zaiyu had to be careful to say that with his ceremonials and music modelled on Yili, he was not trying to change the officially-established rules; but they were only offered as a suggestion for private performance at family schools, for the edification of country elders who were enthusiasts of ancient ceremonials (like himself) [A: Lüli jingyi: Outer Bk. 6 (Lushu: Fasc. 6: 6a); A: Lüli jingyi / FENG 1998: 1013].
ZHU XI 朱熹’s 12 songs from Shijing

朱熹 (朱子) : 〈南山有台〉

(Tune transmitted by) ZHU XI: 〈Nanshan you tai〉

曲：《儀禮經傳通解》: 卷14: 〈詩樂第24〉; 詞：《儀禮》: 〈小雅: 南山有台〉

Music: Yili jingzhuan tongjie: Bk. 14: (Ch. 24 Music of Shijing); Lyrics: Shijing: (Minor odes: Nanshan you tai)

Song: 〈Nanshan you tai〉 in 5 stanzas of 6 lines each.

Fig. 2.9  ZHU XI 朱熹: 〈Nanshan you tai 南山有台〉, from Yili jingzhuan tongjie 《儀禮經傳通解》.

[B: Yili tongjie / WANG 2010: (Bk. 14) 521–522]
朱熹：〈采蘋〉
（Tune transmitted by ZHU Xi: 〈Cai ping〉）

曲：《儀禮經傳通解》卷14；詩：《詩經》；〈召南：采蘋〉
Music: Yili jingzhuan tongjie: Bk. 14; Ch. 24 Music of Shijing; Lyrics: Shijing: 〈Airs of Southern Zhao: Cai ping〉

Song. 〈Cai ping〉 in 3 stanzas of 4 lines each.
無射商。俗呼越調。Scale of shuǐ [11-B = do], mode on high shang [high re]. Popularly called the Yue mode.

Fig. 2: 10 ZHU Xi 朱熹：〈Cai ping 采蘋〉, from Yili jingzhuan tongjie 《儀禮經傳通解》.
[B: Yili tongjie / WANG 2010: (Bk. 14) 526]
NOTES

1 On the subject of Zhu Zaiyu’s dance, the reader may consult [B: WANGNN 2009: 786–812], [C: STANDAERT 2006: 106–130], and especially the excellent study by Wu Zihui [C: Wu 2008].


3 Yili, Zhouli, and Liji are 3 texts hallowed by inclusion in the canonical 13 Classics [B: Shisanjing《十三經》]. The Dadai liji《大戴禮記》 [Book of rites of DAI the Elder] [B: Dadai] is a text similar to Liji, but it has not found acceptance in the canon. Bibliographical information on all these texts can be found in their respective chapters in [C: LOEWE 1993].

- **Yili《儀禮》**  [Protocol and ceremonial] [B: Yili] is a work of 17 Chapters. Each Chapter consists of a detailed description of the rites or ceremonial proceedings for a specific ceremony (e.g. 〈Ch. 4 The Country Banquet 鄉飲酒禮第四〉).

- **Zhouli《周禮》**  [Rites of Zhou] [B: Zhouli], also called Zhouguan《周官》 [Offices of Zhou], is a unified work in 6 Chapters. It gives an idealized description of the complete governmental structure of the royal state of Zhou. Each Chapters describes 1 of the 6 administrative divisions of the state, with a list of all its officials and their job descriptions, from the Prime Minister [Dazai大宰] on down to the lowly slave who cleans the royal toilet [Lipu隸僕]. Ch. 3: 〈Grand Director of Music [Dasiyue大司樂], and the sections following, detail the jobs of the officials in music. Zhu Zaiyu’s treatise Yuexue xinshuo《樂學新說》  [A new discourse on music] [A: Yuexue] is his exegesis of these sections of Zhouli.

- **Liji《禮記》**  [Book of rites] [B: Liji] is a work of 49 disparate Chapters. They range from descriptions of ceremonial similar to Yili (e.g. Liji: 〈Ch. 40 Pitch-pot 投壺〉), to philosophical expositions of central importance in Confucian teaching (e.g. Liji: 〈Ch. 31 Doctrine of the mean 中庸〉), 〈Ch. 45 The meaning of the Country Banquet 鄉飲酒義〉, 〈Ch. 46 The meaning of the Archery Meet 射義〉, and 〈Ch. 47 The meaning of the [Great] Banquet 燕義〉 explain the import of these ceremonies in terms of Confucian social philosophy, without which their bare procedural descriptions in Yili may seem like a mass of meaninglessly fussy detail.

4 Yili jingzhuan tongjie《儀禮經傳通解》：〈Application to conduct research on the 3 ritual texts 乞修三禮劄子〉 [B: Yili tongjie / WANG 2010: 25].
A good bibliographical reference for Yili is [C: LOEWE 1993: 234–243 〈I li 儀禮〉 / by William G. BOLTZ]. This gives clear information on its textual history, origin, transmission, and editions. According to tradition, both the Duke of Zhou and Confucius have been credited with the authorship of Yili. These traditions are not to be taken at face value.

The King of Zhou [Wang 王 = Tianzi 天子] enfeoffed many feudal lords [zhuhou 諸侯] under his rule. They were ranked in 5 grades, from high to low as Duke [Gong 公], Marquis [Hou 侯], Earl [Bo 伯], Count [Zi 子], and Baron [Nan 男]. The King and his feudal lords were all served each by his own corps of officials. These were ranked in 3 grades, from high to low as Qing 卿, Dafu 大夫, and Shi 士. Each official rank was further subdivided into Upper 上, Middle 中, and Lower 下 grades (or perhaps there were fewer than 9 actual grades). In practice, the official posts were often hereditary, and some high officials were rewarded with their own land. Thus they constituted an aristocratic officer class in society, but not quite in the same class as the feudal lords.


The local territorial administration in the Zhou dynasty was organised in this way:

5 families [jia 家] formed a Neighbourhood [Bi 郡 in the environs of the central capital of the King, Lin 郡 in the outer areas] (5 families)
5 Neighbourhoods formed a Village [Lü 閭 (central), Li 里 (outer)] (25 families)
4 Villages formed a Precinct [Zu 族 (central), Zan 鄰 (outer)] (100 families)
5 Precincts formed a Ward [Dang 黨 (central), Bi 鄰 (outer)] (500 families)
5 Wards formed a Township [Zhou 州 (central), Xian 縣 (outer)] (2 500 families)
5 Townships formed a Country [Xiang (central), Sui (outer)] (12,500 families)

The state of the King of Zhou comprised 6 Xiang + 6 Sui = 12 Countries


9 The ‘Great Official of the Country [Xiang Dafu 鄉大夫]’, despite his job title, held the rank of Qing 卿 [B: LÜZL 2015: 87; C: HUCKER 1985: No. 2535].


11 Zhouli 《周禮》 and Yili 《儀禮》 differ at this point. Zhouli says here that the archery takes place on the next day after the banquet. In Yili: 〈Ch. 5 The Country Archery Meet〉, the archery and banquet all take place on the same day.


15 According to the exegesis of ZHENG Xuan 鄭玄 (127–200), this was month 12 in the royal Zhou calendar (with earth-branch number 地支 hai 玄=12), corresponding to month 10 of the Han calendar after −104, that is the month before the Winter solstice [B: Zhouli / ZHENG et al 2000: Vol. 7: 358–359]. In astronomical terms, month 1 of the royal Zhou calendar was the month in which the Winter solstice occurred (with earth-branch number zi 子=1), and month 1 of the Han calendar after −104 was the one beginning on the 2nd new moon after the Winter solstice (with earth-branch number yin 寅=3, same as the modern Chinese lunar-solar calendar) [B: WANGSH 2006: Vol. 1–2].


The statement that the archery contestants are judged on their dance is curious, because neither [B: Yili 《儀禮》: 〈Ch. 5 The Country Archery Meet 鄉射禮〉] nor [B: Yili 〈Ch. 7 The Great Archery Meet 大射〉] says anything about dance. Correspondingly, Zhu Zaiyu’s music scores for these ceremonies in Xiangyin Shiyue pu 《鄉飲詩樂譜》 do not mention the dance.


CHEN Yang 陳暘 (1064? – 1128?), in his Yueshu 《樂書》 (Treatise on music, presented at Imperial court in 1101) [B: Yueshu / Siku: Bk. 113: 2ab, 7a–8b], has drawn up 6 grandiose-looking orchestral plans, with diagrams of the upper and lower music ensembles, as well as the 4 classical Orchestral Suspensions (Yuexuan 樂縣, see Ch. 6). (CHEN’s 6 orchestral plans have been conveniently reproduced, with a sceptical note, by WANG in his 1934 monograph Zhongguo yinyue shi 《中國音樂史》 [History of Chinese music] [B: WANGGQ R2009: 422–426].) Although CHEN meant his plans to be an interpretation of Yili 《儀禮》 and Zhouli 《周禮》, his orchestras are not a realistic representation of the orchestras of Zhou times, and his diagrams are ridiculed by Zhu Zaiyu in [A: Yuexue: 33a]. Indeed, CHEN’s plans look more like the court orchestras of the Song dynasty (960–1279). YANG, in his music history of 1981 (Zhongguo gudai yinyueshi gao 《中国古代音乐史稿》 [A draft history of ancient Chinese music] [B: YANGYL R2009d: Vol. 2: 382–384]), has drawn up 2 plans of the Song palace orchestras, according to a court decree of 1113. One is for the music on the upper court [Dengge 登歌], and the other is for the palace orchestra outdoors in the lower court [Gongjia 宫架]. They look remarkably like the plans of CHEN, but are on an even more lavish scale. For the Qing dynasty several hundred years later, paintings convey some idea of the grandeur of outdoor musical ceremonies at the court in 1689–1889, as can be seen in [B: LIUDS & YUANQY 2008: 290–301].

The monograph [B: JIANGF & AICH 2001] provides an excellent survey of all aspects of the Confucian ceremony in China, and includes coverage of both historical and modern developments. Ch. 7 describes several orchestral plans for ceremonial music from c. 600 – c. 1930, some of them intended for general use at court, and some specifically adapted for the Confucian temple at Qufu. In the pictorial appendix, diagrammatic reconstructions of historical orchestral plans are shown in Fig. 13–18. [C: LAM 1995: 34–38] briefly describes the ceremony performed at Qufu in 1990 and points out its commercialized features.
A good survey of the Confucian ceremony in Taiwan is [B: SULY [1985]]. More recent developments up to 1998 are described in [C: THRASHER 2005]. [B: DUMF 2003] is a special study on the performance space of the Confucian ceremony, with special reference to (but not limited to) the Taibei Confucian Temple. It contains very full information on the spatial dispositions of the celebrants and performers during the ceremony.

See [B: JIANGF & AiCH 2001: pictorial appendix: p. 170–171], showing a photograph of an actual performance at Qufu from 1957; and other photographs.

The number of dancers follows feudal rules. In the Zhou dynasty, the rule was that rites of the King 天子 should be celebrated with 8 rows of dancers (八羽 = 八佾, 8×8 = 64 dancers), feudal lords 諸侯 celebrated with 6 rows = 6×6 = 36 dancers, high officials (Dafu 大夫) with 4 rows = 4×4 = 16 dancers, and low officials (Shi 士) with 2 rows = 2×2 = 4 dancers. (See [B: Chunqiu Zuozhuan《春秋左傳》[Spring and Autumn annals / with commentary by Zuo: (Duke Yin 隱公: Year 5 [−718]); B: Chunqiu Zuozhuan / DU et al 2000: Vol. 16: 112–113; B: Chunqiu Zuozhuan / YU et al 2009: 43–44; C: LEGGE TR1970: Vol. 5: 18–19]. The parallel chronicles in [B: Chunqiu Gongyangzhuan《春秋公羊傳》/ XUE & ZHOU 2008: 18–20] and [B: Chunqiu Guliangzhuan《春秋穀梁傳》/ ZHOU 2000: 38–40] give the King 8 rows, Dukes 諸公 6 rows, Marquises 諸侯 4 rows. Editors also differ in their interpretations of the numbers of dancers, some saying that 8 rows = 8×8 = 64 dancers, 6 rows = 6×8 = 48 dancers, 4 rows = 4×8 = 32 dancers, 2 rows = 2×8 = 16 dancers. My 1st stated interpretation above, following Zuozhuan / DU et al, is standard.) In life, Confucius never attained a high feudal rank; but as the ages passed, his status became more and more elevated. In 1055, his descendant of the 46th generation, KONG Zongyuan 孔宗愿 (? – ?), was ennobled as Duke Yansheng 衍聖公 [B: Queli wenxian kao《闕里文獻考》[A study of documents of Queli] / by KONG Jifen 孔繼汾 (1721–1786): Bk. 7: 2b–3b, Bk. 18: 1b]. His descendants have retained this title ever since. For this reason, Confucius is celebrated with rites befitting a feudal lord or Duke, and his dancers number 6×6 = 36 .

The following fully-instrumentated compositions by Zhu Zaiyu do not emulate Yili《儀禮》. Each song is either provided with a matching dance choreography, or where no explicit choreography is provided, performance with dance is implied by analogy. (The last group of songs in Lingxing xiaowu pu are not included in the present study.)

- 〈Heyue Guan ju 合樂關雎〉, in Xuangong heyue pu《旋宮合樂譜》 [A: Xuangong: 2b–88a (music score only)].
- 〈Heyue Gugong 合樂股肱〉, in Caoman guyue pu《操縵古樂譜》 [A: Caoman: 22b–62a (music score only)].
- 〈Heyue Li wo zhengmin 合樂立我烝民〉, in Lüli jingyi 《律呂精義》 [A: Lüli jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 53b–71a) (music score) ; Outer Bk. 10 (Lüshu: Fasc. 6: 91b–107a) (dance choreography)].

- 〈Heyue Gaoyang 合樂羔羊〉 and 〈Heyue Tuju 合樂兔罝〉, in Xiaowu xiangyue pu 《小舞鄉樂譜》 [A: Xiaowu: 1a–14a, 14a–27a (music score) ; Liudai xiaowu pu 《六代小舞譜》 [A: Liudai: 8b–104a (dance choreography)] and Eryi zhuizhao tu 《二佾綴兆圖》 [A: Eryi: 2b –36a (dance steps)].

- 〈Douye huang 豆葉黃〉, 〈Jinzi jing 金字經〉, 〈Gu gutong 鼓孤桐〉, and 〈Qingtian ge 青天歌〉, in Lingxing xiaowu pu 《零星小舞譜》 [A: Lingxing: 8a–12a, 153b–155b, 196b–198b (music scores); 12b–145b, 146a–153a, 157a–196a (dance choreographies)].

28 Pangong liyue shu 《頖宮禮樂疏》 is intended for the curriculum in local schools only in a feudal sense, and not to mean that its discussion is elementary. The principal topics are the rites and music in the worship ceremony for Confucius, plus the Country Banquet and Country Archery Meet [B: Pangong / FENG F1970: 〈Foreword 凡例〉 65–72]. These are rites appropriate for commoners to take part in, and therefore they may be taught in local schools. Excluded from discussion are the rites appropriate only for the Emperor or the high nobility, like the worship of Heaven and Earth, or the Great Banquet 燕禮 and Great Archery Meet 大射 of Yili. It would be a presumptuous usurpation of privilege for commoners to discuss these things, and they may not be taught in local schools.

29 [B: Yili tongjie / WANG 2010: (Bk. 7) 263–264; B: Pangong / FENG F1970: (Bk. 9) 973–975].

30 Throughout almost the entire history of Imperial China (220–1911), Imperial officials were ranked in 9 Ranks [jiu pin 九品], with further sub-grades in each Rank. In the Ming dynasty (1368–1644), each Rank was sub-graded into Principal [Zheng 正] and Subordinate [Cong 從] grades. From highest to lowest, these Ranks are usually denoted as 1a, 1b, ⋯ 9a, 9b. (See [B: LÜZL 2015: 13, 984; C: HUCKER 1985: p. 4–5, No. 1315].) Rank 5 is a mid-level rank, and an example is the Administrator (of the Prince’s court) [(Wangfu) Zhangshi (王府)長史], who is the chief executive officer at the Prince’s court, of Rank 5a (see Ch. 1).

31 The Director of Ceremonies [Sizheng 司正] does exactly what his job title implies [B: LÜZL 2015: 331].

32 The office or job title ‘Master of Music [Yuezheng 樂正]’ is discussed by Zhu Zaiyu in Yuexue xinshuo 《樂學新說》 [A: Yuexue: 24b]. The title Yuezheng is used in Yili 《儀禮》, and the office of Yueshi 樂師 is described in Zhouli 《周禮》 (see Ch. 6). Zhu Zaiyu believes that they refer to the same official. In the context described here, his job is obviously analogous to that of a modern conductor.

33 According to Yili: 〈Ch. 5 The Country Archery Meet〉, the instrumental ensemble in the lower court comprised 3 big + 1 small sheng = 4 sheng, plus percussion instruments. In his musical settings in
Xiangyin Shiyue pu 《鄉飲詩樂譜》, Zhu Zaiyu replaced the 4 sheng by his own orchestration of 3 sheng + 1 chongdu 春牘, doubling as singer (please see the full discussion with references in Ch. 6). But in this remark, he is simply following the orthodox description of Yili with 4 sheng.

34 The Blind Musicians are called Gumeng 盲矇, and they are led by Musicians’ Guides called Shiliao 聽瞭. These are official posts described in Zhouli 《周禮》 (see Ch. 6).

35 The terms ‘song with string accompaniment [xiange 弦歌]’ and ‘piece for sheng [shengzou 報奏]’ are used by Zhu Zaiyu, but they do not actually appear in Yili. The terms ‘songs alternatim [jiange 間歌]’ and ‘concerted music [heyue 合樂]’ are used both in Yili and by Zhu Zaiyu.

36 Grand Master [Dashi 大師] This official, described in Zhouli 《周禮》, is the leader of the corps of Blind Musicians [Gumeng 盲矇], and we may expect, is himself blind [B: Zhouli 《周禮》: 〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯〉; B: Zhouli / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36979; C: Zhouli T1851: Tome 2: 49–52]. In addition to leading the Blind Musicians, one of his chief duties appears to be to ensure that the musical instruments are kept in tune, as we infer from the 1st part of his job description in Zhouli, “The Grand Master is in charge of the 6 yang and 6 yin pitch-pipes, whose notes match the tones of yin and yang 大師掌六律六同以合陰陽之聲.” Zhu Zaiyu has written an exegesis on this passage, in the treatise Yuexue xinshuo 《樂學新說》 [A new discourse on music] [A: Yuexue: 35b–37b].

37 The shooting range is 50 bow lengths [gong 弓], and 1 bow length = 6 chi 尺 [B: Yili 《儀禮》: 〈Ch. 5 The Country Banquet 鄉飲酒禮〉; B: Yili / ctext 2006–: http://ctext.org/yili/xiang-yin-jiu-li/zh#n54643, http://ctext.org/yili/xiang-shi-li/zh#n54670; B: Yili / GU 2002: 154, 157; C: Yili TR1966: Vol. 1: 52–53, 75–76; A: Lüli jingyi 《律呂精義》: Outer Bk. 6 (Lüshu: Fasc. 6: 6b–7a); A: Lüli jingyi / FENG 1998: 1014–1015]. From reasonably reliable archaeological evidence, we know that during the Zhou dynasty, 1 chi (Zhou) = 231 mm [B: QIUGM et al 2001: 156]. Thus the range is 50 × 6 chi = 300 chi = 69.3 m.


40 2 DRINKING TOASTS [B: Yili 《儀禮》: 〈Ch. 4 The Country Banquet 鄉飲酒禮〉, 〈Ch. 5 The Country Archery Meet 鄉射禮〉; B: Yili / ctext 2006–: http://ctext.org/yili/xiang-yin-jiu-li/zh#n54646,

Chapter 3

The notation of Zhu Zaiyu’s music

The long history of China and its many regional musics have produced a great variety of music notations, and it would vastly exceed the scope of this study to provide a general introduction to the subject. For such an introduction written in English, the reader may consult [C: KAUFMANN 1967]. For a clear introduction in Chinese, [B: YANGYL 2009b] may be recommended. This chapter limits itself to explaining only the notation used by Zhu Zaiyu. The special topic of qin tablature is discussed on p. 117, and Zhu Zaiyu’s concept of caoman 操繘, which are rhythmic figurations using the zithers qin 琴 and/or se 瑟, makes up the central part of this chapter. In Zhu Zaiyu’s time, there were no standardized formats for Chinese music scores, and the last part of this chapter provides a survey of examples from Zhu Zaiyu’s various score layouts.

FORMS OF NOTATION

Zhu Zaiyu’s music notation is relatively simple and explicit, and presents few problems of interpretation. 4 main types of notation are employed: lülü notation 律呂譜, gongshang notation 宫商譜, gongche notation 工尺譜, and qin tablature 琴譜. Many scores utilize a combination of these notations together. This greatly aids in their interpretation, for ambiguities in one notation system can be clarified by a parallel indication in another notation system.

The greater part of Zhu Zaiyu’s scores are written in the lülü notation 律呂譜. This shows the pitch of each note explicitly by the name of its fundamental pitch (huangzhong 黃鍾 [1-C], dalü 大呂 [2-♯C], etc), abbreviated to their initial characters (黃 [1-C], 大 [2-♯C], etc). Fig. 3: 1 illustrates the 12 pitch names, lined up in a column from high to low in the high, middle, and low octave registers (octave registers are more fully discussed in Ch. 4). Note that the same names are used irrespective of octave register, and at times this may give rise to confusion. In a few instances however, Zhu Zaiyu explicitly indicates the octave register, as in Fig. 3: 2. The note names do not indicate any rhythm, but in practice this poses no problems. The rhythms can in most cases be inferred from accompanying caoman zither figurations, or other ostinato figures in the percussion accompaniment, or from a parallel score, perhaps located in a different book or treatise.
Fig. 3: 1 Musical pitches in the lülü notation.
[A: Lülü jingyi: Outer Bk. 2 (Lüshu: Fasc. 5: 34b) (A: Zhu / Li F2013: 1234)]
Fig. 3: 2  Vocal score in lüli notation.

[A: Lüli jingyi: Outer Bk. 3 (Liushu: Fasc. 5: 49b–50a) (A: Zhu / Li F2013: 1264–1265); identically in A: Yuexue: 18b–19a]. See also Fig. 3: 5a.

Pitches in the upper octave are noted as 半 [half], pitches in the lower octave are noted as 倍 [double]. The tune is “Taihe 太和” “慶源發祥 We celebrate our ancestral origins, which project their auspicious benevolence” by LENG Qian 冷謙 (c. 1310 – 1371), used in the worship ceremony for the Ming Imperial ancestors. The original tune can be found in Daming jili 《大明集禮》 [B: Daming jili / Siku F2008: Bk. 52: 11ab], which gives the tune in lüli notation, but does not indicate changes in octave registers; and Taichang xukao 《太常續考》 [B: Taichang / Siku F2008: Bk. 2: 38b], which gives the tune in gongche notation. For transcriptions and studies, see [C: COURANT 1914: 114–115; C: LAM 1998: 147; B: WANGH] 2008a].
Gongshang notation indicates the pitch of a note by its scale degree: gong 宮, shang 商…..

Fig. 3: Gongshang note names for the 7-tone ancient (proper) scale.

The 5 proper tones 五正聲 (1-2-3-5-6) are written as white notes.

The black notes #4 and 6 are auxiliary.

Fig. 3: 3 shows the scale degree names for the 7-tone scale used by Zhu Zaiyu. In modern Chinese musical parlance, this scale is called the ‘ancient scale [gu yinjie 古音階], the ‘court ceremonial scale [yayue yinjie 雅樂音階], or the ‘proper scale [zhengsheng yinjie 正聲音階]. It is constructed from the first 7 pitches generated from do by the method of subtraction and addition by ⅓ [sanfen sunyi 三分損益], equivalent to the Pythagorean circle of 5ths. The scalar intervals are the same as the Lydian mode of Glarean in Western music (but without any implication of division into species of 5ths and 4ths). The scale degrees gong 宮 = 1, shang 商 = 2, jue 角 = 3, zhi 徵 = 5, and yu 羽 = 6 form a pentatonic structural framework (5-tone gamut) within the 7-tone scale, called the 5 proper tones 五正聲. A piece of music may begin and end on any of the 5 proper tones, producing 5 different modes for the scale; while the tones zhong 中 = #4 and he 和 = 6 are auxiliary, and never serve as opening or closing tones. The whole scale is transposable, so that the tonic note gong 宮 is not fixed in pitch, but may fall on any of the 12 fundamental lülü pitches.

The term ‘gamut [yun 均]’ is often encountered in discussions of scales and modes, but its meaning is not always clear. Following HUANG Xiangpeng 黃翔鵬, I use this term to refer to the set of tones within a scale [yinjie 音階], but without specifying any particular tone as its gong 宮 = 1. In other words, a scale is a gamut with a specific tonic gong. Zhu Zaiyu mentions the term frequently in his writings, and his meaning is consistent with this usage. But in his ceremonial music considered in the present study, he employs only the 5-tone gamut and scale, or the 7-tone gamut with the single ancient (proper) scale. In this simple situation, gamut and scale reduce to the same thing. The common term ‘diao 調’ may also give rise to confusion, as it is used with several different meanings. For Zhu Zaiyu, it refers to a qin tuning (see Ch. 5), or to a scalar mode defined by the final tone. Thus a piece in gong diao 宮調 ends on scale degree 1, shang diao 商調 ends on scale degree 2, and similarly for jue diao 角調 (3), zhi diao 徵調 (5), and yu diao 羽調 (6).
For the last 1000 years, until about the mid-20th century, *gongche* notation  was the most commonly-used form of notation in traditional Chinese music. Nowadays it has been superseded by numerical notation [jianpu 简谱]. It was generally used in popular music, and its long history and widespread use has spawned many varieties of the same basic system. It employs a set of 9 or 10 basic symbols (stylized syllables) to represent pitches, with a set of auxiliary symbols (dots and circles etc) called *banyan* 板眼 to represent rhythmic beats. In the music of Zhu Zaiyu, the most prominent application of this notation appears in his arrangements of 4 popular songs in *Lingxing xiaowu pu* 《零星小舞譜》 [Choreography for the minor dances at the Lingxing Temple]. (Due to limitations of time, these songs have been excluded from the present study.) In his other scores which utilize *gongche* notation, the notation is extremely simple, and rhythmic symbols *banyan* are not employed, or are practically superfluous. To understand Zhu Zaiyu’s *gongche* notation, all we need is a concordance chart between the *gongche* syllables and another system of pitch notation. Zhu Zaiyu has kindly provided this in Fig. 3: 4. The 12 fundamental pitches are written on the fixed middle ring, and the *gongche* syllables are arrayed around them on the outer ring. The 7 *gongshang* scale degrees printed in the inner circle may be rotated, so that the tonic *gong* 宮 can be brought to face any of the 12 pitches. In most *gongche* notation systems of more recent practice (the last few hundred years), the *gongche* syllables denote transposable scale degrees (*gongche* syllable *shang* 上 ≡ *gong* 宮 = ¹), but it is important to understand that Zhu Zaiyu followed a more ancient practice, in which each *gongche* syllable is fixedly matched to a fundamental pitch, and they are *not* transposable. Thus the *gongche* syllable *he* 合 = *huangzhong* 黃鍾 [¹-C], *shang* 上 = *zhonglü* 仲呂 [6-#E ⇆ F], etc, always; but these pitch assignments say nothing about the scale, i.e. which pitch corresponds to the scalar tonic *gong* 宮 = ¹. This is conclusively demonstrated in Fig. 3: 5ab, which shows a vocal score with *lüli*, *gongshang*, and *gongche* notations in parallel. We see 2 songs written in 2 different tonics, with ¹ = C and ¹ = F respectively, but the *gongche* syllables do not shift between C and F.
Fig. 3:4  Correspondence between gongche syllables and the 12 fundamental pitches.
[A: Lüli rongtong: Bk. 3 (Lishu: Fasc. 2: 74a) (A: Zhu / Li F2013: 4267)].

The 12 fundamental pitches are written on the fixed middle ring, and the gongche syllables are arrayed around them on the outer ring. The 7 gongshang scale degrees printed in the inner circle may be rotated, so that the tonic gong 宮 = 1 can be brought to face any of the 12 pitches.
Fig. 3: 5a  Vocal score with parallel notations in lülü pitch names, gongshang scales degrees, and gong-che syllables.

[A: Lülü jingyi: Outer Bk. 2 (Lüshu: Fasc. 5: 27ab) (A: Zhu / Li F2013: 1219–1220)]

This tune is the same as 〈Taihe 太和〉 in Fig. 3: 2. It is written in the 5-tone huangzhong scale (1 = C), with modal initial and final gong 宮 = 1 = C.
This tune is “大哉宣聖” 大哉宣聖 O great is the sage [Confucius]” by ZHAN Tong 詹同 (fl. 1373) & YUE Shaofeng 楊韶鳳 (? – 1380), used in the worship ceremony for Confucius during the Ming dynasty. The original tune can be found in Taichang xukao 《太常續考》 [B: Taichang / Siku F2008: Bk. 5: 33ab], which gives the tune in gongche notation. There exist many transcriptions and studies [C: COURANT 1914: 103; C: LAM 1998: 114; B: JIANGF & AIJCH 2001: 391; etc]. The tune is written in the 5-tone zhonglü scale (^1 = F), with modal initial and final yu 羽 = 6 = D. See also Fig. 3: 34.
**PRINCIPLES OF TRANSCRIPTION**

Transcription pitch and sounding pitch

For the purposes of this study, it will be convenient to denote and transcribe musical pitches in 3 different ways.

- **CHINESE PITCH NAMES** These are simply transliterated according to the standard rules of *pinyin* 拼音, followed by the original Chinese term if necessary. Thus, *huangzhong* 黃鍾.

- **TRANSCRIPTION PITCH** For the purpose of discussion and score transcription, it seems preferable to translate Chinese pitch names into a Western pitch which has a similar affect, rather than trying to match its actual pitch in sound. The pitch *huangzhong* is the starting point of all discussions in Chinese music, and it is regarded as the lord and king of all musical pitches. Its obvious counterpart is the pitch C, which may be written as 1-C to show that it is the 1st of 12 pitches. The same applies to a score transcription. A composition written in the ancient (proper) scale with tonic [gong 宫] = *huangzhong* looks fine enough when transcribed into C-Lydian with 1 sharp in the key signature, but would feel very strange if it appeared with a key signature of 5 sharps! Aside from such affective preferences, a more substantive consideration is that the actual sounding pitch of *huangzhong* cannot be presumed ahead of a careful investigation (as done in Ch. 4), and any match of a Chinese pitch to a letter-name pitch can only be an approximation. Assuming a hypothetical transcription pitch, independent of the actual sounding pitch, neatly separates the problem of transcription (involving questions of notation and instrumentation), from the problem of determining the absolute pitch of *huangzhong* (which involves quite different issues.

Fig. 3: 6  Transcription pitch for the 12 fundamental pitches.
of measurement and physical acoustics). I have therefore adopted the system of transcription pitch as shown in Fig. 3: 6. Octave registers above or below are indicated by lines above or below the pitch letter name, thus:

\[
\text{huangzhong} [1-C]
\]

\[
\frac{1}{2}\text{huangzhong} [1-\overline{C}] \text{ (octave above), } \frac{1}{4}\text{huangzhong} [1-\overline{C}] \text{ (2 octaves above)}
\]

\[
2 \times \text{huangzhong} [1-C] \text{ (octave below), } 4 \times \text{huangzhong} [1-\overline{C}] \text{ (2 octaves below)}
\]

(NB Every score transcription is preceded by an incipit which gives the reader a visual reminder of the transcription pitch of huangzhong.)

- **Sounding Pitch** When it is necessary to indicate the actual sounding pitch, I adopt an acoustical pitch notation. Middle C is written as C4, and A440 is A4. Octaves above are C5, C6, …, and octaves below are C3, C2, etc. Where necessary, cents (¢) provide additional precision. As shown in Ch. 4, the actual sounding pitch of Zhu Zaiyu’s huangzhong is

\[
\text{Huangzhong} [1-C] = E5 - (23.5 \pm 5.5) \text{¢} = 650.4 \pm 2.1 \text{Hz}
\]

Since Huangzhong [1-C] is transcribed as C5, but sounds about \(\frac{1}{4}\) pitch below E5, when reading the score transcriptions, it is well to keep in mind that they are really transposing scores, and every pitch sounds approximately 4 pitches (a major 3rd) higher than written.

**Qin tablature** 琴譜

Qin tablature is a special study unto itself. Fortunately, Zhu Zaiyu’s qin scores and tablatures are comparatively simple. To understand them, YUNG’s edition of 6 selected qin pieces from *Shenqi mipu* 《神奇秘譜》 [Wondrous and secret tablature] / by ZHU Quan 朱權 (1378–1448), provides an introduction in English more than adequate for our purposes. 10 For further reference, the interested reader may consult the translation and transcription of the *Mei’an qinpu* 《梅庵琴譜》 [Qin tablature of Plum Blossom Studio] of WANG Binlu 王賓魯 (1867–1921) / by LIEBERMAN 11, and most Chinese qin tablatures include a chapter explaining its fingering symbols.

As YUNG points out in his Preface, transcribing a qin tablature is not a simple mechanical procedure, but much more an act of musical re-composition [dapu 打譜]. On the one hand, a score transcription in any definite rhythm is too explicit, and freezes out the rhythmic freedom inherent in the original qin tablature. On the other hand, there are many finger techniques in playing the qin, which contribute essential effects to the resulting sound, so that a score transcription which merely indicates the pitches, without showing any finger techniques, would be missing out a large part of the musical
information. Back in 1931, WANG Guangqi 王光祈 had pioneered a system of transcribing qin tablature into Western staff notation, with additional symbols to indicate the finger technique, but his system has not found general acceptance. In 1948, YANG Yinliu 杨荫浏 sketched an outline for transcribing qin tablature on to a staff of 7 lines, but the political turmoil of the time prevented him from carrying out his plan with transcriptions of actual pieces. More recently in 2002, GONG Yi 龚一 published new transcriptions of qin tablature, with new symbols to give a simplified indication of the finger technique (see Fig. 3: 24 ▼). But already in 1956, YANG had abandoned his attempt to represent the qin finger techniques by newly-devised symbols, when in the Guqin qu huibian《古琴曲汇编》[Anthology of music for qin] 15, he and co-editor HOU Zuowu 侯作吾 adopted the simple solution of providing both a transcription into Western staff notation, and underlaying it with the original qin tablature. This method was followed by the widely circulated Guqin quji《古琴曲集》[Anthology of music for qin] in 1962 and 1983 16, and it may be regarded today as the standard practice. For a musician who already understands qin tablature, no doubt this is still the best way to convey its musical sound with the full richness of the original notation (short of a recorded performance). Yet the qin tablatures of Zhu Zaiyu are quite simple, rhythmically plain and employing only a very limited repertoire of finger techniques. A transcription of the qin tablature into a score in staff notation, together with a parallel transcription into a lute-style tablature, can make the original tablature accessible to a musician not versed in qin notation, at the same time without restricting or detracting from its musical content. My tablature transcription along these lines can be demonstrated by the opening page of the full-score version of the song 〈Guan ju 關雎〉in Xuangong heyue pu《旋宮合樂譜》[Concerted music / transposable through all 12 pitches] (Fig. 3: 7a, c).
Fig. 3: 7a  〈Guan ju 關雎〉.  Full score.

〈Heyue Guan ju 合樂關雎  [Guan ju with concerted music]〉
[A: Xuangong: 4ab (Exemplar at Princeton University Gest Library TA141/2377 v.12)]
Fig. 3: 7b 〈Guan ju 關雎〉. Short score.

[A: Lüli jingyi: Inner Bk. 7: (Lüshu: Fasc. 3: 22b) (A: Zhu / Li F2013: 770)]
The Master of Music first announces (Heyue Guan ju), and the banner holder repeats (Heyue Guan ju). After the announcement he raises the banner, and then strikes the zhu.

1. m. Bofu: Fu 拜 is a light stroke with the left hand, bo 拜 is a heavy stroke with the right hand.
2. m. 1 Bofu & Chongfu: The rhythm must be even. As the ancients say, "The rhythmic intervals must be uniform 閒若一".
3. m. 5 Wind instruments: The instruments yu 子, sheng 管, xun 鳳, yue 矯, xiao 笛, chi 鼙, di 禾, and guan 管 all play guxian 始在 [5-E] in unison.
4. m. 5 Chorus: Skilled singers sing a long note on the word guan 間, student singers continue with the syllable guan in accord. Similarly with the other words of the song. 2011-8-24, rev. 2012-3-30 胡成筠
Fig. 3: 7c 〈Guan ju 關雎〉.  Transcription of full score (Fig. 3: 7a).
The *qin* tablature in the full score (**Fig. 3: 7a**) is transcribed onto 2 staffs (the bottom 2 staffs in **Fig. 3: 7c**). The top staff is a normal 5-line staff, onto which is transcribed the notated pitches and their rhythm. It requires no comment. The bottom staff is the new lute-style tablature, to show the finger technique. It has 7 lines, representing the 7 strings of the *qin*. The tuning of the open strings is indicated at the beginning of the staff, and it will be noticed that the lowest-pitched string is represented by the top line, while the highest-pitched string is at the bottom, just as they would appear to the player sitting before its 18 *qin*. The player stops the strings with its left hand at various marker positions on the sounding board (or leaves the strings open), while its right hand plucks the strings. The numbers on the staff lines show which string is plucked at which marker (numbered 1 to 13); 0 means the open string is plucked. Below the staff, the numbers 1 to 5 indicate which left-hand finger is used to stop the string; it can be seen that open strings have no LH finger on them. Above the staff, the numbers 1 to 5 indicate which right-hand finger is used to pluck the string. Above each RH finger stands an up-string or down-string symbol. The up-string symbol ⾳ means that the RH plucks the string outwards away from the player, while the down-string symbol ⃞ means that the RH plucks the string in towards the player. If the RH plucks 2 strings at the same time, 2 finger numbers and 2 ⾳ or ⃞ symbols will be shown. These comprise all the finger techniques, and the complete tablature notation.

**The caoman 操縵 ZITHER FIGURATIONS**

The *qin* music of **Fig. 3: 7** is an example of Zhu Zaiyu’s *caoman*. *Caoman* is a distinctive feature of Zhu Zaiyu’s music, and it occurs ubiquitously through much of it. It is always played by the zithers *qin* 琴 and/or *se* 瑟, and consists of broken chord figurations which often look like Alberti bass. Indeed, *caoman* and Alberti bass serve somewhat similar musical functions — they provide rhythmic and harmonic accompaniments to the main melody. Of course, Zhu Zaiyu’s harmony is not tonal nor triadic harmony in any sense (see p. 133ff), and *caoman* is really best regarded as a heterophonic instrumental embellishment of the main melody itself. In Zhu Zaiyu’s ceremonial music, the main melody consists of long-sustained notes sung and played in unison (with octave doublings) by voices and wind instruments, while the *caoman* figurations support it by repeatedly sounding the melodic note on each beat. Let us look at some examples of *caoman*, in order to better understand its function and meaning.

*Caoman* figurations for the *qin* 琴 and *se* 瑟

There are extensive pages of *caoman* music in *Lüli jingyi* 《律呂精義》 [Precise principles of the musical pitches]. Inner Bk. 6: (Lüshu: Fasc. 2: 14a–85b) is an exhaustive tabulation of a single *caoman*
pattern for the qin, realized in all 60 modes and transpositions of the 5-tone gamut (5 modes × 12 transpositions = 60), as applied in the song 〈Nanfeng ge 南風歌〉. Inner Bk. 7: (Lüshu: Fasc. 3: 22b–103a) are short scores of the song 〈Guan ju 關雎〉, scored with full caoman for both qin and se, realized in all 12 transpositions of its 7-tone scale. The other treatises and music scores of Zhu Zaiyu contain similar profusions of caoman. Several representative examples are transcribed in Fig. 3: 8, Fig. 3: 9, and Fig. 3: 10, and many more can be seen in the music transcriptions of Ch. 7.
Fig. 3: 8a  *Caoman* pattern for *qin* in the 7-tone gamut on *huangzhong* (for the tune 〈*Guan ju* 關雎〉).

Score.

[A: *Lüli jingyi*: Inner Bk. 7 (Lüshu: Fasc. 3: 8b) (A: Zhu / Li F2013: 742)]
Fig. 3: 8b  
*Caoman* pattern for *qin* in the 7-tone gamut on *huangzhong* (for the tune 〈*Guan ju* 關雎〉).

Transcription.
Fig. 3: 9a Caoman for qin in the 5-tone gamut on huangzhong, with tune 〈Nanfeng ge 南風歌〉.

Score.

[A: Lüli jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 14a–15a) (A: Zhu / Li F2013: 553–555)]
Fig. 3: 9b  *Caoman* for *qin* in the 5-tone gamut on *huangzhong*, with tune 〈*Nanfeng ge* 南風歌〉. 
Transcription.
朱厚烷, 朱載堉: 《建子月黃鍾均操缦》黃鍾之宮在第三弦

Fig. 3: 10a Selected caomun patterns for qin in the 5-tone gamut.

[Li Lili zhengzheng: Bk. 3: 2a–4a (A: Zhu / L1 F2013: 3653–3657)]
Let us first look at Fig. 3: 8. It shows the caoman pattern used in the song 〈Guan ju〉. As we can see in the full score of Fig. 3: 7a and Fig. 3: 7c, the percussion instruments beat out a regular rhythm in 4/4 meter. The caoman score of Fig. 3: 8a does not indicate any percussion instruments, but the same regular rhythm is marked by the rhythmic dots [banyan 板眼] written next to the qin tablature symbols. For each sustained melody note, the qin plays a continuous caoman figuration of 16 notes in every 4 beats, with a repeat which brings it to 8 beats in all. Zhu Zaiyu calls the 1st half-phrase of 4 beats (initiated by the bell) the ‘sound of gold’, and the 2nd half-phrase of 4 beats (initiated by the stone chime) the ‘vibrations of jade’ 金聲玉震 [A: Lüliu jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 11b–12a), Outer Bk. 8 (Lüshu: Fasc. 6: 34a); A: Lüliu jingyi / FENG 1998: 210–211, 1057]. I have however beamed the 16th notes into groups of 6+4+6, in order to bring out the phrasing of its mnemonic verse, which is only shown on the full score. This phrasing is reflected in the pattern of pitch repetitions on the qin and se. It says:

Fig. 3: 10b  Selected caoman patterns for qin in the 5-tone gamut.  
Transcription.
Zhu Zaiyu provides a mnemonic verse for every caoman pattern. The verses are taken from proverbs, quotations from the classics, and common moralistic sayings. For the patterns in Fig. 3:10, the verse is written on the score, and it clearly marks the 4/4 meter with the words

4/4 1 2 3 4

滄浪之水清兮 之水清兮 可以濯我纓兮      Gold
滄浪之水濁兮 之水濁兮 可以濯我足兮      Jade

The mnemonic verses are only meant to help the performers to remember the rhythm, and not to be sung aloud. Thus he advises his ceremonial dancers ([A: Lülü jingyi: Outer Bk. 10 (Lüshu: Fasc. 6: 90b); A: Lülü jingyi / FENG 1998: 1168]; identically in Liudai xiaowu pu《六代小舞譜》 [Choreography for the minor dances of the 6 ancient dynasties] [A: Liudai: 5b]; see Fig. 3:15 below) “Beginners learning the dance [should] recite the caoman verse orally, while stepping to the rhythm of the beats 初學舞者口念操縵腳踏板眼”.

Note that he says “recite 念”, not “sing 唱”.

In contrast to the mnemonic verse recited sotto voce, every song has a melody sung aloud by voices and accompanied by wind instruments in unison (or with octave doublings). Its lyric is usually printed in extra large type at the top of each column in the score. After remarking on the 2 half-phrases denoted as gold and jade, Zhu Zaiyu continues to quote the words of his father Zhu Houwan 朱厚烷 [A: Lülü jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 11b); A: Lülü jingyi / FENG 1998: 210]:

The 2 [half]-phrases together make 1 phrase, and it accompanies 1 single note of the song. While that 1 note is being sung, [the instruments] play these 2 [half]-phrases; and before the 2 [half]-phrases have finished playing, the 1 sung note may not end. To sustain [cao-chi] the singing, making it extremely slow [huanman] — this is the meaning of caoman.

二段為一章配歌一聲也歌彼一聲彈此二段二段未彈畢一聲不敢盡操持歌聲令極緩慢此之謂也

Why, we ask, must the melody be drawn out to such an extraordinary length? As with most things by Zhu Zaiyu, the answer lies in the Confucian classics. At the beginning of his 1584 Preface to Lüxue xinshuo《律學新說》 [A new discourse in musical metrology] (and in many other places, e.g. the
Poetry gives voice to the heart and mind, song prolongs the voice, tones follow the song, and musical pitches harmonize the tones.

The song is slow because it must prolong the voice, and the qin and se play many tones in order to follow the song. From a practical performance standpoint, caoman is used to activate the rhythm for the long notes of the music [A: Caoman: 2ab]. Without it, the singers would be at a loss how long to prolong their voices.

Now we come to consider the pitches of the caoman figures. Zhu Zaiyu describes 4 possible types of pitch and colour variation for the notes played on the qin in each caoman pattern [A: Lülü jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 13a), Outer Bk. 8 (Lüshu: Fasc. 6: 32a); A: Lülü jingyi / FENG 1998: 213, 1054]. They may be

- **Proper** [zheng 正] The melody note itself, played on the open string
- **Resounding** [ying 應] The melody note itself, played on a stopped string
- **Harmony** [he 和] A tone related by mutual generation, played on an open string
- **Together** [tong 同] 2 strings played simultaneously by the technique of cuo 撬, sounding the same note

For the ‘harmony’ note, ‘mutual generation’ refers to the process of pitch generation by the method of subtraction and addition by $\frac{2}{3}$ [sanfen sunyi 三分損益]: a tone generated by the melody note stands at an interval 8 pitches above it, and a tone which generates the melody note lies 8 pitches below. (The sanfen sunyi principle is also known as ‘mutual generation at 8-pitch intervals [geba xiangsheng 隔八相生]’. An 8-pitch interval is, of course, a perfect 5th, but I wish to avoid this culturally inappropriate concept.) As we can see from the transcribed examples (Fig. 3: 8b, Fig. 3: 9b, Fig. 3: 10b), this is loosely meant to include tones related by octave equivalence (8 pitches above = 6 pitches below, 8 pitches below = 6 pitches above). In practice, the generated tone (8 pitches above the ‘proper’ melody note) is always preferred, and the generating tone (8 pitches below) is resorted to only when the generated tone lies outside the scalar gamut. 22 The technique of cuo for the ‘together’ note means plucking 2 strings at the same time, using the thumb and middle finger of the right hand in a pinching motion. 23 The 4 terms zheng 正, ying 應, he 和, tong 同 are printed on black circles beside each note in Fig. 3: 10a, and we can easily verify their meanings from the transcription in Fig. 3: 10b.
The same concepts of zheng, ying, he, tong apply to caoman figurations played on the se, but they are modified to take into account its different instrumental technique. The se has 25 strings, it is plucked by both left and right hands, and uses only open strings. Zhu Zaiyu gives this description of zheng, ying, he, tong for the se in Lüliu jingyi [A: Lüliu jingyi: Inner Bk. 7 (Lüshu: Fasc. 3: 21b); A: Lüliu jingyi / Feng 1998: 433]:

FINGER TECHNIQUE FOR THE 4 WORDS [zheng, ying, he, tong] ON THE se 瑟譜四字指法

The 4 words zheng, ying, he, tong apply to caoman patterns with 13 notes. Only the 3 words zheng, ying, he apply to caoman patterns with 16 notes.

- **Proper [zheng 正]** The middle octave register, played by the right middle finger
  - Printed on a circle in red lettering
- **Resounding [ying 應]** The high octave register, played by the left middle finger
  - Printed on a square in red lettering
- **Harmony [he 和]** At an 8-pitch interval, played by the right thumb plucking the string in towards the player [bo 擘]
  - Printed on a square in red lettering
- **Together [tong 同]** Being focussed on one only, the 2 hands make the same sound
  - Printed on a circle in black lettering

A few minor comments may first be noted. As can be seen from the colour photographs in this chapter (see esp. Fig. 3: 11b, Fig. 3: 27) Zhu Zaiyu’s music scores are actually all printed in monochrome black, with no red lettering at all. For the ‘harmony’ note, perhaps “red” is a misprint for “black”. For the ‘together’ note, “the same sound” must be taken to mean an octave doubling, as no 2 strings of the se are tuned to the same pitch. And for the ‘proper’ note, the “middle octave register 中聲” does not mean the octave register of huangzhong [1-C], for huangzhong [1-C] sounds at about E5, and the se is a bass instrument. Instead it must mean the middle register for the se itself. (In this regard, my cautionary remarks about octave registers in Ch. 4 and 5 are relevant.) In spite of such reservations, these remarks of Zhu Zaiyu provide us with an invaluable guide. Zhu Zaiyu’s scores for se are always notated in lüliu notation, with all its usual ambiguities about octave register. Yet, careful application of the remarks given here will enable the correct pitch to be found in every case.
Fig. 3.11a (Gugong 股肱). Full score.

〈Heyue Gugong 合樂股肱 [Gugong with concerted music]〉

[A: Caomun: 228–230 (Exemplar at Princeton University, Firest Library 1A14227v.10)]
Fig. 3: 11a 〈Gugong 股肱〉. Full score.

〈Heyue Gugong 合樂股肱 [Gugong with concerted music]〉
[A: Caoman: 24ab (Exemplar at Princeton University Gest Library TA141/2377 v.10)]
Fig. 3: 11b 〈Gugong 股肱〉. Short score.

A: Caoman: 10a (Exemplar at Princeton University Gest Library TA141/2377 v.9)]
The Master of Music first announces (Heyue Gugong), and the banner holder repeats (Heyue Gugong). After the announcement he raises the banner, and then strikes the zhu.

(1) m. 1. *bǐ lì* is a light stroke with the left hand, *bǐ* is a heavy stroke with the right hand.
(2) m. 1. *bǐ fǔ & chōng fǔ*: The rhythm must be even. As the ancients say, 'The rhythmic intervals must be uniform 篡若一'.
(3) m. 5. Wind instruments: The instruments *gu*, *shēng*, *xū*, *xū wén*, *yue wén*, *xiǎo wén*, *chì*, *hú*, and *gōu* all play in unison to support the chorus.
(4) m. 5. Chorus: Skilled singers sing a long note on the word *gu* 割, student singers continue with the syllable *gu* in accord. Similarly with the other words of the song.

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Fig. 3: 11c 〈Gugong 股肱〉. Transcription of full score (Fig. 3: 11a).
As our first example of caoman on the se, we can do no better than look at the song 〈Gugong股肱〉 in Caoman guyue pu《操缦古樂譜》[Ancient music with zither figurations] (Fig. 3: 11). In the full score (Fig. 3: 11a), the music for se is printed in lülü notation on a row of black squares, beneath the qin tablature. Unusually, Zhu Zaiyu has marked the octave register of every note by the words ‘middle [zhong中]’ (for the middle register) and ‘clear [qing清]’ (for the high register). The ‘harmony’ note he和 is also marked as such. These are transcribed accordingly in Fig. 3: 11c. Under the qin tablature, the words ‘proper 正’, ‘resounding 應’, and ‘harmony 和’ mark each note, and they match respectively the ‘middle 中’, ‘clear 清’, and ‘harmony 和’ of the se exactly. The short score of the same song from the same book (Fig. 3: 11b) shows the same caoman figurations, written in tablature for qin and lülü for the se. Since there is no space to print additional indications of ‘middle’, ‘clear’, and ‘harmony’ in so many words on the short score, Zhu Zaiyu has printed the notes on black squares and circles instead. With the key to the meanings of the squares and circles provided by Lülü jingyi, we can easily verify that the short score and full score corroborate each other exactly. It is extremely instructive as well to see how the qin and se may play the same caoman figuration in different notes, to convey the same ideas of ‘proper’, ‘resounding’, and ‘harmony’, but adapted to the idiom of each instrument individually.

For our second example, let us return to the song 〈Guan ju關雎〉 in Fig. 3: 7. On the full score (Fig. 3: 7a), we note 2 differences in the caoman notation from the song 〈Gugong〉. Under the qin tablature, Zhu Zaiyu has added the mnemonic verse for this caoman pattern “滄浪之水清兮 … ” (as noted earlier). Under the se score in lülü notation, in place of the words ‘middle 中’, ‘clear 清’, and ‘harmony 和’, Zhu Zaiyu now writes ‘proper 正’, ‘resounding 應’, and ‘harmony 和’ instead. Their meanings are the same. Fig. 3: 7b shows a short score of the same music, as printed in Lülü jingyi: Inner Bk. 7. Now the identical information is conveyed by squares and circles instead. We can verify that the 2 scores again corroborate each other entirely. As the transcription shows (Fig. 3: 7c), this time the qin and se play the same notes on the first 2 words of the lyric (關雎), but begin to diverge in the next 2 words (雎鳩), due to differences in their instrumental ranges and registers. Yet they all represent the same caoman pattern.

Lest all this uniformity give a wrong impression that the caoman pattern is fixed for each song, Fig. 3: 12 shows the song 〈Guan ju關雎〉 with a different setting. This setting comes from Xiangyin Shiyue pu《鄉飲詩樂譜》[Songs of the Shijing [Classic of poetry] for performance at the Country Banquet]. The melody is the same as before, but the caoman pattern is different. Moreover, each melodic note is held for only 4 beats instead of 8, and only half of the mnemonic verse (16 notes) is used (see Ch. 6). Fig. 3: 12b is a reduced transcription of stanza 1, showing only the vocal melody and the caoman, scored for se (the complete song is transcribed in Ch. 7). The caoman figure of this setting is a favourite of Zhu Zaiyu. Its mnemonic verse strongly emphasizes the 4/4 meter. In the complete version with
2 half-phrases, it reads [A: *Lüli jingyi*: Outer Bk. 8 (*Lüshu*: Fasc. 6: 34a); A: *Lüli jingyi* / Feng 1998: 1057–1058; and many other places] :

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>非禮勿視 非禮勿聽 非禮勿言 非禮勿動</td>
<td>Gold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>傲不可長 欲不可從 志不可滿 樂不可極</td>
<td>Jade</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fig. 3: 12a 〈Guan ju 關雎〉 stanza 1 (with 非禮勿視 caoman pattern).
Score
〈Heyue Guan ju 合樂關雎 〈Guan ju with concereted music〉 〈A: Xiangyin: Bk. 1: 31b-32a (A: Zhu / Li F2013: 2010–2011)]
Fig. 3: 12a  (Guan ju 關雎) stanza 1 (with 非禮勿視 caoman pattern).

Score

Fig. 3: 12b (Guan ju 關雎) stanza 1 (with 非禮勿視 caoman pattern).
Transcription of vocal melody and caoman for se.
**Quasi-caoman in the sheng 笙**

The term *caoman* had a long history before Zhu Zaiyu and his father Houwan, and it is always associated with string instruments, specifically the zithers *qin* and *se* (see p. 159 below for a few historical remarks). In *Xiangyin Shiyue pu*《鄉飲詩樂譜》, Zhu Zaiyu composed several songs with accompaniment by 3 *sheng* 笙, in which the *qin* and *se* do not take part (see Ch. 6). The *sheng* is a wind instrument, and ill suited to playing broken chord figurations. Yet apparently Zhu Zaiyu was so enamoured of *caoman*, that he attempted to make the *sheng* play *caoman* too.

**Fig. 3: 13a** 〈*Shengzou Nangai* 笙奏南陔 [Song Nangai for sheng]〉

Score.

〈*Shengzou Nangai* 笙奏南陔〉[A: *Xiangyin*: Bk. 1: 14a (A: *Zhu / Li* F2013: 1975)]
Fig. 3: 13b 〈Shengzou Nangai [Song Nangai for sheng]〉  
Transcription.

Note: The sheng always plays one long note, which contains within it the cauman rhythm. The other notes are similar.
Fig. 3: 13c  （Shengzou Nangai 笙奏南陔 [Song Nangai for sheng]）.
Suggested realization of sheng part.
Fig. 3: 13a shows the score of the song 〈Shengzou Nangai 笙奏南陔 [Song Nangai for sheng]〉, from Xiangyin Shiyou pu. The reader will notice immediately that in place of squares and circles, the notes are printed on a continuous straight black column. Furthermore, in each column, instead of various lülü note names denoting pitches in broken chords, there is only 1 unvarying tone, repeated 16 times in each column — for the 1st lyric 南, it appears that the sheng should play lin[zhong 林 8-G] – lin – lin – … 16 times; and then on 2nd lyric 陔, gu[xian 姑 5-E] – gu – gu – … 16 times, … , and so on — strange music indeed! Next to the 16 repeated notes, we see the 16 words of the familiar mnemonic verse for caoman: 非禮勿視 非禮勿聽 非禮勿言 非禮勿動. In the 1st column under the lyric 南, in place of the mnemonic verse, stands this enigmatic rubric:

The sheng always plays one long note, which contains hidden within it the caoman rhythm.

The other notes are similar

笙總是一長聲暗藏操縵節奏餘條放此

As befits this enigmatic instruction, I have made the correspondingly enigmatic transcription of Fig. 3: 13b. It shows the sheng playing 16 repeated 16th notes in each bar, but the 16 notes are all tied together. What does this mean?

Now the sheng is a common instrument, but unusual in a special way: uniquely among (Chinese) wind instruments, it is able to play several tones in harmony at the same time. As discussed in Ch. 5, in traditional music for the sheng, it is common practice for the player to add harmony to the main melody in parallel perfect 5ths and 4ths (using ethnologically inappropriate terminology), and this is done as a matter of course without the need for any special instruction on the score. In Lülü jingyi [A: Lülü jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 34b); A: Lülü jingyi / FENG 1998: 667], Zhu Zaiyu explicitly asks for harmony in his music for the yu 竇, which is a big sheng. In the music transcriptions (which aim to be as literal as possible) I do not show the harmony notes added ad lib, but this method of performance is indicated by the word [harmony] on the parts for sheng and yu. These facts suggest a possible solution to Zhu Zaiyu’s enigmatic prescription. My suggested realization of the ‘hidden caoman’ in the song 〈Nangai〉 is shown in Fig. 3: 13c. 26

The suggested realization of the score for sheng shows the instrument playing a kind of quasi-caoman. Not only does it convey the rhythm of the caoman figuration in “one long note, which contains hidden within it the caoman rhythm”, it also conveys the sound of its harmony, according to the ideas of proper 正, resounding 應, and harmony 和 for the 16-note caoman pattern, by making use of the natural playing technique of the sheng. If we check the transcription of the complete song 〈Nangai〉 in Ch. 7, we can see that it uses only the pitches C, E, G, A, B. This is not a pentatonic scale of the
5 proper tones (1, 2, 3, 5, 6), but rather a reduced form of the 7-tone scale on huangzhong [1-C], missing the 2 pitches D and #F. As shown in Note 22, every melodic note in this song should be harmonized by the tone 8 pitches above it. In the realization of Fig. 3:13c I have faithfully followed this rule, with 1 prominent exception. The melody note G, which is the song’s modal initial and final tone, is not harmonized by D, but by C instead, that is an interval of 8 pitches below the melody. The reason for this exception is not tonal, but concerns Zhu Zaiyu’s peculiar ideas about the modes of songs of the Shijing《詩經》[Classic of poetry]. (Because of its importance for understanding major features of Zhu Zaiyu’s music, this topic deserves a separate discussion in another chapter. Due to limitations of time, I have compressed it into a small summary table at this point. Zhu Zaiyu’s full discussion is found in [A: Lüli rongtong Bk. 3 (Lishu: Fasc. 2: 75a–77b); A: Lülü jingyi: Outer Bk. 5 (Lüshu: Fasc. 5: 76a–103b); A: Lülü jingyi / FENG 1998: 958–1004].)

Fig. 3: 14 Table Modes of songs of the Shijing《詩經》, according to Zhu Zaiyu.

<table>
<thead>
<tr>
<th>Subdivision of Shijing</th>
<th>Mode</th>
<th>Initial and final tone in huangzhong scale (( \hat{1} = C ))</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airs of the states</td>
<td>Guofeng 国風</td>
<td>jue 角</td>
<td>( \hat{5} = E )</td>
</tr>
<tr>
<td>Minor odes</td>
<td>Xiaoya 小雅</td>
<td>zhi 徵</td>
<td>( \hat{5} = G )</td>
</tr>
<tr>
<td>Major odes</td>
<td>Daya 大雅</td>
<td>gong 宫</td>
<td>( \hat{1} = C )</td>
</tr>
<tr>
<td>Hymns of Zhou</td>
<td>Zhousong 周頌</td>
<td>yu 羽</td>
<td>( \hat{6} = A )</td>
</tr>
<tr>
<td>Hymns of Lu</td>
<td>Lusong 魯頌</td>
<td>yu 羽</td>
<td>( \hat{6} = A )</td>
</tr>
<tr>
<td>Hymns of Shang</td>
<td>Shangsong 商頌</td>
<td>shang 商</td>
<td>( \hat{2} = D )</td>
</tr>
</tbody>
</table>

If we examine all the music composed by Zhu Zaiyu with lyrics from the Shijing, we find that he faithfully adheres to the modal scheme shown in Fig. 3:14. This scheme has no historical basis, but Zhu Zaiyu attempts to justify it with references to the classical literature. He has the additional notion that all songs of the Shijing, except the Hymns of Shang, should avoid the scale degree shang 商 [2], that is the pitch D in the huangzhong [1-C] scale. The ancient Shang dynasty (c. –1600 – –1045) was vanquished by the Zhou in the year –1045. All the songs of the Shijing, except the Hymns of Shang, were composed during the subsequent Zhou dynasty (–1045 – –256). Zhu Zaiyu imagined that the people of Zhou would have retained a certain residual animosity against their former enemies of the Shang, and would prefer not to mention their name in their music. Therefore, they avoided the scale degree shang. Of course this was pure fantasy on his part, as we have no example of any music from the Zhou dynasty to go by (although there are many archaeological specimens of instruments, and descriptions
Nevertheless, he has scrupulously followed his own injunction in his own music, not only in the melodies, but in the accompaniments as well. (Nangai) is the title of a lost song from the Shijing, grouped with the Minor odes, for which Zhu Zaiyu composed new lyrics and music (see Ch. 6). Appropriately, it conforms to the zhi 徵 mode, begins and ends on G, and the pitch D is avoided in the melody. In harmonizing the note G with C instead of D, I have only followed Zhu Zaiyu’s modal rules, and given him a little assist with his fantasy.

Caoman and dance — The tempo of caoman

From the earliest times on, both music and dance have featured as complementary parts of Chinese ceremonial rituals. The Yuelü quanshu 《樂律全書》 [Comprehensive treatise on music and music theory] [A: Yuelü quanshu], as a treatise on the ‘Gesamtkunstwerk’, contains an integrated account of music and dance. To understand Zhu Zaiyu’s music, it is necessary to take at least a brief look at his dance, even though dance is not the theme of the present study. 28
Fig. 3: 15 The rhythm of the *chongdu* and dance steps in the choreography of the ancient personal dance.

[A: Lülü jingyi: Outer Bk. 10 (Lüshu: Fasc. 6: 90b–91a)
(Exemplar at Princeton University Gest Library TA141/2377 v.10)]

A similar diagram is found at [A: Liudai: 5b–6a].
▲ Fig. 3: 16 Feet positions for the Upwards turn: Opening posture.
[A: Eryi: 2b–3a (A: Zhu / Li F2013: 2392–2393)]

▼ Fig. 3: 17 Feather dancer.
[A: Liudai: 3a (Exemplar at Princeton University Gest Library TA141/278 v.15)]
The question I wish to address in this section is: how do the rhythms of the music and the dance correlate with each other? For this will give us a clue to the tempo of both. Zhu Zaiyu gives a clear answer, through the caoman. Fig. 3: 15 is the preliminary page of a dance choreography in Lülü jingyi. We see running across the top of the page (from right to left) the familiar caoman mnemonic verse

\[
\text{傲不可長} \quad \text{欲不可從} \quad \text{志不可滿} \quad \text{樂不可極} : 11
\]

Each half-phrase of 4 beats is repeated, making 8 beats for the entire mnemonic. At each beat, marked by the chongdu 29, Zhu Zaiyu describes 1 dance posture. There follows on the next pages of the choreography a sequence of diagrams, each diagram showing 1 dance posture for each beat. A sequence of 8 postures fills up the 8 beats of 1 phrase of the caoman pattern (Gold + Jade), and all this accompanies 1 sustained note of the vocal melody. The sequence of 8 postures is then repeated and varied 4 times, marking 4 statements of the caoman pattern and 4 notes of the melody, for a total of 8 x 4 = 32 postures and beats. The whole sequence of 32 beats and postures may then be repeated and varied any number of times.

In Eryi zhuizhao tu《二佾綴兆圖》 [Diagrams of dance steps for 2 rows of dancers] [A: Eryi], Zhu Zaiyu provides diagrams detailing the positions of the feet for the 32 dance postures. Since there are 2 rows of dancers, 2 diagrams are given for each posture, mirroring each other left and right. Fig. 3: 16 shows the feet positions of the left and right dancers in the 1st posture

To give concrete meaning to the rhythmic scheme outlined above, Fig. 3: 18 shows the feather dance with the song 〈Gaoyang 羔羊〉. The music is from Xiaowu xiangyue pu《小舞鄉樂譜》, and the dance choreography from Liudai xiaowu pu《六代小舞譜》. 30 In this song and dance, there are 3 stanzas, danced by 3 groups of dancers with 4 dancers in each group. 31 Stanza 1 is the personal dance [renwu 人舞], stanza 2 is the phoenix dance [huangwu 鳳舞], and stanza 3 is the feather dance [yuwu 羽舞]. Fig. 3: 17 shows a feather dancer, who is a young boy 13 to 20 years of age, holding a pipe in his left hand (yue 箫, see Ch. 5), and a stick with 3 pheasant feathers in his right (di 篙). His dance posture on each beat is shown in small diagrams on the music transcription (Fig. 3: 18). The music transcription shows the percussion prelude, followed by the first 4 notes of the vocal melody, sung to the lyric 羔羊之縫.

On the 1st lyric 羔 (m. 5–6), the dancer performs an Upwards turn 上轉 through 8 postures. On the 2nd lyric 羊 (m. 7–8), the dancer performs a Downwards turn 下轉 through 8 postures. On the 3rd lyric 之 (m. 9–10), the dancer performs an Outwards turn 外轉 through 8 postures.
On the 4th lyric 繡 (m. 11–12), the dancer performs an Inwards turn 内转 through 8 postures.

With all this turning upwards, downwards, outwards, and inwards, it must not be imagined that the dancer is whirling around like a dervish! Dressed in his long sleeves and flowing robe, and brandishing 3 huge feathers on a stick, that would hardly be possible. On the contrary, Zhu Zaiyu advises that the dance “should be simple and easy, slow and relaxed 宜简而易宜缓而舒” [A: Xiaowu: 29b; C: Wu 2008: 372]. I would suggest something on the order of $\downarrow = 40$ as a suitable tempo.

Now we understand what Zhu Houwan means when he says “extremely slow” [p. 132].

Fig. 3: 18 〈Heyue Gaoyang 合樂羔羊〉 transcription with feather dance.
朱载堉: 《合樂羔羊》
ZHU Zaiyu: 《Heyue Gaoyang [Concerted music for the song Gaoyang]》

[Yu and sheng play in harmony]

1. 羔
2. 羔
3. 羔

Upwards turn

[54]

Winds

Dance

[Voice]

Stone Bells

Drum

Zhu Yu

Zhuo

Zuo

Tao Sendrum

Big drum

[54]

2011-9-8, rev. 2012-6-19, 2016-5-7 胡威浩
朱載堉：《合楽羔羊》
ZHOU Zaiyu：《Heyue Gaoyang [Concerted music for the song GaoYang]》

2013-9-8, rev. 2012-6-19, 2016-5-7 胡成筠
朱載堉：〈合樂羔羊〉
ZHU Zaiyu: 〈Heyue Gaoyang [Concerted music for the song Gaoyang]〉
朱载堉:《合樂羔羊》

ZHU Zaiyu:《Heyue Gaoyang [Concerted music for the song Gaoyang]》

2011-9-8, rev. 2012-6-19, 2016-5-7 明成諷
Sources and Transmission of caoman

Sources of caoman

The term caoman was not invented by Zhu Zaiyu nor his father Houwan, but had appeared early on in classic texts like Liji [Book of rites]. Ch. 18 On education says, "If [a student] does not learn to play various tunes on the zither (caoman), he will not take delight in its strings. If he does not learn to acquire a broad knowledge of analogies and to rely on it, he will not enjoy the Shijing. 不學操縵不能安弦不學博依不能安詩 " In its general sense, as used in Liji, it means no more than playing various tunes and tuning exercises on the zither. For Zhu Houwan, this statement was a springboard from which he launched his whole treatise Xiangye yaozhi [Essentials of song with string accompaniment]. In Xiangye yaozhi Zhu Houwan expanded on the general idea, and elaborated it into his whole theory of caoman as specific rhythmic figures played on the zither. Xiangye yaozhi was never printed as an independent treatise, but Zhu Zaiyu has incorporated it into both Caoman guyue pu [Ancient music with zither figurations] and Lüli jingshi [Precise principles of the musical pitches]: Outer Bk. 8: (Lüshu: Fasc. 6: 31a–74b), in 2 somewhat different versions.

Zhu Zaiyu’s own understanding of caoman evolved with time. In his early treatise Sepu [Notes on the se](1560) [A: Sepu: Bk. 6: 5ab], he explained the term caoman simply in its general sense, as used in Liji. He had some notion of the figurations by which qin and se players tuned their instruments, but his own ideas were still loose and vague [A: Sepu: Bk. 4: 5a–6a]. Then in all his later works, written after his father Zhu Houwan’s release from prison and restoration to his fief in 1567, he adopted his father’s more specific and elaborate ideas about caoman. Zhu Houwan does not claim the idea as his own invention. He says (as quoted by Zhu Zaiyu) [A: Lüli jingshi: Inner Bk. 6: (Lüshu: Fasc. 2: 11b); A: Lüli jingyi / FENG 1998: 210] “Tuning is the first task of the qin player, and every player does it in a different rhythm. It is all passed on orally and not written down in tablature, and the common folk treat it lightly as an insignificant nothing. Yet, unbeknown to them, the two tasks of tuning and harmonizing the strings are just what the ancients called caoman. […] Qin players may not know this, and therefore I explicate and expound on it in detail, and make scores for songs with strings. 定弦乃琴家先務而其節奏人各不同率皆口傳不編入諸俗士輕易之而不以為事殊不知定和弦此二者即古所謂操縵者也 […].”

According to what Zhu Houwan says, caoman should have been a common oral tradition passed among qin players of his time. Oral traditions are difficult to document after more than 400 years, but perhaps a diligent search may yet uncover traces of it among the surviving qin literature.
Let us look at Fig. 3: 19, which shows a tuning exercise from the *qin* manual *Taiyin daquanji* 《太音大全集》 [Sounds of antiquity compendium]. The editor YUAN Junzhe 袁君哲 had lived c. 1436–1449, but the manual was printed c. 1506 – c. 1521, and a new edition was issued c. 1522 – c. 1566. Possibly, Zhu Houwan might have used it in his youth when he was learning the *qin*. Notice the melodic figures 6-2-6-6, 6-3-6-6, 2 6-2-2, 1 5-1-1, and compare with the *caoman* figures for *qin* in the song 〈Gugong 股肱〉 (Fig. 3: 11). The resemblance is striking. The similarity goes deeper, for the finger techniques are identical as well. The 4-note figures in *Taiyin daquanji* can be described precisely in Zhu Zaiyu’s (Zhu Houwan’s) terms, as ‘proper-harmony-proper-resounding 正和正應’ (p. 133). The pairs of proper and resounding notes in the tuning exercise, 6-6, 1-1, ... (i.e. 2 notes of the same pitch played first on an open string, and then on a stopped string), is sometimes called the *xianweng* sound 仙翁音. The sound continues to be utilized today, in the *qin* tuning method called the *xianweng* method 仙翁法.
Fig. 3: 19  Qin tuning exercise, from Taiyin daquanji 《太音大全集》 [Sounds of antiquity compendium].  
[B: Taiyin daquanji: Bk. 5: 24ab (B: Taiyin daquanji / F2010: Vol. 1: 100)]
Fig. 3: 20 〈Caoman yin 操縵引 [Caoman prelude]〉
from Taiyin chuanxi《太音傳習》 [Sounds of antiquity, transmitted in practice] (Author's Postface 1552).
[B: Taiyin chuanxi: 5–6 (B: Taiyin chuanxi / F2010: Vol. 4: 5)]
Fig. 3: 21 〈Caoman yin 操缦引 [Caoman prelude], from Xingzhuang taiyin buyi 《杏莊太音補遺》 [Xingzhuang’s supplement to the sounds of antiquity] (Author’s Preface 1557). [B: Xingzhuang: Bk. 1: 12.2–12.3 (B: Xingzhuang / F2010: Vol. 3: 311–312)]
While the figurations of Fig. 3: 19 are certainly suggestive, yet it does not mention the word caoman. Fig. 3: 20 and Fig. 3: 21 make this connection. The 2 qin pieces shown bear the identical title 〈Caoman yin 操縵引  [Caoman prelude]〉, and this title is cited directly by Zhu Zaiyu in Lüli jingyi [A: Lüli jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 11a)] : “〈Caoman yin〉 is the title of an ancient piece of music 操縵引者古曲名也 36. The two qin manuals were printed c. 1552 – c. 1561. At that time, Zhu Houwan was deprived of his princely title, and languishing as a commoner in the prison for royal clannsmen at Fengyang, called High Walls [Gaoqiang 高墻] (see Ch. 1). Zhu Zaiyu relates that his father consoled himself by reading and playing the qin, and his ideas about caoman were formulated during those prison years [A: Yuelü quanshu 〈Jin Lüshu zoushu 進律書奏疏  [Petition to present the Lüshu]〉 : 1a; A: Lüli jingyi / FENG 1998: 〈Jin Lüshu zoushu〉: 1]. Xingzhuang taiyin buyi 《杏莊太音補遺》 [Xingzhuang’s supplement to sounds of antiquity] (Fig. 3: 21), edited by Xiao Luan 蕭鸞 (literary name Xingzhuang Laoren 杏莊老人, 1488 – > 1561), is also listed in Zhu Zaiyu’s bibliography at the end of the Preface to Lüli jingyi, as Xiao Luan qinpu 《蕭鸞琴譜》 [XIAO Luan’s qin tablature] [A: Lüli jingyi: Preface (Lüshu: Fasc. 1: 6a); A: Lüli jingyi / FENG 1998: Preface: 10]. We can be sure that it had a formative influence on Zhu Houwan’s and Zhu Zaiyu’s thinking about caoman.

The 2 examples in Fig. 3: 20 and Fig. 3: 21 show 2 versions of a qin tuning exercise. The introductory note in Taiyin chuanxi (Fig. 3: 20) comes straight to the point: “Caoman means tuning the strings 操縵即和弦也”. Its tablature is written out in longhand words [wenzi pu 文字譜] instead of the usual abbreviated tablature [jianzi pu 減字譜], perhaps in order to feign antiquity. Xingzhuang taiyin buyi (Fig. 3: 21) has a more fanciful introductory note, which tells a story of how the author-editor Xingzhuang happened to meet a Daoist master in the mountains, whom he addresses as Xianweng 仙翁 [Transcendent (supernatural) elder]. The Daoist master played the qin superbly, and when asked about the secret of his fine skill, he uttered just 2 syllables “Caoman”. Xingzhuang then comes to understand that caoman means tuning the strings, an art which most players regard as a minor nothing, with disastrous results for their playing. The Daoist master took out from his sleeve the qin tablature 〈Caoman yin〉, which he attributed to the ancient qin master Shi Cao 師曹 (fl. ~564 – ~559).

The 2 versions of 〈Caoman yin〉 shown here both have 3 sections, with the same section titles. In section 1, only open strings [sansheng 散聲] and stopped notes [shiyin 實音, also called anyin 按音] are used, but in sections 2 and 3, harmonics [fanyin 泛音] are employed as well. (There are no harmonics in Zhu Zaiyu’s qin music.) There are some resemblances between the 2 versions, but they are not identical — and this is just what we may expect from an oral tradition. For example in section 1, Taiyin chuanxi begins with 8 notes that are not found in Xingzhuang, and then (starting from 5-2-5-5) both versions continue on in the same way, except that Xingzhuang tacks on 2 extra notes (6-2) at the end. (To compare the two versions, it is necessary to look at the tablatures with their finger techniques, not just
the pitches.) The exact form of Zhu Zaiyu’s ‘proper-harmony-proper-resounding 正和正應’ figure is found only once (5-2-5-5 at the opening of Xingzhuang), but the ‘proper-resounding’ pair of the xianweng sound is omnipresent. In sections 2 and 3, Xingzhuang is the more elaborate version. Notable in the middle part of section 3 (of Xingzhuang), is an octave-leap figure 6-2-6-6 2-5-5-5. Might these octave leaps perhaps have suggested to Zhu Houwan to use an upwards octave leap to represent the ‘proper-resounding’ pair for the se (p. 134 and Fig. 3: 12)?

The next example (Fig. 3: 22) comes from a large and popular qin manual containing 3 * 102 = 105 tunes, first printed in 1573, with a revised edition in 1585 37. It therefore belongs to Zhu Zaiyu’s generation more so than that of his father Houwan. It shows another tuning prelude in 3 sections. In contrast to the previous examples (Fig. 3: 19, Fig. 3: 20, Fig. 3: 21), the music here has a lyric. The word caoman no longer appears, but xianweng comes to the fore instead. The lyric basically repeats the words “Dedao xianweng 得道仙翁” [Transcendent (supernatural) elder who has attained the Way] and the name of the Daoist “CHEN Tuan 陳摶” (? – 989) over and over. Section 1 is titled 〈Tiaoxian runong 調絃入弄 [Introduction / Tuning the strings]〉. Almost every occurrence of the lyric “得道仙翁” or “得道陳摶” is sung to Zhu Zaiyu’s caoman figure ‘proper-harmony-proper-resounding 正和正應’ (Fig. 3: 11), and very appropriately, the lyric xianweng is always sung to the xianweng sound in the qin melody. 38 Section 2 is played in harmonics, and need not detain us. Section 3 is titled 〈Wuhui diao-nong 五徽調弄 [Play on marker no. 5]〉, and it introduces a new feature: marker no. 5, which sounds a ‘perfect 12th’ above the open string. The resulting octave figures (6-2-6-6, 5-1-3-3, 5-5, etc) recall similar octave figures in section 3 of the Xingzhuang 〈Caoman yin〉 (Fig. 3: 21), and Zhu Zaiyu’s proper-resounding 正應 octaves for se (p. 134 and Fig. 3: 12). Thus, although the tunes of Fig. 3: 19, Fig. 3: 20, Fig. 3: 21, and Fig. 3: 22 are all more or less different, their family resemblance is clear.
Fig. 3: 22a (Tiaoxian runong 調絃入弄 [Introduction / Tuning the strings]) tablature.
From Chongxiu zhengwen dui yin jieyao zhenchuan qinpu daquan 《重修正文對音捷要真傳琴譜大全》 [Compendium of authentic qin tablatures in abbreviated notation, with correct lyrics matching the notes / revised edition].
[B: Zhenchuan: Bk. 4: 4ab (B: Zhenchuan / F2010: Vol. 4: 303)]
Fig. 3: 22b 〈Tiaoxian runong 調絃入弄 [Introduction / Tuning the strings]〉.

Transcription by John THOMPSON [C:THOMPSON 2011–: Transcription of 〈Caoman Yin〉
A video recording of THOMPSON playing his reconstructed score is available on the internet
Fig. 3: 23 “Dedao xianweng 得道仙翁” mnemonic verse in Caoman guyue pu 《操缦古樂譜》.
[A: Caoman: 1a (Exemplar at Princeton University Gest Library TA141/2377 v.9)]
Let us now return to Zhu Zaiyu, and take a look at the opening page of *Caoman guyue pu* (Fig. 3: 23). This shows 2 mnemonic verses for *caoman* (more follow on the next page). The figuration pattern is not notated in score nor tablature, but indicated by the words ‘proper-harmony-proper-resounding 正和正應’, with a brief rubric to explain how the pattern may be played on the *qin* and *se*. It is the familiar pattern we have seen in Fig. 3: 11 and Fig. 3: 12. Of the 2 mnemonic verses shown, the 2nd one is 非禮勿視 非禮勿聽 非禮勿言 非禮勿動, also used in Fig. 3: 12. The 1st verse is not used by Zhu Zaiyu in any composition, and it does not even appear anywhere else in the whole *Yuelü quanshu* 《樂律全書》. Its words are (for the 1st half-phrase)

得道仙翁 自在輕閒 月朗風清 流水高山

Now, with our understanding of some *qin* lore concerning *caoman*, we recognize the phrase “Dedao xianweng 得道仙翁”, with which the verse begins, as the lyric of a *qin* tuning melody current in Zhu Zaiyu’s time, and that melody (6-3-6-6 in relative pitches, see Fig. 3: 22) is just what Zhu Zaiyu specifies as the *caoman* figure for his *qin* (Fig. 3: 11). It is the missing link which corroborates everything that Zhu Zaiyu and Zhu Houwan say about the source of their ideas on *caoman*.

When we consider that *Caoman guyue pu* was the earliest book of the *Yuelü quanshu* to be written (see Ch. 1), this singular occurrence of the apparently insignificant phrase “Dedao xianweng 得道仙翁”, placed at the very beginning of the work, takes on a symbolic significance. It connects that work to its source, and represents Zhu Houwan’s and Zaiyu’s acknowledgement of their debt to the *qin*-playing tradition and the *qin*-playing community at large. Zhu Zaiyu has often said, “When [the ancient] rules and rituals are lost, seek them among the common folk 禮失求諸野” ([A: Lülü jingyi: Outer Bk. 8 (Lü-shu: Fasc. 6: 32a); A: Lülü jingyi / FENG 1998: 1053]; and elsewhere). His *caoman* is an outcome of this sentiment.

**Later transmission of *caoman***

The tune 〈Tiaoxian runong 調絃入弄〉 of Fig. 3: 22 has been copied, varied, and transmitted in numerous later *qin* manuals, and its transmission to modern times is documented by THOMPSON 40. It is usually regarded as a tuning exercise or beginner’s study.

Modern *qin* manuals have come to call this tune by the title 〈Xianweng cao 仙翁操 [Melody of the transcendent (supernatural) elder] 〉. The title no doubt comes from its catchy lyrics, although the lyrics are not always shown with the score or tablature. Its earliest reincarnation in this guise was published in 1961 in the *qin* tutor *Guqin chujie* 《古琴初階》 [First steps at the *qin*], by SHEN 沈草农, ZHA 查阜西, & ZHANG 张子谦, and shown in Fig. 3: 24 ▲.  Fig. 3: 24 ▼ is a more recent version by GONG 龔一, re-written in staff notation and employing GONG’s new symbols for the *qin* finger techniques (see
SHEN’s school of qin playing has been continued in Hong Kong by his pupil CAI Deyun [TSAR Teh-yun] 蔡德允. The Yinyinshi qinpu《愔愔室琴譜》 [Qin tablature of the Studio of Pleasant Contentment] of CAI opens with 2 pieces bearing the same title 〈Xianweng cao〉. The 2nd tune is identical to Fig. 3: 24 (with some minor rhythmic adjustments), but the 1st tune is quite different, and only vaguely related to the 2nd. Yet it is the 1st tune which carries the xianweng lyrics, while the 2nd tune is textless. Fig. 3: 24 shows another modern edition by BO 薄克礼 & ZHANG 张子盛, with the title 〈Tiaoxian runong 調絃入弄 (Xianweng cao 仙翁操)〉. The score of BO & ZHANG is reconstructed [dapu 打譜] from several ancient tablatures, so we should probably not count it as stemming from any modern tradition of qin playing. Of particular relevance to our present discussion is the fact that in all these modern editions of the tune, a prominent place is given to the ‘xianweng theme’ 6-3-6-6. This is just Zhu Zaiyu’s caoman figure ‘proper-harmony-proper-resounding 正和正應’.
Fig. 3: 24 〈Xianweng cao 仙翁操 [Melody of the transcendent (supernatural) elder]〉.

▲ SHEN 沈草农, ZHA 查阜西, & ZHANG 张子谦. 《古琴初阶》[First steps at the qin]  [B: SHENCN et al 1961: 56]

▼ GONG Yi 龚一, ed. 《古琴演奏法》 [How to play the qin] / 2nd ed.  [B: GONGY 2002: 78]
此曲见于《和注琴谱》、《文会堂琴谱》、《双琴书屋琴谱集成》均有著录。

Fig. 3: 25 〈Tiaoxian runong 調絃入弄 (Xianweng cao 仙翁操)〉.

BO 薄克礼 & ZHANG 张子盛, ed. Zhongguo gudai qinge jinghua jiaoyi 《中国古代琴歌精华校译》
[The best ancient Chinese songs with qin / Critical transcriptions] [B: BOKL & ZHANGZS 2012: 137]
On another track, we may enquire how the concept and practice of caoman, as developed by Zhu Houwan and Zhu Zaiyu, has fared in subsequent ages. Regrettably, the answer here is far less encouraging. Zhu Zaiyu’s practice of caoman has been followed by only 1 other writer-composer, and nothing similar to it has been done in any later performances of ceremonial music that I know of (nor in any other music, unless one regards the minimalist compositions of present-day composers like Glass as an unwitting re-creation of the practice!) The Pangong liyue shu《頖宮禮樂疏》 [An itemized exposition of ritual and music in schools] of Li Zhizao 李之藻 (1565 ? 1571 – 1630) has already been mentioned in Ch. 2. It quotes extensively from the works of Zhu Zaiyu, and many music scores with caoman in the style of Zhu Zaiyu can be found in Bk. 5, 6, 7, 9, 10 of this work. Fig. 3: 26 shows a hymn to Confucius, sung to a melody well-known in the Ming dynasty and arranged with caoman accompaniment by Li. After Li, no other writer has followed up on Zhu Zaiyu’s ideas of caoman. We can expect that Zhu Zaiyu did perform his music in his own court while he was living. Li Zhizao on the other hand was a commoner, and he did not have command of the resources of a prince’s court. It is unlikely that his music was ever performed at all. The many mistakes in his score are a tell-tale indication that his music had never passed the test of real performance. After the fall of the Ming dynasty in 1644, their conquerors of the Qing dynasty (1644–1912) took a hostile view towards the music of the Ming court, and the works of Zhu Zaiyu came under especially vicious attack. His music was suppressed, and to the present it has not been revived.

Outside of the Imperial and royal courts, the performance practice that bears the closest resemblance to the ceremonial music of Zhu Zaiyu is the music used in the worship ceremony of Confucius at the Confucian temple (as noted in Ch. 2). Prompted by the example of Li Zhizao (Fig. 3: 26), one may perhaps look for traces of caoman in this ceremony. The Confucian ceremony in China and its music, both historical and modern, are described in the studies [B: JIANGF & AiCH 2001; B: YANGYL R2009] (and other references) and the Confucian ceremony in Taiwan and its music are described in [B: SULY [1985]] (and other references). For the most recent coverage, video recordings of ceremonies at the temples to Confucius in Taipei and in Qufu can be seen on the internet. And according to all accounts, even though the qin (and in most cases also the se) take part in these ceremonial performances, they do not play any caoman figurations, neither during the Qing dynasty when the ritual was widely practised, nor in any of its modern revivals.
Fig. 3: 26 〈Jinghe zhi qu 景和之曲 [Jinghe music]〉 arr. Li Zhizao 李之藻 (1565 ? 1571 – 1630).
[B: Pangong: Bk. 6: 1a (B: Pangong / FENG F1970: 657)]

The tune 〈Jinghe 景和〉 百王宗師 Teacher of a hundred kings”, by ZHAN Tong 詹同 (fl. 1373) & YUE Shaofeng 樂韶鳳 (? – 1380), is used in the worship ceremony for Confucius during the Ming dynasty. The original tune (with melody only) can be found in Taichang xukao 《太常續考》 [B: Taichang / Siku F2008: Bk. 5: 34ab], which gives the tune in gongche notation. There exist several transcriptions [C: COURANT 1914: 105; B: CHUANGPL 1963: 75; B: JIANGF & ATICH 2001: 394; etc]. Li Zhizao’s understanding of caoman is less than perfect, and his score has many mistakes. For example, he harmonizes nanlü 南 [A] with guxian 姑 [E], exceeding the gamut of the melody (5-tone scale F-G-A-C-D, ^1 = F), with the result that the open string 4 of the qin has to play guxian [E] on the lyric 王, but taicou [D] on the next lyric 宗.
Summary

*Caoman* 撥絃 originally meant playing various tunes on the zithers *qin* and *se*, which had strings made from silk (literally, *cao* 操 = to manipulate, *man* 繫 = silk). The term is hallowed in Confucian classics like *Liji*《禮記》, which exhorts student to study it. Over time, *qin* players came to apply the term to mean tuning the strings, for which they developed a rich oral tradition, in short tuning exercises with titles like *(Caoman yin)拨絃引*. Another Confucian classic, the *Shangshu*《尚書》, has a saying that the function of song is to prolong the voice. Pondering over these things while playing the *qin* to pass his time at High Walls prison, Zhu Houwan conceived the idea that song can be prolonged by making use of the tuning exercises traditionally played among *qin* players of his day. In this he was guided by his (almost certainly mistaken) belief that pieces with titles like *(Caoman yin)* were really descendants of long-lost tunes which *Liji* refers to as *caoman*. He took short melodic figures from the *qin* tuning exercises, like the ‘*xianweng* theme' (6-3-6-6), and elaborated them into regular rhythmic figurations, which can then provide a rhythmic framework for extremely prolonged tones sung by the voice. At the same time, the lyrics of the tuning exercises were converted into mnemonic verses for his *qin* and *se* figurations. He made up many more of these verses himself, appropriating phrases from common proverbs and sayings, like 非禮勿視 非禮勿聽 非禮勿言 非禮勿動. After he was restored to his fief at Henei in 1567, Houwan and Zaiyu worked all this out together, and over time, a large corpus of music was created. Zhu Zaiyu diligently recorded the scores in *Caoman guyue pu*《操絃古樂譜》, *Xuangong heyue pu*《旋宮合樂譜》, *Xiangyin Shiyue pu*《鄉飲詩樂譜》, *Xiaowu xiangyue pu*《小舞鄉樂譜》, *Lülü jingyi*《律呂精義》, and *Lüxue xinshuo*《律學新說》. He further enriched the music with the dance, also modelled on Confucian concepts. In this way the compositions of his ceremonial music came into being, with their distinctive zither figurations which he calls *caoman*.

Among *qin* players, the tradition of *caoman* as a tuning exercise has continued to the present day, though not in the form as developed by Zhu Houwan and Zaiyu. We can see a vestige of it in the *qin* tuning method called the *xianweng* method 仙翁法, and hear more of it in the *qin* melody known today as *(Xianweng cao)仙翁操*. *Caoman* in the style of Zhu Zaiyu, however, has found 1 follower only in Li Zhizao 李之藻, and thus it remains a form almost unique to the music of Zhu Zaiyu.

**SURVEY OF SCORE NOTATIONS**

It remains to exhibit samples of the types of music scores written by Zhu Zaiyu. We have already looked at several types in the preceding discussion, and only a few comments are needed.
3 pieces of music by Zhu Zaiyu are notated in full score:

- The full score version of 〈Heyue Guan ju 合樂關雎 [Concerted music for the song Guan ju]〉, which takes up the whole of Xuangong heyue pu《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches] [A: Xuangong: 2b–88a].
- The full score version of 〈Heyue Gugong 合樂股肱 [Concerted music for the song Gugong]〉, in Caoman guyue pu《操縵古樂譜》 [Ancient music with zither figurations] [A: Caoman: 22b–62a].
- 〈Heyue Li wo zhengmin 合樂立我烝民 [Concerted music for the song Li wo zhengmin]〉, in Lülü jingyi《律呂精義》 [Precise principles of the musical pitches] [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 53b–71a); A: Lülü jingyi / FENG 1998: 1094–1129].

The format of all 3 full scores is the same. We have already looked at 〈Heyue Guan ju〉 and 〈Heyue Gugong〉 in Fig. 3: 7 and Fig. 3: 11. All 3 scores begin with the same percussion prelude, which shown on the opening page of Fig. 3: 11a and Fig. 3: 11c.

In the full score format, the lyric with melody is printed in extra large type at the top of the page, and the various accompanying instruments are laid out vertically down the page. Each instrument occupies its own horizontal line, much as in a Western-style orchestral score. The music moves across the page in time, from right to left. Individual wind instruments do not have their own line, but are specified in a special note, and another note gives an essential instruction to the chorus of singers (Fig. 3: 11a):

Skilled singers sing a long note on the word gu, student singers continue with the syllable gu in accord.
The instruments yu, sheng, xun, yue, xiao, chi, di, and guan all play in unison to support the chorus.
Similarly with the other words of the song.

善歌者長聲唱股字學歌人接聲和股字
竽笙塤籥簫篪篴管諸器皆齊吹以協歌
其餘放此

It is sometimes said that lülü and gongshang notation and qin tablature are deficient, in that they do not indicate any rhythm. This is certainly not true for the music of Zhu Zaiyu. We have already seen how he and his father Zhu Houwan created caoman figurations for the qin and se, with the practical
purpose of marking out a rhythmic framework for their singers to follow. On the opening page of Fig. 3: 11a, we see an instruction to the percussion players (chongdu 春牘 and bofu 博拊) as well, which says:

The rhythm must be even. As the ancients say, “The rhythmic intervals must be uniform.”

節奏均勻古人所謂閒若一也

Zhu Zaiyu enlarges on the meaning of the note “The rhythmic intervals must be uniform” in several places [A: Caoman:20b–21a; identically in A: Lüli jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 53b); A: Lüli jingyi / FENG 1998: 1085–1086; music scores for the Archery Meet in A: Xiangyin: Bk. 5]. It refers to the Country Archery Meet and the Great Archery Meet described in Yili 《儀禮》 [Protocol and ceremonial] [B: Yili], where the archery participants are required to shoot their arrows in time to the beat of the percussion instruments (see Ch. 2). The rhythm must very steady indeed.

The short scores

In the short score format, the lyric is printed in large type at the top of each column, and the accompaniment for that lyric is written in the column beneath it, running from top to bottom (as in traditional Chinese writing). Caoman can be notated in the accompaniment column, but the compact format usually does not permit every instrument to be notated in full. It is the most common format for the music scores of Zhu Zaiyu. We have already seen examples in Fig. 3: 7b〈Heyue Guan ju〉 and Fig. 3: 11b〈Heyue Gugong〉. Fig. 3: 27 shows a similar example from Lüxue xinshuo《律學新說》, in the beautiful exemplar at Princeton University.
Fig. 3: 27 〈Si huang xianzu 思皇先祖 [In remembrance of our Imperial forefathers]〉.
[A: Lüxue: Bk. 2: 41ab (Exemplar at Princeton University Gest Library TA141/2377 v.4)]

The tune is 〈Shouhe 壽和〉 by LENG Qian 冷謙 (c. 1310 – 1371), composed in 1368 (rev. 1388) for the worship ceremony of the Ming Imperial ancestors. The original tune can be found in Taichang xukao 《太常續考》 [B: Taichang / Siku F2008: Bk. 2: 38b–39a], which gives the melody only, in gongche notation. For transcriptions and studies, see [C: AMIOT 1779: 184; C: COURANT 1914: 130–131; C: LAM 1998: 148].

The arrangement shown here, with caoman accompaniment, is by Zhu Houwan and Zhu Zaiyu. The melody is given in parallel gongche and lülü notations, with indications of octave register for the lülü. These features render this score particularly informative and valuable.
Fig. 3. 28

Xiangyin Shiyue pu 《鄉飲詩樂譜》 is Zhu Zaiyu’s reconstruction of the musical program for the Country Banquet and Country Archery Meet of the Zhou dynasty (−1045 – −256), modelled after their descriptions in the classic text Yili 《儀禮》 (see Ch. 2). Bk. 1–5 of Xiangyin Shiyue pu is written in short score format. Following Yili, Zhu Zaiyu employs 3 different instrumental ensembles for the songs in this work. We have already looked at the Concerted music in 〈Heyue Guan ju 合樂關雎 [Song Guan ju with Concerted music] (Fig. 3: 12a), and the Songs for sheng in 〈Shengzou Nangai 笙奏南陔 [Song Nangai for sheng]〉 (Fig. 3: 13a). The 3rd ensemble, Songs with string accompaniment, is shown in Fig. 3: 28 〈Xiange Lu ming 弦歌鹿鳴 [Song Lu ming with string accompaniment]〉. Notice that the Concerted music has a longish percussion prelude of 3 columns, and the Song with string accompaniment has only a short 1-column prelude, but otherwise the 2 scores look exactly alike. However, appearances can be deceptive, and one obvious clue that these scores are not meant to sound the same is their different titles, ‘Concerted music’ vs. ‘Song with string accompaniment’. To correctly interpret them, we must understand that they are short scores, and not all participating instruments are notated in full. The scores must be supplemented by other information gleaned from elsewhere in Zhu Zaiyu’s writings, in order to find their intended mode of performance. This study is done in Ch. 6.

Fig. 3: 29 shows the score of 〈Heyue Gaoyang 合樂羔羊 [Song Gaoyang with Concerted music]〉, from Xiaowu xiangyue pu 《小舞鄉樂譜》. We have already looked at its transcription, adorned with pictures of its accompanying feather dance (Fig. 3: 18). The special feature of this score is that an outline of the choreographic scheme is notated on the score. Next to each lyric (extra large type at the top of each column), there are notes specifying the personal dance 人舞, phoenix dance 凰舞, and feather dance 羽舞 for each stanza of the song, as well as the particular turn — Upwards turn, Downwards turn, Outwards turn, and Inwards turn — which is danced to that lyric.
Fig. 3.29 〈Heyue Gaoyang 合樂羔羊 [Song Gaoyang with Concerted music] 〉.

The melody scores

In the melody scores, only the lyric and its melody are shown, with no accompaniment. They are used more for purposes of theoretical discussion, than as scores for actual performance. They come in a variety of formats, but all are quite easy to understand. I shall only point out some interesting features of each type.

Fig. 3: 30 shows a very interesting graphic score from Caomin guye pu 《操缦古樂譜》. Each page shows 1 phrase of the song 〈Gugong 股肱〉. Lined up vertically at the center of the page are the 12 fundamental pitches, with huangzhong [1-C] at the bottom and [1-Č] at the top, rather like Fig. 3: 1. The 4 syllables of each phrase are drawn in circles on the right, each syllable sitting at just the level of its pitch in the central column, and the 4 syllables of the phrase are joined up with a line between each syllable. On the left the same is done, except that each lyric syllable is replaced by the its gonshang scale degree. The whole picture therefore is a graph of the shape of the phrase in its rise and fall. Each graph is dignified by a quotation from the classic Liji 《禮記》: 〈Ch. 19 On music 樂記〉, which just aptly describes the shape of that musical phrase. Thus, in the picture on the right, where the musical phrase is C-D-E-G, Liji says, 46 “angular phrases are like the square”, and Zhu Zaiyu remarks, “The square means going straight up from low to high”. The score is beautifully graphic and extravagant. A similar graphic score, with a different song, can be found at [A: Üüü jingyi: Outer Bk. 2 (Lüshu: Fasc. 5: 35b–39a); A: Üüü jingyi / FENG 1998: 887–894].
Fig. 3: 30  Graphic score of song 〈Gugong 股肱〉.
[A: Caoman: 5b–6a (Exemplar at Princeton University Gest Library TA141/2377 v.9)]
Fig. 3. 31 shows a rare instance in which Zhu Zaiyu has given 2 variant readings on the same melody. The song is 〈Tuju 兔罝〉. Fig. 3. 31a is from Xiangyin Shiyue pu《鄉飲詩樂譜》: Bk. 6, which contains a compilation of songs with lyrics from the Shijing《詩經》, all written in a plain lüli notation with huge characters. (It is the only melody score by Zhu Zaiyu that seems to be made for performance.) Fig. 3. 31b shows the same song as printed in Lüli jingyi. Phrase 1 reads E-C-♯F-E in score a vs. E-C-A-E in score b, and phrase 3 reads ♯F-E-♯F-A in score a vs. ♯F-E-C-E in score b.

Fig. 3. 31 〈Tuju 兔罝〉 variant readings.

a 〈Tuju 兔罝〉 [A: Xiangyin Bk. 6: 9b–10a) (A: Zhu / Li F2013: 2340–2341)]
Fig. 3: 31 〈Tuju 兔罝〉 variant readings.

b 〈Music for the song Tuju, in the style of the 〈Airs of Southern Zhou〉 擬周南兔罝〉
[A: Lüli jingyi: Outer Bk. 9 (Lüshu: Fasc. 6: 85a) (Exemplar at Princeton University Gest Library TA141/278 v.10)]
Fig. 3: 32 is taken from Lüli jingyi: Outer Bk. 9. This is the Book in which Zhu Zaiyu lists all the lyrics and melodies for the musical programs in Yìli《儀禮》. As such, the melodies in this Book and the melodies in Xiangyin Shiyue pu《鄉飲詩樂譜》 serve to corroborate each other. The melody is written in standard lüli characters, without distinction between octave registers.

Fig. 3: 32 〈Lu ming 鹿鳴〉 弦歌三終: 第一 3 songs with string accompaniment: No. 1.
[A: Lüli jingyi: Outer Bk. 7 (Lùshu: Fasc. 6: 20b–21a) (Exemplar at Princeton University Gest Library TA141/278 v.10)]
The simple and compact nature of a melody score is put to good use in Fig. 3:33. The song 〈Wenwang 文王〉 is written in all 12 transpositions for easy comparison. The lyrics run across the top of the page, and the melody is written under it in standard lülü notation, 1 transposition on each line.

Fig. 3:33 〈Wenwang 文王〉 in 12 transpositions.
[A: Lülü jingyi: Outer Bk. 5 (Lüshu: Fasc. 5: 84b–85a)
(Exemplar at Princeton University Gest Library TA141/278 v.9)]
The same score layout is used in Fig. 3: 34, taken from Yuexue xinshuo《樂學新說》，and this score is selected for its musical interest. Yuexue xinshuo is Zhu Zaiyu’s exegesis of several passages concerning music from the classic text Zhouli《周禮》. In this text, there is an enigmatic passage which has puzzled many commentators. Zhu Zaiyu proposes a new interpretation, and the result is Fig. 3: 34.

Zhouli divides the 12 fundamental pitches into 2 complementary sets of 6 each, according to yang and yin. It explains:
The **yang** pitches are Huangz hong 黃鍾 [1-C], dacou 太蔟 [3-D], guxian 姑洗 [5-E], ruibin 蕏賓 [7-F], yize 夷則 [9-G], wuyi 無射 [11-A].

The **yin** pitches are dalü 大呂 [2-C], yingzhong 應鍾 [12-B], nanlü 南呂 [10-A], hanzhong 函鍾 [8-G], xiaolü 小呂 [6-E], jiazhong 夾鍾 [4-D].

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**Fig. 3: 35** Matching the 6 **yang** and 6 **yin** musical pitches “六律六同以合陰陽之聲”.

According to the orthodox exegesis of **ZHENG Xuan** 鄭玄 (127–200) et al, the 6 **yang** and 6 **yin** musical pitches are ‘matched 合’ to each other according to their sequence in the above list. **Zhouli** lists the **yang** pitches in ascending sequence, and the **yin** pitches in descending sequence, thus matching huangzhong [1-C] to dalü [2-C], dacou [3-D] to yingzhong [12-B], … (**Fig. 3: 35 1**). **ZHENG et al** find a certain numerological-astrological logic in this matching sequence, but Zhu Zaiyu rejects their explanation, and declares the sequence in the received text of **Zhouli** to be spurious. In Zaiyu’s exegesis [A: Yuexue: 8a–9a, 35b–37b], he replaces the **yin** sequence of **Zhouli** with 2 different modified sequences, each of them ascending in parallel with the **yang** sequence. He matches the **yang** and **yin** pitches by pairing together those related through 6-pitch or 8-pitch intervals (perfect 4th or 5th) (**Fig. 3: 35 3**). Zaiyu’s modifications give the matching a more musical logic, but they are purely his own speculations, and have no philological basis.
Matching yin and yang pitches may seem like an empty exercise in musical mysticism, but it is connected to a very concrete musical problem, and that is the enigmatic passage in Zhouli mentioned above. This says, \[47\] The instruments play [in the key of] huangzhong [1-C], the singers sing [in the key of] dalü [2-♯C] \[\ldots\] The instruments play [in the key of] dacou [3-D], the singers sing [in the key of] yingzhong [12-B] \[\ldots\] “The instruments play in the key of the yang pitch, and the singers sing in the key of its corresponding yin pitch. With the yin-yang pairings of Zhouli, the result would be cacophonous if the instruments and singers sounded together, and a musically acceptable interpretation can only mean that they should sound separately one after the other. With Zhu Zaiyu’s re-interpretation, however, the passage is read as \[48\] “The instruments play [in the key of] huangzhong [1-C], the singers sing [in the key of] xiaolü [6-♯E ≈ F] \[\ldots\] The instruments play [in the key of] taicou [3-D], the singers sing [in the key of] hanzhong [8-G] \[\ldots\]” “The yin and yang keys are related through 6-pitch or 8-pitch intervals, and this implies that voices and instruments may (should?) sing and play together in such intervals throughout, as in parallel organum. Zaiyu provides an example in score with the 1st Hymn to Confucius (Shidian dacheng yuezhang 釋奠大成樂章), re-written according to his interpretation in 6 different transpositions, and the result is Fig. 3: 35. From my knowledge, it has been emulated only by Li Zhizao 李之藻 in his Pangong liyue shu 《頖宮禮樂疏》of 1618. Perhaps Zaiyu got the idea of parallel 6-pitch and 8-pitch intervals from the traditional method of performance on the sheng 笙 (see p. 148).
Fig. 3: 36 shows an unusual score for Zhu Zaiyu. It is written solely in gongche notation. There is no abandonment of absolute pitches however, because for Zhu Zaiyu, gongche notation translates directly into lülü notation (Fig. 3: 4). The song 〈Yao yao 堯謠 [Song from the time of Yao]〉 is just 〈Li wo zhengmin 立我烝民〉, set out in full score in Lülü jingyi a few pages later, and transcribed in Ch. 7. Fig. 3: 36, however, goes further than the full score, as it gives the song in all 5 modes yu 羽 (6), zhi 徵 (5), jue 角 (3), shang 商 (2), and gong 宮 (1) of the 5-tone scale on huangzhong.

We close our survey of notation in Zhu Zaiyu’s music by returning to Fig. 3: 5. The importance of this score has already been pointed out earlier. It provides us with a concordance of all 3 types of
pitch notation used by Zhu Zaiyu, the lüli notation 律呂譜, gongshang notation 宮商譜, and gongche notation 工尺譜, in a score where all 3 types of notation are written together in parallel.
NOTES

1 The reader should be cautioned, however, that YANG’s abridged copy of Zhu Zaiyu’s song ‘Heyue Guan ju 合樂關雎 [Concerted music for the song Guan ju]’ from Xuangong heyue pu 《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches] [B: YANGYL 2009b: 464–483] is marred by such massive misprints (with the music running in retrograde on several pages) that one wonders if Yang’s posthumous editors had any idea of how the music should sound. Zhu Zaiyu’s original print (or a facsimile copy) should always be consulted [A: Xuangong: 2b–88a].

2 Huangzhong 黃鍾 [1-C], jiazhong 夹鍾 [4-#D], linzhong 林鍾 [8-G], and yingzhong 應鍾 [12-B] are the pitch names used by Zhu Zaiyu. They are more usually written as 黃鍾, 夹鍾, 林鍾, and 應鍾 respectively.


4 Zhu Zaiyu’s terms zhong 中 and he 和, for scale degrees #4 and 7 respectively, have not found widespread acceptance. The more common terms used today are bianzhi 變徴 = #4 and biangong 變宮 = 7.

5 HUANG Xiangpeng 黄翔鹏 has proposed a theory of fundamental import for understanding the modal structure of Chinese music, called ‘3 tonics in the same gamut 同均三宮’ [B: HUANGXP 1989; ______ 2003]. This concept has generated some controversy, but it appears to be gaining critical acceptance in Chinese musicological circles (see, for example, [B: TONGZL et al 2004: 131–138, 151–155]). In the gamut comprising the 7 white notes on the piano, say, there can exist 3 different scales based on 3 different tonic pitches [gong 宮 = 1]: (1) the proper scale [zhengsheng yinjie 正聲音階] with 1 = F (F G A B C D E), (2) the low zhi scale [xiazhi yinjie 下徵音階] with 1 = C (C D E F G A B), and (3) the popular scale [suoyue yinjie 俗樂音階] with 1 = G (G A B C D E F). Each of the 3 scales contains its own pentatonic framework of 5 proper tones (marked in bold above), and can therefore accommodate 5 different modes, each ending on one of its proper scale degrees gong 宮 = 1, shang 商 = 2, jue 角 = 3, zhi 徵 = 5, or yu 羽 = 6. In a given 7-tone gamut, there can thus exist 3 scales × 5 finals = 15 different modes.

Zhu Zaiyu often uses the term ‘gamut [yun 均]’ in his writings, and his music is written in either a 5-tone or a 7-tone gamut. In the 7-tone gamut, and for the ceremonial music considered in the present study, he employs only a single scale, the proper or ancient scale. In this simple situation, the gamut already determines the scale and its tonic note uniquely, and gamut and scale reduce to the same thing. For this music, the complexities of ‘3 tonics in the same gamut’ do not apply.
In Lingxing xiaowu pu《零星小舞譜》[A Lingxing] however, Zhu Zaiyu has included arrangements of 4 popular tunes of his day, which do employ all the 3 modal scales mentioned above. Huang’s distinction between scale and gamut will then greatly clarify the discussion. Unfortunately, time does not permit these 4 very interesting songs to be included in this study.


7 These 4 songs bear the tune titles [qupai 曲牌] 〈Doye huang 豆葉黃〉, 〈Jinzi jing 金字經〉, 〈Gu gutong 鼓孤桐〉, and 〈Qingtian ge 青天歌〉 [A: Lingxing: 8a–12a, 153b–155b, 196b–198b].

8 The rubric on the diagram says that the inner circle of gongshang scale degrees may be rotated. In the edition of the Yuelü quanshu 《樂律全書》[Comprehensive treatise on music and music theory] published by Taiwan Shangwu Yinshuguan [A: Yuelü quanshu / FR1968], the inner circle is printed on a small disc of paper, and it may actually be rotated on the page. But in the original print of the Yuelü quanshu at Princeton University ((Princeton U Gest) TA141/278 20), the whole page is simply printed on a single sheet of paper, with no movable part. This print, although made from Zhu Zaiyu’s original printing blocks, is of poor quality, and the blocks are badly deteriorated. It is evidently a late impression. The other original print of the Yuelü quanshu at Princeton ((Princeton U Gest) TA141/2377) is altogether of much finer quality, and clearly an early printing. It would be very interesting to see whether this print has a movable circle or not. Unfortunately the print is incomplete, and lacks this page.

9 More than one writer have been led astray by failing to recognize this fact, that in Zhu Zaiyu’s music, gongche notation is a system of fixed pitches, not one of relative pitches. See the edition of Lingxing xiaowu pu in the Siku quanshu 《四庫全書》[B: Shenqi mipu 《神奇秘譜》B: Shenqi]. Shenqi mipu was compiled and edited by Zhu Quan 朱權 (literary name Quxian 腰仙, 1378–1448), a prince of the Ming royal house, and the author’s Preface bears the date 1425. It is celebrated as the earliest anthology solely devoted to qin tablatures, and written in reduced-ideograph notation [jianzipu 減字譜]. Yung’s edition includes facsimiles of the original tablatures, and Appendix I contains an explanation of many qin fingering symbols found in it. Shenqi mipu is one of the works cited in Zhu Zaiyu’s bibliography in Lüli jingyi 《律呂精義》[Precise principles of the musical pitches], as a reference for qin technique [A: Lüli jingyi: Preface (Lüshu: Fasc. 1: 6a); A: Lüli jingyi / FENG 1998: 9]. The complete Shenqi mipu is available in several facsimile reprints, and all of its music has been recorded and transcribed [B: Shenqi / WU T2008].
The *Mei’an qinpu*《梅庵琴譜》 is a modern introductory handbook on playing the *qin*, and it records 15 pieces of *qin* tablature of the *Mei’an* school and of its founder 王賓魯 (courtesy name Yanqing 燕卿, 1867–1921). See [B: WANGBL 1971; C: [WANG Binlu] T1983].

This was printed by mimeograph in 1948, but remained unpublished until 2009. It is particularly useful for being written bilingually in both Chinese and English.

There are many scores of the song 〈Guan ju 關雎〉 in the works of Zhu Zaiyu. Some of them contain only the melody without accompaniment. The 3 scores which do include accompaniment are found in

(1) *Xuangong heyue pu*《旋宮合樂譜》 [A: Xuangong: 2b–88a]. Full score with *caoman* for *qin* and *se* (*Fig. 3: 7a*).

(2) *Lülü jingyi*《律呂精義》 [A: Lülü jingyi: Inner Bk. 7: (Lüshu: Fasc. 3: 22b–103a)]. Short score with *caoman* for *qin* and *se* (*Fig. 3: 7b*).

(3) *Xiangyin Shiyue pu*《鄉飲詩樂譜》 [A: Xiangyin: Bk. 1: 31b–33a, Bk. 4: 1a–8b]. Short score with *caoman* for *se* only (*Fig. 3: 12a*).

Scores (1) and (3) are transcribed in Ch. 7. They employ different patterns of *caoman*. The *caoman* patterns in scores (1) and (2) are identical.

It is a gender-neutral pronoun, and it means *he* or *she.*

The *qin* 琴 and *se* 瑟 are described in Ch. 5.

This rubric has been interpreted in different ways in the literature. In my reading and translation, “Beginners learning the dance [should] recite the *caoman* verse orally, while stepping to the rhythm of the beats.” the sentence is parsed in regular 4-word phrases as 初學舞者,口念操縵,腳踏板眼。 This agrees with [B: CHENWN 1992: 200]. [B: WANGNN 2009: 797] adopts the irregular punctuation 初學舞者,口念,操縵,腳踏板眼。 and explains it as “舞者口念词,动作宽缓,脚下踏着节奏。” [C: Wu 2008: 204, 235] gives the translation “Die Anfänger lesen die Merkverse vor sich hin, zupfen die Saiten und stampfen mit den Füssen genau im Takt der Schläge.” which implies a parsing similar to that of WANG. The reading of WANG appears to me as forced, and that of Wu as impossible, because the dancer cannot at the same time dance and pluck the strings. All this
would be a minor quibble, if the readings of WANG and WU were not symptomatic of a deeper misunderstanding with far-reaching musical consequences.

Neither WANG nor WU appears to recognize that caoman refers to patterns of zither figuration, each pattern being associated with a mnemonic verse, which are not lyrics to be sung aloud. WANG [B: WANGNN 2009: 801] continues to say that in Liudai xiao wu pu, the lyrics are the caoman verse 非礼勿听，非礼勿言，非礼勿视，非礼勿动, and these 4 phrases are sung repeatedly. WU Zihui, in his transcriptions of Zhu Zaiyu’s music, notates all the mnemonic verses as lyrics to be sung to the caoman pitches, labelled as ‘Melodie’ [C: WU 2008: 288–366]. WU Zhi-wu 吴志武 makes the same mistake in his transcription of 〈Heyue Guan ju〉 (1st stanza only, from [A: Xiangyin: Bk. 1: 31b–33a]) [B: WuZW 2007: 58–60]. (The mistake of WU Zhi-wu has already been pointed out by [B: XUANXY 2014].) The older writers [C: COURANT 1914: 121–132] and [B: YANGYL 2009b: 445–454] understand the function of caoman better, and do not make this mistake. I return to consider this question more fully in Ch. 6.


22 In this note I give an analysis of the caoman pitches in the 7-tone and 5-tone gamuts on huangzhong [1-C]. All pitches are referred to a single octave by octave equivalence. Remember that an 8-pitch interval is a ‘perfect 5th’.

7-tone gamut on huangzhong [1-C] (Fig. 3: 8b)

<table>
<thead>
<tr>
<th>Outside gamut</th>
<th>Example</th>
<th>Melody note</th>
<th>8 pitches above</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside gamut</td>
<td></td>
<td>1 1-C</td>
<td>5 8-G</td>
<td>m. 1</td>
</tr>
<tr>
<td>^ 8-G</td>
<td>x</td>
<td>2 3-D</td>
<td>6 10-A</td>
<td>m. 3</td>
</tr>
<tr>
<td>^ 10-A</td>
<td></td>
<td>3 5-E</td>
<td>7 11-B</td>
<td>m. 5</td>
</tr>
<tr>
<td>^ 11-B</td>
<td>m. 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>^ 1 1-C</td>
<td></td>
<td>3 8-G</td>
<td>2 3-D</td>
<td>m. 2</td>
</tr>
<tr>
<td>^ 3-D</td>
<td></td>
<td>6 10-A</td>
<td>3 5-E</td>
<td>m. 4</td>
</tr>
<tr>
<td>^ 5-E</td>
<td></td>
<td>9 11-B</td>
<td>4 7-4F</td>
<td>m. 6</td>
</tr>
</tbody>
</table>

The tone 8 pitches above the melody note is always preferred, and the tone 8 pitches below is used only when the melody note is 7-4F, for which the tone 8 pitches above (2-4C) lies outside the scalar gamut.
5-tone gamut on huangzhong [1-C] (Fig. 3: 9b)

<table>
<thead>
<tr>
<th>8 pitches below</th>
<th>Example</th>
<th>8 pitches above</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside gamut</td>
<td></td>
<td>^1 1-C</td>
<td>^5 8-G</td>
</tr>
<tr>
<td>^5 8-G</td>
<td>x</td>
<td>^2 3-D</td>
<td>^6 10-A</td>
</tr>
<tr>
<td>^6 10-A</td>
<td>m. 3 = 8 = 13 = 18 = 23</td>
<td>^3 5-E</td>
<td>Outside gamut</td>
</tr>
<tr>
<td>^1 1-C</td>
<td>x</td>
<td>^5 8-G</td>
<td>^2 3-D</td>
</tr>
<tr>
<td>^2 3-D</td>
<td></td>
<td>^6 10-A</td>
<td>^3 5-E</td>
</tr>
</tbody>
</table>

The tone 8 pitches above the melody note is always preferred, and the tone 8 pitches below is used only when the melody note is ^3 (5-E), for which the tone 8 pitches above (11-B) lies outside the scalar gamut.

For the examples in Fig. 3: 10b, they represent only a small selection from all the patterns given in the complete tabulation with song in [A: Lülü zhenglun: Bk. 3–4]. In the complete tabulation, again the tone 8 pitches below the melody note (as in m. 3, 4) is used only when the melody note is ^3, for which the tone 8 pitches above would lie outside the gamut.

This analysis confirms a rule stated by Zhu Zaiyu (quoting his father ZHU Houwan): “On a qin tuned in a 5-tone gamut, stop the string at marker no. 9 only for the tone jue [mi]. For all other tones, stop the string at marker no. 10. 五音琴惟角音按九徽其餘皆按十徽   ” ([A: Caoman: 14ab; A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 42b); A: Lülü jingyi / FENG 1998: 1072]; a similar rule is stated in [A: Lülü zhenglun: Bk. 3: 5b]). An examination of the qin tablature in Fig. 3: 9b will verify that marker no. 9 is used in m. 3 = 8 = 13 = 18 = 23, precisely in those caoman figures harmonizing the melody note ^3 (5-E). All other bars use marker no. 10. A similar conclusion holds for Fig. 3: 10b, but the few selected bars cannot demonstrate this, because no tonic note gong 宮 is specified.

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23 [C: [ZHU Quan] T1997 / ed. YUNG: 82].

24 The terms he 和 and tong 同, as applied to the se, had already appeared with the same meanings as described here in Zhu Zaiyu’s early treatise Sepu《瑟譜》 [Notes on the se] of 1560 [A: Sepu / Jiguge F1989: Bk. 4: 4b–6a]. In Sepu, Zhu Zaiyu was still using these terms rather tentatively, and more often referred to panghe 旁合 (= he 和) and zhenghe 正合 (= tong 同) instead.

25 [C: COURANT 1914] correctly transcribes this example on p. 125, where each melodic tone takes 4 beats with 16 notes of caoman; but then on p. 128 he confuses the issue by extending the caoman pattern to 32 notes, in error.

26 I am grateful to WANG Jingsong 王景松 for advice on the technique of playing the sheng, and on possible ways of realizing Zhu Zaiyu’s instruction for the song 〈Nangai〉. I have also considered
other possible solutions: because 3 sheng are used in Zhu Zaiyu’s songs for sheng (see Ch. 6), perhaps the suggested realization of Fig. 3: 13c can be played divisi, each player playing one or two of the 3 voices in the suggested sheng part? WANG Jingsong’s opinion was that such divisi playing is not employed in traditional Chinese music.

There exist other musical settings of songs from the Shijing, dating from before Zhu Zaiyu. The most well-known is the group of 12 songs included in Yili jingzhuan tongjie《儀禮經傳通解》[Comprehensive exegeses on 《Yili》 by ZHU Xi 朱熹 (1130–1200) [B: Yili tongjie / WANG 2010: 517–526]. All 12 titles of ZHU Xi are included among Zhu Zaiyu’s own compositions. ZHU Xi’s music is written in lülü notation, and the lyrics include poems from the Minor odes and the Airs. Without exception they all begin and end on huangzhong [1-C] or [1-C ‾]. Several transcriptions are readily available, I only need to cite [C: PIAN R2003: 154–173]. See Ch. 2.

For an account of Zhu Zaiyu’s dance, the reader may consult [B: WANGNN 2009: 786–812], [C: STANDAERT 2006: 106–130], and especially the excellent study by WU Zihui [C: WU 2008].

A chongdu 春牘 is a sort of clapper, see Ch. 5.

Page references are noted on the transcription. The melody of this song (without accompaniment) is also given in [A: Xiangyin: Bk. 6: 23ab; A: Lülü jingyi: Outer Bk. 9 (Lüshu: Fasc. 6: 85b); A: Lülü jingyi / FENG 1998: 1157]. Transcriptions can be found in [C: WU 2008: 186, 288–327], but see Note 20.

The number of dancers is discussed in Ch. 6.

Due to pressure of time, I have dispensed with a transcription into full 5-line staff and 7-line tablature notation. Instead, the pitches are notated directly on the facsimile using the popular numerical notation [jianpu 簡譜]: 1 2 3 4 5 6 7 = do re mi fa sol la si resp. A dot above the numeral indicates 1 octave higher; a dot below indicates 1 octave lower.

See, for example, Mei’an qinpu 《梅庵琴譜》 [Qin tablature of Plum Blossom Studio] [B: WANGBL 1971: 68–69; C: [WANG Binlu] T1983: 35].

In FENG Wenci 馮文慈’s edition of Lülü jingyi, the title 〈Caoman yin 操縵引〉 is masked by an erroneous punctuation [A: Lülü jingyi / FENG 1998: 209]: “操、縵、引者，古曲名也。” Apparently FENG was unaware that 〈操縵引〉 is itself the title of a piece for qin.
The sound of the lyric xianweng suggests to me an onomatopoeic imitation of the qin sound of the xianweng. The reader may judge for itself if it listens to a performance by John Thompson, with voice and qin, of the song 〈 Xianweng cao 〉 [37] http://www.silkqin.com/07play/xianweng.htm#r16 (accessed 17 May 2016). See also Note 42.

Caoman guyue pu was written after Zhu Houwan was released from High Walls prison in 1567, and it was polished up and revised before its eventual printing and presentation in 1606. The qin manual containing 〈 Tiaoxian runong 〉 (Fig. 3: 22) was first published in 1573, with a revised edition in 1585. But the caoman verse Dedao xianweng could have been written any time before or after 1573 or 1585. As Zhu Zaiyu says, it was simply the folklore current among qin players of the time.

[C: THOMPSON 2011: Strum Silk Prelude: Appendix 1 Chart tracing Caoman Yin (and Xianweng Cao)] http://www.silkqin.com/07play/caoman.htm#r5 (accessed 15 May 2016). This website is well-researched and very informative — highly recommended.

The monograph [B: JIANGF & AiCH 2001] provides an excellent survey of all aspects of the Confucian ceremony in China, and includes coverage of both historical and modern developments. Ch. 13 contains the music scores, mostly notated without accompaniment. The worship ceremony for Confucius in the late Qing dynasty is well described in the monograph [C: AALST 1884: 25–35], which includes the music (without accompaniment) and texts of the hymns, in both Chinese and transcriptions and English translations. [C: MOULE 1900] has described his observations at the sacrifice to Confucius at Hangzhou, before a ceremonial rehearsal in 1891 and at a real performance in 1898. [B: YANGYL R2009i] is a detailed description of the Confucian ceremonial music as it was practised at Liuyang in Hunan in 1956, with transcriptions in full score. [C: LAM 1995: 34–38] briefly describes the ceremony performed at Qufu in 1990 and points out its commercialized features. All modern performances of the Confucian ritual in China employ music and dance based on the practice of the Qing dynasty.

The official music manual of the Qing dynasty, containing music theory, and scores and dance choreographies for all ceremonial functions, is the (Yuzhi) lülü zhengyi 《(御製)律呂正義》 (1714) [B: Lülü zhengyi] and its Sequel (Yuzhi) lülü zhengyi...
The worship ceremony for Confucius is in the *Houbian*: Bk. 29, 31 (music scores), and Bk. 30, 32 (dance choreographies). This manual must be read with caution. It is written in a special artificial tuning system devised by Qing Emperor Shengzu 清聖祖 (reign Kangxi 康熙 1662–1722), which puts 14 tones into an out-of-tune octave instead of the usual 12 tones in a well-tuned octave [B: *Lülü zhengyi*: Pt. 1 上編]. The traditional note names are hijacked to denote new untraditional pitches in the Kangxi 14-tone tuning 康熙十四律 in a self-contradictory way, creating terrible confusion (see [B: CHENWN 2010: 82–304]). The Confucian ceremonial music in the 14-tone tuning was promulgated in 1743, and it must have sounded weirdly mistuned to all ears except those of the Emperor (in his new clothes). I doubt very much if the strange tuning was ever generally adopted in practice.

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45 [B: SULY [1985]] provides a good survey of the Confucian ceremony in Taiwan. Full scores of the music played at Tainan (following the Qing dynasty model) are shown in Appendix 1, and that at Taibei (following the Ming dynasty model) are shown in Appendix 3. The brief pamphlet [B: CHUANGPL 1969] is the report and recommendations of the Working Committee on Ceremony and Music for the Worship of Confucius 祭孔禮樂工作委員會; it contains the melodies (without accompaniment) of the reformed Ming-dynasty music for Taibei. More recent developments up to 1998 are described in [C: THRASHER 2005].


47 [B: *Zhouli* 《周禮》 : (Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Grand Master [Dashiq 大師]) ; B: *Zhouli* / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36979 ; B: *Zhouli* / HUENG et al 2000: Vol. 8: 714–717; C: *Zhouli* T1851: Tome 2: 49–50].

48 [B: *Zhouli* 《周禮》 : (Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Grand Director of Music [Dasiqie 大司樂]) ; B: *Zhouli* / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36972 ; B: *Zhouli* / HUENG et al 2000: Vol. 8: 682–686; C: *Zhouli* T1851: Tome 2: 30–32].

49 All 6 transpositions of Zhu Zaiyu’s score have been transcribed into staff notation by [C: COURANT 1914: 103–105; and B: WANGHJ 2008a: 76].

50 хИЖ Зфтпщптт 。АУТП А1970Ж Илю 7Ж 6и–40иъ.
Chapter 4

The tuning of *huangzhong* 黄鍾 and the 12 fundamental pitches

In order to establish the actual sounding pitches of Zhu Zaiyu’s music, it is necessary to make a study of his music tuning. There are 2 aspects to this question: (1) what is the sounding pitch of *huangzhong* 黄鍾 (transcribed as 1-C)? and (2) what is the tuning of the 12 fundamental pitches, relative to *huangzhong*?

As we proceed to answer these questions, we approach the domain of music theory where Zhu Zaiyu made his most signal contributions — the study of *lüxue* 律學. The subject of *lüxue* is really peculiar to Chinese music theory, and has no good counterpart in Western music. Its closest parallel may be the science of harmonics in ancient Greece. At its core, *lüxue* concerns the theory of tuning and temperament, and scales and modes. Though that has been its emphasis in modern times, historically the ramifications of *lüxue* were much broader. From the beginning it had been intimately related to calendrical science and astrology, because all these fields dealt with numerical calculations and invoked a certain numerological mysticism. Metrology (the science of measurement) constituted another large component of *lüxue*. The connection between music theory and measurement reaches back through a tradition of some 2000 years. The fundamental work in this field, and the first attempt to create a systematic metrology in China, was the 〈Treatise on the musical system and calendar 律曆志〉 of *Hanshu* 《漢書》 [History of the (Former) Han dynasty (~206 – +9 – +23)]. Written by BAN Gu 班固 (32–92) but compiled from earlier work by LIU Xin 劉歆 (−46 – +23), it derives the whole system of measuring length, capacity, and weight from the *huangzhong* pipe as a starting point. This work will be a major concern of Zhu Zaiyu’s music theory.

Zhu Zaiyu’s work in *lüxue* was comprehensive; he contributed to the subject in all of the areas mentioned above. His major work on the calendrical aspect of *lüxue* is *Lüli rongtong* 《律曆融通》 [The concordance of music and calendar] (Preface 1581) [A: Lüli]. The metrological aspect is the focus of *Lüxue xinshuo* 《律學新說》 [A new discourse in musical metrology] (Preface 1584) [A: Lüxue]. The theory of musical tuning, and the arts of music and dance, form the subject of *Lüli jingyi* 《律呂精義》 [Precise principles of the musical pitches] (Preface 1596) [A: Lüli jingyi]. As the present study is focussed primarily on Zaiyu’s music compositions and only secondarily on his music theory, only a summary of the main theoretical results will be presented. More generally, I shall not attempt to provide a review of Chinese music theory, nor the history of tuning and temperament. For systematic expositions of
other elements of Zhu Zaiyu’s music theory, the interested reader may consult the monographs by CHEN and by DAI.

THE ACOUSTICAL RULER (duchi 度尺 AND lüchi 律尺)

The traditional unit of length in China is the chi 尺. (Subunits are 1 chi = 10 cun 寸 = 100 fen 分.) Its present-day length is defined to be 1 chi (modern) = ⅓ meter = 333 mm. Its actual length has varied though the ages, and it was not always well-defined. The 〈Treatise on the musical system and calendar 律曆志〉 of Hanshu《漢書》 bases the chi and the measurement of length on huangzhong, thus:

4 The measurement of length […] basically arises from the length of huangzhong. Using grains of black millet of medium size, take the width of 1 grain and measure out 90 fen: [this is] the length of huangzhong, 1 [grain] being 1 fen. 10 fen make 1 cun, 10 cun make 1 chi, […]

度者 […] 本起黃鐘之長以子穀秬黍中者一黍之廣 度之九十分黃鐘之長一為十分十 分為寸十分為尺 […]

This statement is the starting point for Zhu Zaiyu’s musical metrology, and the source of endless debate. The length of huangzhong is stated to be 90 fen, which is not 1 chi. But one of Zhu Zaiyu’s basic propositions is that the length of the huangzhong pipe must be exactly 1 chi. In spite of his objections to many statements in Hanshu, Zhu Zaiyu readily accepts its principle, that “The measurement of length […] basically arises from the length of huangzhong”, and he cites it many times to justify his thesis that huangzhong = 1 chi. Since the measurement of length arises from the length of huangzhong, the huangzhong pipe itself defines the length of the acoustical ruler (chi). As he acknowledges, his idea originates from HE Tang 何瑭 (1474–1543). In the treatise Yuelü guanjian《樂律管見》 [My humble opinions on the musical pitches], HE wrote:

6 The 〈Treatise〉 of Hanshu says that as the huangzhong pipe is 9 cun in length, 1 cun must be added to it to make up 1 chi. Now the reason why the standards of length, capacity, and weight are based on huangzhong, is the value this places on its resonance with the ethers of heaven and earth. If 1 cun is added to make up 1 chi, then how is the chi based on huangzhong? They do not realize that the length of huangzhong is in fact not something that can be made up by man. As for taking 9 of its cun units to make the pitch standard (lü), and 10 of its cun units to make the length standard (chi), that is human artifice. The
〈Treatise〉 of Hanshu, in its ignorance of how these thing come about, would add 1 cun to huangzhong to make up 1 chi. That is absurd!

漢志謂黃鐘之律九寸加一寸為一尺夫度量權衡所以取法於黃鐘者蓋貴其與天地之氣相應也若加一寸以爲尺則又何取於黃鐘殊不知黃鐘之長固非人所能爲至於九其寸而爲律十其寸而爲尺則人之所爲也漢志不知出此乃欲加黃鐘一寸爲尺謬矣

For HE Tang, huangzhong was a naturally given thing, not something created by man, which “resonates with the ethers of heaven and earth”, and the length of the chi was based on it. In this he was clinging to some last vestiges of a belief in the theory of ‘watching for the ethers’ [houqi 候氣’]. This was a piece of pseudo-scientific mysticism which had plagued Chinese music theory ever since Han times (c. −37?). By the time Zhu Zaiyu came to write Lüxue xinshuo and Lülü jingyi, he no longer subscribed to the theory of ‘watching for the ethers’, yet he always held on to a metaphysical belief that huangzhong was an a priori and naturally-given thing, divinely revealed to the ancient sages, and the acoustical ruler was derived from huangzhong as an a posteriori and historical object. With modern science we understand that the notion of a naturally given huangzhong is a myth; the acoustical ruler was really Zhu Zaiyu’s invention.

The acoustical ruler is not to be confused with any mundane ruler in common use. Zhu Zaiyu constructed a special huangzhong measuring pipe [lüyue 律龠] according his interpretation of Hanshu, with the acoustical ruler engraved on it. The pipe was made of bronze, and though the instrument itself has not survived, we are fortunate to have a drawing of it (Fig. 4: 1). On the front and back of the pipe are engraved the 2 principal forms of the acoustical ruler, respectively the lüchi 律尺 and the duchi 度尺. Both are the same length as the huangzhong pipe itself, but the lüchi is subdivided in 9 (1 chi = 9 cun = 81 fen), and equal to 81 millet grains aligned longitudinally; while the duchi is subdivided in 10 (1 chi = 10 cun = 100 fen), and equal to 100 millet grains aligned transversely. The lüchi inscription on the left side of the pipe reads:

The huangzhong measuring pipe, of circumference 9 fen, and length 9 cun, equal to 1 chi. Capacity 1 200 millet grains, and weight 12 zhu; doubling this capacity makes 1 ge, and doubling this weight makes 1 liang.

黃鍾律龠空圍九分長九寸是為一尺容千二百黍重十二銖合之為合兩之為兩

The pipe capacity of 1 200 millet grains, which weigh 12 zhu (the millets, not the pipe), and the double units ge and liang, are all specified in Hanshu. The last line contains 2 puns on their names, “合之
為合兩之爲兩” , original with *Hanshu*, which readers of Chinese will appreciate. The *duchi* inscription on the right side of the pipe is a quote from BAN Gu’s versified summary of his 〈Treatise〉 in *Hanshu*, and it reads:

12 From the primal origin,
Numbers began with 1.
The ethers and *huangzhong* were created,
[And thereby] measurements to the smallest hair’s breadth are made.
The 8 kinds of musical instruments 13, the 7 inceptions 14,
The 5 tones 15, the 6 *yang* musical pitches 16,
Length, capacity, weight and balance,
Calendars and mathematics — all grow out from this.
Fig. 4: 1 The huangzhong measuring pipe [lüyue 律龠].


Caption ► The measuring pipe lüyue has the same length as the huangzhong pitch-pipe, but it is circular inside and square outside. The square [side] is the same as the external diameter of the huangzhong pipe, and the circular [diameter] is the same as the internal diameter of huangzhong. On the front is engraved the longitudinal-millet lüchi, with length 9 cun₉, each cun₉ measuring 9 fen₉. On the back is engraved the transverse-millet duchi, with length 10 cun₁₀, each cun₁₀ measuring 10 fen₁₀. The lüchi is the chi of Huangdi, and the duchi is the chi of the Xia. The engraving is as fine as a hair, and the divisions must be even.

Caption ◄ The lüchi inscription of 32 characters is engraved on the left side. It reads, “[please see p. 203]”. The duchi inscription of 32 characters is engraved on the right side. It reads, “[please see p. 203]”.

a Huangdi ws a sage-king of legendary antiquity. The semi-legendary Xia dynasty came some time later (c. −2070 – c. −1600).
What, then, was the length of Zhu Zaiyu’s acoustical ruler, which will tell us the length of huang-zhong, and the dimensions of his musical instruments? After an exhaustive search through many historical documents, Zhu Zaiyu believed that he had recovered the true huangzhong acoustical ruler of antiquity: it was the chi of the Xia dynasty (c. −2070 – c. −1600). As this conclusion is based solely on his interpretation of documents written hundreds and thousands of years after the semi-legendary Xia, unsupported by archaeological findings on any actual musical or measuring instrument, it can have no validity. But if we patiently sift through the mire of Zhu Zaiyu’s historical analysis, it is possible to extract from it some verifiable relationships concerning his idealized acoustical ruler. The most important of these relationships can be concisely summarized in an equation:

\[
1 \text{ acoustical chi} = (\frac{8}{10}) \times \text{carpentry ruler} = (\frac{8}{10}) \times \text{length of printed border on the Daming baochao} = 10 \times \text{diameter of the kaiyuan tongbao coin (duchi)} = 9 \times \text{diameter of the daquan coin (lüchi)}
\]

The carpentry ruler [yingzao chi 營造尺] was an official ruler in use during Zhu Zaiyu’s day. The Daming baochao 大明寳鈔 was a monetary note first issued by Ming Emperor Taizu 明太祖 in 1375; the kaiyuan tongbao 開元通寶 was a coin originally minted by Tang Emperor Gaozu 唐高祖 in the year 621; and the daquan 大寳 was a coin first minted by Wang Mang 王莽 in the year +7 (Fig. 4: 2). The duchi and lüchi are two forms of Zaiyu’s acoustical ruler, as explained above. Both are the same length overall, but the duchi is subdivided in 10, and equal to 100 millet grains aligned transversely; the lüchi is subdivided in 9, and equal to 81 millet grains aligned longitudinally. All these ideas are illustrated in Fig. 4: 3a, Fig. 4: 3b. 20, 21
Fig. 4: 2  Antique money and coins.

▲ Daming baochao 大明寳鈔, first issued in 1375 by Ming Emperor Taizu 明太祖. This specimen was printed by the Ministry of Revenue [Hubu 户部] after 1380 (see [B: PENGXW R2007: 466; C: PENG T1994: 537]). Average length of black border = 319 mm.

▲ Kaiyuan tongbao 開元通寳, originally minted in 621 by Tang Emperor Gaozu 唐高祖. Diameter of this specimen = 25 mm.

▲ Daquan 大泉, first minted in year +7 by Wang Mang 王莽. Diameter of this specimen = 28.5 mm.
The *Daming baochao* is represented by its black border, the same length as the official carpentry ruler on top. 9 *daquan* coins are aligned in the top row with a longitudinal-millet *lüchi* subdivided in 9. 10 *kaiyuan tongbao* coins are shown. \[\textbf{Fig. 4: 3b}\]
Fig. 4: 3b  Combined diagram of the official [carpentry] ruler, [Daming] baochao, antique coins, and black and foxtail millets.


Fig. 4: 3a  on the bottom row with a transverse-millet duchi subdivided in 10. The 12 fundamental pitches are measured with the longitudinal-millet lüchi, and their lengths marked according to their numbers in Huainanzi《淮南子》, but emended by Zhu Zaiyu according to his discussion in Lüxue xinshuo《律學新說》 (see Note 21).
While millet grains may not appear to us as a very accurate method of measuring length, museum specimens of the *Daming baochao* and carpentry rulers from Zhu Zaiyu’s time exist. Data on their dimensions are reported by Qiu [B: QIUGM 1992; B: QIUGM et al 2001]. Two specimens of carpentry rulers have been measured, their lengths being 320 and 318 mm respectively.22 The *Daming baochao* gives a similar result: from measurements on 39 specimens at the National Museum of China in Beijing, its printed border is found to have a mean length and standard deviation of 319.0 ± 1.1 mm.23 The ruler and *baochao* measurements are quite consistent with each other, and we may take 319 mm as a good average value for both. Eqn. 4: 1 then yields 1 acoustical *chi* = \((8/10) \times 319\) mm = 255.2 mm. Since the carpentry ruler and *Daming baochao* were objects contemporary with Zaiyu, their evidence should be a most reliable guide.

If coins are used for verification, the *kaiyuan tongbao* and *daquan* can be found on the website of the American Numismatic Society.24 A search found 26 *kaiyuan tongbao* coins with measured diameters ranging from 23 to 28 mm, with a mean size and standard deviation of 25.9 ± 1.8 mm. 10 such coins would then make an acoustical *duchi* of 258.8 ± 3.5 mm.26 A search for the *daquan* found 24 coins with measured diameters ranging from 26 to 29 mm, with a mean size and standard deviation of 27.3 ± 0.8 mm. 9 such coins then make up a *lüchi* of 246.0 ± 1.5 mm.27 According to Zhu Zaiyu, both *duchi* and *lüchi* should be the same length, but the measurement data do not bear out his claim. In other words, Zhu Zaiyu picked and chose his coins, so that his data would match his hypothesis. His many caveats about using coins of suitably large size tell us as much. Thus, the coins can provide a rough guide to the length of Zaiyu’s *duchi* and *lüchi*, but due to the variations in their sizes, they are not a reliable guide to the precise length of his acoustical ruler. A thorough analysis of Zhu Zaiyu’s rulers and coins has been done by Zheng [B: ZHENG 1990]. He made measurements on several large-sized coins (*kaiyuan tongbao*, *daquan*, and others mentioned by Zhu Zaiyu), and compared measurements on a number of historical rulers preserved in museums. Zheng’s result is that Zaiyu’s acoustical *chi* = 256 mm.28

The many finely-engraved diagrams in Zhu Zaiyu’s printed books suggest a more direct way to find the length of Zaiyu’s acoustical *chi*. If it can be assumed that the diagrams are drawn at actual size, then the lengths of his pipes and rulers can be obtained by direct measurement on the printed page. Very thorough measurements along these lines were made by Yang in 1937 and by Dai in 1986, with slightly different results.29 As a further check, I have taken measurements on all the acoustical rulers drawn in *Lüxue xinshuo* 《律學新說》. The Princeton University Library possesses 2 original prints of this work. As discussed in Ch. 1, the 2 prints are slightly unequal in size, and quite different in quality. The difference can be clearly seen in Fig. 4: 4. TA141/278 (left on top) is printed on paper of mediocre quality from a smudged and deteriorated printing block, but TA141/2377 (right under) is made on paper
of superior quality, the print is pristine and extremely fine, and the whole is manifestly a carefully-made early impression. Their slight inequality in size is due to shrinkage of the wooden printing block with age \(^{30}\), and it accounts for the differences between the measurements of YANG and of DAI. Evidently, to obtain results which correspond to Zhu Zaiyu’s intentions, measurements should be taken only from the superior early print TA141/2377. The measured data are tabulated in Fig. 4: 6. The black border representing the Daming baochao, extending over 1 double-sided leaf on the diagrams, has a mean length and standard deviation of 318.71 ± 0.25 mm. This agrees well with the length of 319 mm obtained from independent measurements on the baochao and carpentry rulers as noted above, and the deviations are much smaller. The drawings are really done precisely and in actual size. Since they are made by Zhu Zaiyu himself, they provide the most authentic reference for his acoustical ruler and the length of his huangzhong. Thus, according to Fig. 4: 6, 1 acoustical chi = 254.96 ± 0.10 mm \(^{31}\). This result is in excellent agreement with the measurement of 254.8 mm obtained by YANG.

Looking at Fig. 4: 4 and Fig. 4: 5, one observation may perhaps strike the reader. Zhu Zaiyu’s huangzhong pipe, equal to 1 acoustical chi, is 255 mm long, and there are 12 fundamental pitches. The height of the frame which borders the printed page, from top to bottom externally, also measures 255 mm (within small errors of engraving) \(^{32}\), and each page has just 12 columns of text. Thus, every page of text in the Yuelü quanshu 《樂律全書》 is a symbolic representation of 12 pipes, each one the length of huangzhong! \(^{33}\) Scholars have expended huge amounts of effort to find the length of Zhu Zaiyu’s huangzhong, researching millets, antique coins, monetary notes, and much else besides, and all along, it has been staring out at the reader from every page. This fact has never been noticed before. How Zhu Zaiyu must have been chuckling behind our backs all this time!
Fig. 4: Comparing 2 prints of the acoustical ruler.

[A: Lixue: Bk. 2: 29b]

Exemplars at Princeton University Gest Library: TA141/278 v.1, TA141/2377 v.4
Fig. 4:5  Huangzhong × 12 columns per page.
[A: Lüxue: Bk. 1: 1a (Exemplar at Princeton University Gest Library TA141/2377 v.1)]

Height of outer frame = 253 mm (in the photo it looks longer because of parallax).
The general frame dimensions shown apply to a sampling of pages from Lüxue xinshuo《律學新說》.
**Fig. 4: 6**  
**TABLE** Measurements on the acoustical ruler.  
[A: *Lüxue* Bk. 2 (Exemplar at Princeton University Gest Library TA141/2377 v.3–4)]

<table>
<thead>
<tr>
<th>Lüxue xinshuo</th>
<th>Diagram</th>
<th>Black border / mm ± 0.4a</th>
<th>Acoustical ruler / mm ± 0.4a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bk. 2: 8ab</td>
<td>3 contemporary rulers</td>
<td>Top 319.0 Bottom 319.0</td>
<td>255.0</td>
</tr>
<tr>
<td></td>
<td>(8/10) × carpentry ruler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 9ab</td>
<td>3 ancient rulers</td>
<td>Top 318.6 Bottom 318.4</td>
<td>254.8</td>
</tr>
<tr>
<td>Ruler of Xia Yu = 10 cun</td>
<td>夏禹十寸之尺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 10ab</td>
<td>3 millet rulers</td>
<td>Top 318.8 Bottom 318.5</td>
<td>254.6</td>
</tr>
<tr>
<td>Diagonal millet ruler = 90 fen</td>
<td>斜黍九十分尺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 13ab</td>
<td>Antique coins &amp; millet rulers</td>
<td>Top 319.1 Bottom 319.1</td>
<td>255.2</td>
</tr>
<tr>
<td>Diagonal millet ruler</td>
<td>斜黍尺</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 14ab</td>
<td>Rulers of the Taichang Court, true huangzhong, &amp; Cai Yuanding</td>
<td>Top 318.6 Bottom 318.7</td>
<td>254.7</td>
</tr>
<tr>
<td>True huangzhong</td>
<td>真黃鍾</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 29ab</td>
<td>The carpentry ruler, baochao, antique coins, &amp; millets</td>
<td>Top 318.5 Bottom 318.5</td>
<td>254.8</td>
</tr>
<tr>
<td>lüchi 律尺 = duchi 度尺</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bk. 2: 39ab</td>
<td>The 12 pitch-pipes</td>
<td>Top 318.7 Bottom 318.4</td>
<td>255.5</td>
</tr>
<tr>
<td>Longitudinal millet ruler = 81 fen</td>
<td>縱黍尺</td>
<td>255.0</td>
<td></td>
</tr>
<tr>
<td>Transverse millet ruler = 100 fen</td>
<td>橫黍尺</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>mean ( \bar{x} ) b</th>
<th>( n = 14 )</th>
<th>318.71</th>
<th>254.96</th>
</tr>
</thead>
<tbody>
<tr>
<td>sd ( s_{n-1} ) c</td>
<td>0.25</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>sd of mean ( \bar{x} ) d</td>
<td>0.07</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>( (8/10) \times ) border</td>
<td></td>
<td>254.97</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

a The measurements are made with a ruler graduated in mm, and the ± 0.4 mm error bar is a simple visual estimate.

b mean \( \bar{x} = (\sum x)/n \), \( x \) = sample data, \( n \) = sample size

| c standard deviation \( s_{n-1} = \sqrt{\frac{\sum(x-x)^2}{n-1}} \) |
| d standard deviation of mean = \( s_{n-1}/\sqrt{n} \)

Summing up all the evidence, we can confidently state that for Zhu Zaiyu,

\[ \text{huangzhong length} = 1 \text{ acoustical chi} = 254.96 \pm 0.10 \text{ mm} \]  

Eqn. 4: 2
Zhu Zaiyu’s most celebrated achievement is his calculation of the exact lengths of the 12 fundamental pitches in an equal-ratio tuning. The calculation proceeds according to the formula

\[ l_{n+1} = \frac{\text{huangzhong}}{\text{double} - \text{yingzhong}} \times l_n = \frac{1}{1.059463094359295264561825} \times l_n \quad \text{Eqn. 4: 3} \]

where \( l_0 = \text{huangzhong} [1-C] = 1 \text{ chi} \), \( l_1 = \text{dalü} [2-\#C] \), \ldots \( l_{11} = \text{yingzhong} [12-B] \), \( l_{12} = \text{half-huangzhong} [1-\overline{C}] \), \ldots are the lengths of the respective pitches [A: Lüli jingyi: Inner Bk. 1 (Lüshu: Fasc. 1: 9a–13b); A: Lüli jingyi / FENG 1998: 6–15]. Double-yingzhong represents the ‘precise ratio' \( \text{milü 密率} = 2^{1/12} \), evaluated by way of a sequence of square and cube root extractions in an extremely laborious computation performed on the abacus [A: Suanxue xinshuo 《筭學新說》: 4b–18a]

\[ 2^{1/12} = \left(2^{1/2}\right)^{1/3} = 1.059463094359295264561825 \]

Thus Zhu Zaiyu’s Eqn. 4: 3 can be expressed as

\[ l_{n+1} = 2^{-1/12} \times l_n \quad \text{Eqn. 4: 4} \]

This is the defining formula for 12-tone equal tuning. It can be applied directly to obtain the lengths of strings on a monochord or a qin or other string instrument. Zhu Zaiyu constructed a ‘monochord' [lüzhun 律準] with 12 strings to tune his instruments just this way (Fig. 4: 7). It gives relative pitches easily and accurately, but cannot provide any absolute pitch standard. For this purpose, pipes must be used.
For pipes, however, the problems of end correction and mouth correction complicate matters. The resonating stationary waves inside the pipe extend somewhat beyond its open ends, and the pipe appears to be effectively longer than its physical length. If the pipe lengths change according to the ratio of Eqn. 4: 4, but all pipes remain the same diameter, their effective lengths will change less than proportionately. Consequently, pitch intervals from pipe to pipe will be too small, the short pipes will

---

Fig. 4: 7 The new lūzhün (12-stringed ‘monochord’).

[Text: A: Lüxue; Bk. 1: 28a (Exemplar at Princeton University Gest Library TA141/2377 v.2)]

Length of each string = 5 chi. The 12 markers down the middle are spaced according to Eqn. 4: 4.
not sound high enough, and the long pipes not low enough. Zhu Zaiyu tackled this problem by pro-
gressively narrowing down his pipes for the higher pitches, using the factor \( 1.029302236 = 2^{\frac{1}{24}} \):

\[
d_{n+1} = \frac{1}{1.029302236} \times d_n = 2^{-\frac{1}{24}} d_n
\]

Eqn. 4: 5

Here \( d_0, d_1, \ldots, d_{12} \) are the respective pipe diameters [A: Lüli jingyi: Inner Bk. 2 (Lūshu: Fasc. 1: 47a–51b); A: Lüli jingyi / FENG 1998: 63–69]. \( d_0 \) is the diameter of the huangzhong [1-C] pipe, derived from its length \( l_0 = 1 \) chi via historical considerations and numerological relationships.


\[
\text{Huangzhong circumference } O_0 = \frac{l_0}{9} = 0.111\,111\ldots \text{ chi}
\]

Eqn. 4: 6


\[
\text{Hzhng diameter } d_0 = \frac{O_0}{\pi_{\text{朱}}} = 0.035355\ldots \text{ chi}, \quad \pi_{\text{朱}} = \frac{40}{9\sqrt{2}} = 3.142\,697\ldots
\]

Eqn. 4: 7

where \( \pi_{\text{朱}} \) is Zhu Zaiyu’s special value for \( \pi = 3.141592653590 \ldots \).

Zhu Zaiyu provides a grand summary of pipe dimensions (lengths, external and internal circum-
ferences, external and internal diameters, cross-section areas, and volumes) for all 36 pipes, covering a
range of 3 octaves from double-huangzhong [1-C], through huangzhong proper [1-C], and half-huang-
zhong [1-Č] to half-yingzhong [12-B], in [A: Lüli jingyi: Inner Bk. 3 (Lūshu: Fasc. 1: 71a–79b); A: Lüli jingyi / FENG 1998: 94–110]. The numbers in these pages are expressed in 18-digit precision. As Zhu
Zaiyu himself says, those mind-numbing numbers are intended for theoretical rather than practical use.

For our purposes, a diagram gives a perfectly adequate picture, and is far easier to comprehend
(Fig. 4: 8a, Fig. 4: 8b). Note that the pipes are open at both ends, and they all have a cutout at one end
to serve as the mouthpiece. We know that the pipe ends are open, because Zhu Zaiyu explains that
the panpipe [xiao 蕭], which is a set of pipes [guan 管] bound together and arranged in order from long
to short (see Ch. 5), is open at its bottom [A: Lüli jingyi: Inner Bk. 8 (Lūshu: Fasc. 4: 13a–14b, 16a); A: Lüli jingyi / FENG 1998: 623–626, 629]. He also cautions players of his pipes not to cover up its lower end
[A: Lüxue: Bk. 1: 19a; A: Lüxue / FENG 1986: 42]. The mouthpiece cutout is a constant size for all pipes,
\( d_0/2 = 0.017\,6 \) chi, the same in length and width [A: Lüli jingyi: Inner Bk. 8 (Lūshu: Fasc. 4: 7b); A: Lüli jingyi / FENG 1998: 611–612]. It is an essential part of their design for obtaining the correct pitches.
Fig. 4: Note 35  Derivation of $\pi_朱$ by the true and natural numbers of heaven = 9 & earth = 10.

[A: Yuexue xinshuo: 45b (A: Zhu / Li F2013: 236)]

Counting the white dots, $\bigcirc$-arc = 10, thus circumference = 40. Counting the black dots, $\square$-side = 9, thus diameter = diagonal = $9\sqrt{2}$. Therefore $\pi_朱$ = circumference / diameter = $40 / (9\sqrt{2})$. 

*******************************************************************************
Fig. 4: 8a  The 12 equal-ratio pitch-pipes, with their lengths and external and internal diameters.  
[A: Lüxue: Bk. 2: 39ab (Exemplar at Princeton University Gest Library TA141/2377 v.4)]
The 12 equal-ratio pitch-pipes, with their lengths and external and internal diameters.

Note the longitudinal millet grain = 1 fen_9, 81 fen_9 = huangzhong

Length 1 chi
Length 0.9438 chi
Length 0.8908 chi
Length 0.7937 chi
Length 0.7491 chi
Length 0.7071 chi
Length 0.6674 chi
Length 0.6299 chi
Length 0.5946 chi
Length 0.5612 chi
Length 0.5297 chi
1 transverse millet grain = 1 fen_10, 100 fen_10 = huangzhong

The diagram clearly shows the mouth cutout on each pipe, which is the same size = 0.0176 chi for all pipes. Ext = external diameter; Int = internal diameter.

LENG Qian's tuning is lower than that of CAI Yuanding by more than 5 pitches, and sounds too full and lax. Yuanding is higher than Qian by more than 5 pitches, and sounds too shrill. The new tuning lies between these two, and might fairly be considered as central. LENG Qian's tuning is the one used in ceremonial music at the Taichang Court.

Fig. 4: 8b  The 12 equal-ratio pitch-pipes, with their lengths and external and internal diameters.


a  See p. 225.
**THE PITCH OF huangzhong AND ZHU Zaiyu’s TUNING IN SOUND**

**In theory**

With the pipe dimensions firmly established, it is in principle a straightforward matter to find all their pitches, either directly by experiment, or theoretically by calculation. Let us first try the calculation. This makes use of a formula from elementary physics. For a pipe open at both ends, its fundamental frequency is

\[ f = \frac{v}{\lambda} = \frac{v}{2 (l + \Delta_e + \Delta_m)} \]  

Eqn. 4: 8

where \( v = 343.2 \text{ m s}^{-1} \) is the speed of sound (conveniently taken at 20°C), \( \lambda \) is its wavelength, \( l \) is the pipe length, and \( \Delta_e \) and \( \Delta_m \) are the end and mouth corrections respectively. The pipe end correction is a difficult problem in mathematical physics, whose analytical solution was only obtained in 1948 by Levine & Schwinger. In the long-wavelength limit where \( \lambda >> d \) (\( d \) = pipe diameter) (this condition holds very well for the fundamental frequencies of the pipes), its value is \( \Delta_e \approx 0.613 \frac{d}{2} \). For the pipe mouth correction, there is no adequate physical theory (more below). As a very rough estimate, suppose we make the common assumption that \( \Delta_m = \Delta_e \). Combining all the above information, we then get an estimate for the pitch of huangzhong [1-C], as Zhu Zaiyu knew it. \( v = 343.2 \text{ m s}^{-1} \) (at 20°C), \( l = 0.255 \text{ m}, \Delta_e = \frac{1}{2} \times 0.613 \times 0.035 \times 0.255 \text{ m} \), \( \Delta_m = \Delta_e \).

\[ f \approx \frac{343.2}{2 \times 0.255 \times (1 + 0.613 \times 0.035 \times 0.255)} = 658.8 \text{ Hz} \]

On an equal-tempered scale with A4 = 440 Hz, this corresponds to a concert pitch of E5 – 1.3 ¢.

If desired, the pitches of all other notes on Zhu Zaiyu’s pipes can be calculated in a similar manner, as was first done by Yang [B: YANGYL R2009c: 256–257]. These ‘classical’ calculations show that, apparently, Zaiyu’s pipes produce a close approximation, but not perfect agreement, to equal tuning. The intervals between adjacent pitches are all slightly too narrow by 1 to 2 ¢, and the octave from huangzhong [1-C] to half-huangzhong [1-C̅] is only 1.186 ¢, compared to the correct value of 1.200 ¢. The reason for the discrepancy is clear. According to Eqn. 4: 8, the frequencies \( f \) will vary in the ratio \( 2^{1/12} \) only if the denominator \((l + \Delta_e + \Delta_m)\) varies in the inverse ratio \( 2^{-1/12} \). If the pipe length \( l \) is made to decrease in the ratio \( 2^{-1/12} \), then the correction \((\Delta_e + \Delta_m)\) must also decrease in the same ratio \( 2^{-1/12} \). With the proportionality \( \Delta_m + \Delta_e = 0.613 \times d \), this means that the pipe diameters \( d \) must also decrease in this ratio \( 2^{-1/12} \). Yet Zhu Zaiyu has made his pipe diameters decrease by the larger ratio \( 2^{-1/24} \) instead (\( 1 > 2^{-1/24} > 2^{-1/12} \)). The pipe diameters change too little in proportion to their changes in length; and as a result, the end and mouth corrections are not sufficiently compensated for.
However, the main error actually lies not in Zhu Zaiyu’s pipes, but in the above calculations. The approximation $\Delta_m = \Delta_e$ for the mouth correction $\Delta_m$ is simply too poor. The physical processes at the open end and at the mouth end of the pipe are quite different, so there is really no good reason to expect that their corrections should be the same. At the open pipe end, a sound wave inside the pipe radiates into open space. At the pipe mouth, an air jet blown by the player strikes the edge of the pipe mouth, which creates a series of turbulent vortices in the air stream, and the resulting periodic changes in air pressure and air flow then excite resonant oscillations of the air column inside the pipe. The effects of the irregularly-shaped mouth cutout, and the player’s variable embouchure, only add to the complications. Since the mouth cutout is the same size for every pipe, the pipe mouths are not proportionately scaled from pipe to pipe. This fact renders invalid all calculations which assume a simple proportionality factor between the mouth correction $\Delta_m$ and the pipe diameter $d$.

Xu [B: XUF 1996] has attempted to deal with the problem by an ad-hoc estimate for the effect of the mouth cutout. Xu’s hypothesis is that the uniform cutout, of size $\Delta_c = 0.0176$ chi, decreases the mouth correction for every pipe by a uniform amount of $-\Delta_c/2 = -0.256 \times 0.0176/2$ m $[= -2.253$ mm]. His calculated table exhibits a perfect 100¢ interval between all adjacent pipes, and it is hailed by Dai as a vindication of Zhu Zaiyu’s work. But Xu’s hypothesis really has no physical basis, and it cannot serve as justification for fine quantitative distinctions on Zhu Zaiyu’s temperament. Moreover, his perfect 100¢ intervals are calculated with insufficient precision, and this hides a systematic error in his results. A more precise calculation shows that, according to his formula, the octave interval from huangzhong [1-C] to half-huangzhong [1-C̅] is really 1 199.73¢, instead of the perfect 1 200¢ as claimed. Xu’s work is not the theoretical vindication of Zhu Zaiyu’s pipes that it claims to be; but at least, it has exposed the error of previous ‘classical’ calculations, and makes clear the importance of the mouth cutout in the overall tuning design of the pipes.

By experiment

Given the inadequacy of the theoretical approach, experimental tests take on primary importance. These tests attempt to verify the pitches of Zhu Zaiyu’s pipes by actual performance on carefully-made replicas. Earlier work in this direction was performed by Chuang and by Chen. They have been superseded by the more careful experiments of Liu [B: LIUY 1992]. Liu crafted pipes as close to Zhu Zaiyu’s specifications as possible, with the correct mouth cutouts. The open pipes were blown by a human player and recorded on 2 runs of the experiment, and pitch measurements were then made on the recorded tones. Most of the tests were carried out on the half-length pipes, for the simple reason that they were easier to play: it was very difficult to make any sound come from the longer pipes at all. Liu’s results are reproduced in Fig. 4: 9.
Fig. 4: 9  TABLE  Measured pitches of Zhu Zaiyu’s pipes.
[B: LIUY 1992: 61, 67]

Proper-length pipes made of stainless steel, half-length pipes of copper.  
Acoustical \( \chi = 254.8 \) mm

Date of recordings: 4–5 May 1991  
Room temperature: 21°C  
Player: YANG Limin

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Length / mm</th>
<th>Internal diameter / mm</th>
<th>Pitch (1) / ¢</th>
<th>Difference (1) / ¢</th>
<th>Pitch (2) / ¢</th>
<th>Difference (2) / ¢</th>
<th>Mean difference / ¢</th>
<th>Mean pitch / ¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huangzhong</td>
<td>1-C</td>
<td>254.90</td>
<td>E5–29</td>
<td>408</td>
<td>E5–18</td>
<td>389</td>
<td>398.5</td>
<td></td>
</tr>
<tr>
<td>Guxian</td>
<td>5-E</td>
<td>202.20</td>
<td>#G5–21</td>
<td>481</td>
<td>#G5–29</td>
<td>505</td>
<td>493</td>
<td></td>
</tr>
<tr>
<td>Nanlì</td>
<td>10-A</td>
<td>151.60</td>
<td>#C6–40</td>
<td>199</td>
<td>#C6–24</td>
<td>198</td>
<td>198.5</td>
<td></td>
</tr>
<tr>
<td>Yingzhong</td>
<td>12-B</td>
<td>134.98</td>
<td>#D6–41</td>
<td>119</td>
<td>#D6–26</td>
<td>105</td>
<td>112</td>
<td></td>
</tr>
</tbody>
</table>

\( \frac{1}{2} \)-huangzhong | 1-Ć | 127.41 | 6.36 | 6.33 | E6–22 | E6–21 | 1 202 |
\( \frac{1}{2} \)-dalì    | 2-ṭĆ    | 120.20 | 6.16 | 6.20 | F6–45 | F6–25 | 1 288.5 |
\( \frac{1}{2} \)-taicou  | 3-Ĭ     | 113.47 | 6.00 | 5.94 | #F6–41 | #F6–25 | 1 390.5 |
\( \frac{1}{2} \)-jiatzhong| 4-ṭĐ    | 107.14 | 5.81 | 5.76 | G6–44 | G6–23 | 1 490 |
\( \frac{1}{2} \)-guxian  | 5-Ĕ     | 101.10 | 5.64 | 5.62 | #G6–40 | #G6–22 | 1 592.5 |
\( \frac{1}{2} \)-zhonglü | 6-ṭĒ    | 95.48  | 5.48 | 5.46 | A6–38 | A6–37 | 1 686 |
\( \frac{1}{2} \)-ruibin | 7-ṭĒ    | 90.10  | 5.32 | 5.30 | #B6–39 | #B6–21 | 1 793.5 |
\( \frac{1}{2} \)-linzhong | 8-Ć     | 85.04  | 5.18 | 5.16 | B6–36 | B6–21 | 1 895 |
\( \frac{1}{2} \)-yize    | 9-ṭĞ    | 80.30  | 4.98 | 5.00 | C7–34 | C7–28 | 1 992.5 |
\( \frac{1}{2} \)-nanlì   | 10-Ĭ    | 75.78  | 4.84 | 4.84 | #C7–41 | #C7–32 | 2 087 |
\( \frac{1}{2} \)-wuyi   | 11-ṭĬ   | 71.54  | 4.74 | 4.76 | D7–38 | D7–29 | 2 190 |
\( \frac{1}{2} \)-yingzhong| 12-Ĭ   | 61.51  | 4.58 | 4.58 | #D7–43 | #D7–23 | 2 290.5 |
As may be expected, the largest source of error comes from the vagaries of the human performer. The inevitable variations in embouchure influence the mouth correction and sounding pitch far more than any minute details of pipe dimensions. The mean pitch of huangzhong [1-C] is $E_5 - \frac{(29 + 18)}{2} \, \text{¢}$ with standard deviation 5.5 ¢, i.e.

$$\text{huangzhong [1-C]} = E_5 - (23.5 \pm 5.5) \, \text{¢} = 650.4 \pm 2.1 \, \text{Hz}$$

which is about a quarter-pitch lower than the theoretical value of $E_5 - 1.3 \, \text{¢}$ calculated on p. 221 \(^{47}\). This shows that the mouth correction $\Delta_m$ is far more considerable than was assumed in that calculation. What is more noteworthy is that, aside from random errors of experiment, the last column of Fig. 4: 9 shows no systematic departures from true equal-temperament, of the sort predicted by the ‘classical’ calculations, or apparently indicated by the experiments of CHUANG and CHEN. LIU’s huangzhong [1-C] to $\frac{1}{2}$-huangzhong [1-C] octave is 1 202 ¢, and from huangzhong to $\frac{1}{4}$-huangzhong [1-C] it is 2 403.5 ¢; the discrepancies from the true values of 1 200 ¢ and 2 400 ¢ are well within the bounds of experimental error. Discrepancies like the 1 199.73 ¢ error mentioned on p. 222 cannot be ruled out, but such hair-splitting differences have no audible consequences on practical music-making.

We can conclude then, that the pitch-pipes of Zhu Zaiyu do provide a set of instruments in equal-tempered tuning, as good as any musician can possibly expect.

**CENTRAL TONES OF THE VOICE & THE OCTAVE REGISTER OF huangzhong**

For Zhu Zaiyu, the absolute pitch of huangzhong [1-C] held a mystical significance. He says [A: Lüli jingyi: Inner Bk. 10 (Lüshu: Fasc. 4: 92a); A: Lüli jingyi / FENG 1998: 785]:

The musical pitches represent the spiritual rectitude of heaven and earth, and constitute the central tones of the human voice. They cannot be decreased or increased (shortened and raised or lengthened and lowered by human artifice).

律乃天地正氣人之中聲不可以損益也
The “central tones of the human voice” are the practical standards by which to judge the pitch of huangzhong and all the fundamental pitches. Zhu Zaiyu complains that the huangzhong pitch standard fixed by LENG Qian 冷謙 (c. 1310 – 1371) early in the Ming dynasty and currently in use at the Court of Imperial Sacrifices [Taichang Si 太常寺] is pitched too low (LENG’s huangzhong [1-C] ≈ Zaiyu’s [11→B♭ or 10-A+]), and he criticizes the huangzhong of CAI Yuanding 蔡元定 (1135–1198) as pitched too high (CAI’s huangzhong [1-C] ≈ Zaiyu’s [4→E]) 48: with these pitch standards, some songs would exceed the central tones of the voice and the range of comfortable singing. He illustrates his complaint with 3 hymns of LENG sung at the worship ceremony for the Imperial Ming ancestors. 49 The 1st hymn has a low note which would be difficult for young singers if sung at LENG’s pitch (written A, sounding approx. B♭3+, more on its octave register below); the 2nd hymn has a high note which would be a strain for older singers if sung at CAI’s pitch (written D, sounding approx. A5); whereas the 3rd hymn would be just fine if sung at Zaiyu’s pitch (written range A to A, sounding approx. #C4 to #C5). He explains [A: Lüli jingyi: Outer Bk. 2 (Lüshu: Fasc. 5: 26b); A: Lüli jingyi / FENG 1998: 872] :

The 12 fundamental pitches are all central tones. […] What is a central tone? The singing comes naturally. Even if it is high, it is not so high that one strains and cannot reach it; even if it is low, it is not so low that one chokes and cannot force it out. This is what is meant by ‘central tone’. Above the central tones are the half-length pitches; they are the clear tones. Below the central tones are the double-length pitches; they are the murky tones.

When we look at the theoretical (p. 221) or experimental (p. 223) results for Zhu Zaiyu’s standard pitch of huangzhong, it comes as something of a surprise that it is pitched so high. Zaiyu’s huangzhong [1-C] sounds at 650 Hz, or about concert E5. This is in the soprano register, and certainly not a “central tone of the human voice”. It is all the more true, when we consider that in his writings, the singers are always men or boys, but never women. Zhu Zaiyu clarifies his meaning in a remark made elsewhere in Lüli jingyi [A: Lüli jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 51a; A: Lüli jingyi / FENG 1998: 1089; see Ch. 6] :

“High voices sing high, low voices sing low. 聲高依高聲低依低”. Zaiyu does not mean that all voices must sing in soprano, but each person should sing in a voice register comfortable for himself. (NB The result is that, in transcriptions of the vocal music, I have written all voice parts 1 or 2 octaves below Zhu Zaiyu’s original notation, i.e. for treble voices, huangzhong = [1-C], to sound at a pitch about concert E4, or for men’s voices, huangzhong = [1-C], to sound at a pitch about concert E3.)
We must conclude that, when Zhu Zaiyu speaks of huangzhong or any other pitch, he may mean it in its literal pitch register, or it may be meant as a pitch 1 or more octaves lower. This is not to say that octave register is unimportant to him. As we have seen, he carefully distinguishes between murky tones (double-length pitches), central tones (proper-length pitches), and clear tones (half-length pitches). But these distinctions must be understood in a relative sense: they distinguish between octave registers in the same song, with the same instrument. Between different songs, or between different instruments, absolute octave register has a less clearly-defined meaning. When transcribing his music into staff notation, where octave register cannot be left ambiguous, I have applied some musical common sense to determine a suitable octave register for each part. Any editorial adjustments made in this way are indicated by the incipits, which show the literal (unadjusted) pitch registers of the original notation.
Although half-length pitches are 6 in number, clear tones are limited to 4 only. Higher pitches would be a strain to reach.

Although double-length pitches are 6 in number, murky tones are limited to 4 only. Lower pitches would choke to force out.

**Fig. 4: 10** Central tones, clear and murky tones, and singing range.

[A: Lüli jingyi: Outer Bk. 2 (Lüshu: Fasc. 5: 35a)  
(https://iiif.lib.harvard.edu/manifets/view/drs:15498530$818d)]

Pitches are notated enharmonically as convenient.
NOTES

1 [B: *Hanshu*《漢書》: Bk. 21 〈Treatise on the musical system and calendar 律曆志〉: Pt. 1; B: *Hanshu* / ctext 2006–: http://ctext.org/han-shu/lv-li-zhi/zh#n62917; B: *Hanshu* / WU & LIU 2013: 979–1007]. LIU Xin 劉歆’s work has not been independently transmitted, and it is known only through its record in *Hanshu*, where BAN Gu 班固 acknowledges LIU Xin’s contribution in the opening paragraph of his 〈Treatise〉. A modern summary and discussion of *Hanshu*’s metrology may be found in [B: QIUQM et al 2001: 45–50]; but note that QIU’s calculation of the frequency of *Hanshu*’s huangzhong pipe (= 384.8 Hz) is not accurate, due to a wrong value for the pipe-end correction (see p. 221).

2 For a clear and succinct overview of Chinese music theory in English, the reader may consult [C: CHEN Yingshi T2002]. [C: CHEN Yingshi T1988–1989] is slightly more technical. An older reference is [C: COURANT 1914: 78–143], which contains a great deal of source material from the works of Zhu Zaiyu, and remains one of the best presentations of classical Chinese music theory in a Western language. References in Chinese provide a fuller picture. For a modern systematic (non-historical) exposition, the textbook by TONG et al. may be recommended [B: TONGZL et al 2004]. Historical surveys of Chinese tuning and temperament theory, from modern perspectives, are clearly presented in the monographs by DAI [B: DAINZ 1994: 139–192, 205–297, 310–380], and by LI [B: LIM 2007: 41–119]. The newer monograph by CHEN [B: CHENQS 2011] gives a more detailed survey of the subject, but CHEN’s discussion is often stultifying instead of illuminating, and I was disappointed to find that (in the sections on Zhu Zaiyu at least, p. 567–624) there are many mistakes and misprints in the numerical calculations.

3 [B: CHENWN 1992: Ch. 2–4; B: DAINZ 2008: Ch. 4–5, 9].


5 To justify his proposition that huangzhong = 1 chi, Zhu Zaiyu repeatedly cites this principle in his works: *Lüxue xinshuo*《律學新說》 [A: *Lüxue*: Preface: 2b, Bk. 1: 2a, 3b, Bk. 2: 31a; A: *Lüxue* / FENG 1986: 3, 11, 15, 130]; *Lüli jingyi*《律呂精義》 [A: *Lüli jingyi*: Inner Bk. 1 (Lüshu: Fasc. 1: 8b, 9b), Inner Bk. 10 (Lüshu: Fasc. 4: 94a); A: *Lüli jingyi* / FENG 1998: 5, 9, 789]; *Suanxue xinshuo*《筭學新說》 [A: Suanxue: 4a]; *Jialiang suanjing*《嘉量算經》 [A: *Jialiang*: Bk. 1: 16a]; and the short treatise *Lüli zhiyi bianhuo*《律呂質疑辨惑》 [A: *Lüli zhiyi*: 9b]. The quoted passage from *Hanshu*, in its mention of “90 fen”, is phrased rather awkwardly. In [A: *Lüxue*: Bk. 2: 49b–51a; A: *Lüxue* / FENG 1986: 165–166], Zhu Zaiyu cites from the historical literature several variant quotations of this passage, all of which omit mention of “90 fen”, and suggests that the phrase “90 fen” in the received text of *Hanshu* is corrupt. However, there are other variant quotations of this same passage (not cited by Zaiyu), that are equally definite in reading “90 fen” as correct [B: QiuQS 1999: Vol. 1: 159–161].
The theory of ‘watching for the ethers [houqi 候氣]’ holds that the 12 pipes of the 12 fundamental pitches somehow resonate with the yin-yang ethers of heaven and earth, in their yearly cycle of ebb and flow. The experiment consists in burying the 12 pitch-pipes in the ground in some prescribed arrangement, stuffing their open ends (exposed above ground) with a particular kind of ash (specifically burnt ash from a reed grown in Henei 河内, Zhu Zaiyu’s and He Tang’s hometown as it happens), and on the appropriate day of each month, so the theory goes, the corresponding pipe would resonate and its ashes would be scattered. See [B: Houhanshu 《後漢書》 [History of the Latter Han dynasty (25–220)]: 〈Treatises 志〉 / by SIMA Biao 司馬彪 (? – 306): Bk. 1 〈The musical system and calendar: Pt. 1 律曆 上〉 ; B: Houhanshu / ctext 2006–: http://ctext.org/hou-han-shu/lv-li-shang/zh#n77942 ; B: Houhanshu / WEI 2013: 5091]. Although houqi was a poorly-tested and eventually even fraudulent piece of pseudo-science, it held sway over Chinese music and calendrical theory for something like 1 700 years, from the time of its invention by (probably?) Jing Fang 京房 (~77 – ~37), until its abolition by Imperial order in 1669. Two excellent surveys of houqi are [C: BODDE R1981] on its earlier history, and [C: HUANG & CHANG T1996] on its later history. Several articles by TANG focus on more specific issues of houqi, or contain material particularly pertinent to Zhu Zaiyu [B: TANGJK 2002; B: TANGJK 2003; B: TANGJK R2006: 7, 32–33].

He Tang was only a partial believer in houqi. He thought that only the huangzhong 煌鍾 pipe would resonate at the winter solstice in the 11th month, but the experiment would fail for all other pipes in the other months. See [B: Yuelü guanjian: 〈Para. 8 On watching for the ethers 第八章論候氣〉; B: Gujin tushu / F1934: Vol. 736: 22b]. It does not appear that He had performed the experiment himself.

Zhu Zaiyu’s views on houqi underwent several significant changes through his life. His early attitude was to ignore it with disdain [A: Sepu 《瑟譜》 [Notes on the se] (1560): Bk. 10: 5ab]. This changed later to an ambivalent acceptance [A: Lüli rongtong 《律曆融通》: Preface (1581) (Lishu: Fasc. 2: 1a), Bk. 3 (Lishu: Fasc. 2: 88a)]. Finally it gave way to a resounding rejection of the whole notion [〈Preface to Lüxue siwu pu [The 4 elements of musical metrology] 律學四物譜序〉 (before 1584, and appended to later prints of Lüxue xinshuo 《律學新說》 [A: Lüxue: Bk. 4: 42a; A: Lüxue / FENG 1986: 276]); A: Lüli jingyi 《律呂精義》 (prefaced 1596): Inner Bk. 5 (Lishu: Fasc. 1: 126a–128a), Inner Bk. 10 (Lishu: Fasc. 4: 116ab), etc; A: Lüli jingyi / FENG 1998: 185–188, 825–826, etc]. Zaiyu had himself tried the experiment, and found that it did not work [A: Lüli zhenglun 《律呂正論》 (1610): Bk. 1:
Zhu Zaiyu’s evolving views on houqi offer us a handle on investigating the chronological development of his music theory, a complex topic to be reserved for further study.

[C: AMIOT 1779: Pl. VIII] is a very good re-drawing of Fig. 4:1, labelled as “Pied des Hia dans sa grandeur naturelle”. I have not seen a printed copy of the 1779 publication, which may well show Zhu Zaiyu’s lüyue at its natural size of 255 mm, as it is drawn in [A: Lülu jingyi: Inner Bk. 10 (Lüshu: Fasc. 4: 104ab)]. But in the facsimile reprint [C: AMIOT F1973], the pipe is only 226 mm long, too short to be the original size.

The lüchi and duchi are mathematical constructions, not practical measuring instruments. The lüchi subdivided in 9, in particular, is a hypothetical concept invented solely for convenience in calculating the musical pitches using the method of subtraction and addition by ⅓ [sanfen sunyi 三分損益], which requires repeated divisions by 3. The technique of subdivision in 9 was invented by CAI Yuanding 蔡元定 (1135–1198) in his Lülu xinshu 《律呂新書》 (1187) [B: Lülu xinshu / Xingli 1597: Bk. 22: (Ch. 2–4) 7a–13a, Bk. 23: (Ch. 3) 13a–14b], and further developed by Zhu Zaiyu [A: Lülu jingyi 《律呂精義》: Inner Bk. 4 (Lüshu: Fasc. 1: 95b–99b); A: Lülu jingyi / FENG 1998: 137–143; A: Lüxue xinshuo 《律學新說》: Bk. 1: 2b–4b, 5b–7a; A: Lüxue / FENG 1986: 12–16, 20–22]. Both CAI and Zaiyu explain that it is a hypothetical computational technique for use in acoustical calculations. In modern mathematical terminology, it is called base-9 arithmetic. But Zhu Zaiyu’s talk of ancient rulers subdivided in 9 has contributed to confusion in the literature, and it is well to emphasize that no ruler for practical use in Chinese history was ever subdivided in 9. All historical rulers recovered by archaeology, from the earliest specimens from the Shang dynasty (c. −1600 − −1045) onwards, have been subdivided in 10 [B: Qıugm et al 2001: 65–70].

“The 8 kinds of musical instruments are: earth as in the xun, gourd as in the sheng, skins as on drums, bamboo as in pipes, silk as in strings, stone as in stone chimes, metal as in bells, wood as in the zhu 八音土曰埙匏曰笙皮曰鼓竹曰管絲曰絃石曰磬金曰鐘木曰柷” [B: Hanshu 《漢書》: Bk. 21 〈Treatise on the musical system and calendar 律曆志〉: Pt. 1; B: Hanshu / ctext 2006–: http://ctext.org/han-shu/lv-li-zhi/zh#n62928, http://ctext.org/han-shu/lv-li-zhi/zh#n62931; B: Hanshu / WU & LIU 2013: 968].

The 5 tones [wusheng 五聲] are the 5 scale degrees gong 宮, shang 商, jiao 角, zhi 徵, yu 羽 [do, re, mi, so, la] [B: Hanshu 《漢書》: Bk. 21 〈Treatise on the musical system and calendar 律曆志〉: Pt. 1; B: Hanshu / ctex 2006- : http://ctext.org/han-shu/lv-li-zhi/zh#n62920 ; B: Hanshu / WU & LIU 2013: 981].

“There are 12 musical pitches. The yang ones are called lì (tone 4), and the yin ones are called lì (tone 3). The yang pitches function to marshal the ethers and classify objects, and the 1st is called huangzhong [1-C], the 2nd is called taicou [3-D], the 3rd is called guixian [5-E], the 4th is called ruibin [7-F], the 5th is called yize [9-G], the 6th is called wuyi [11-A]. The yin pitches travel among the yang and broadcast the ethers, and the 1st is called linzhong [8-G], the 2nd is called nanlü [10-A], the 3rd is called yingzhong [12-B], the 4th is called dalü [2-C], the 5th is called jiazhong [4-D], the 6th is called zhonglü [6-E].

Zhu Zaiyu’s researches into the length of the acoustical ruler, and other rulers, monies, and millets, are given in parallel in several places. A diffuse account with many historical references is presented in Lüxue xinshuo 《律學新說》 [A: Lüxue: Bk. 2: 1a–20b, 25b–29b; E: Lüxue / FENG 1986: 90–116, 122–128]. A more systematic and concise account is given in Lüli jingyi 《律呂精義》: (Ch. 11 The measurement of length 審度第十一) [A: Lüli jingyi: Inner Bk. 10 (Lüshu: Fasc. 4: 92a–103a); A: Lüli jingyi / FENG 1998: 785–800]; there is some overlap of identical material between Lüxue xinshuo and Lüli jingyi. The late treatise Lüli zhenglun 《律呂正論》 (1610) relates some interesting details about Zhu Zaiyu’s experiments with millets and the Daming baochao [A: Lüli zhenglun: Bk. 1: 4a–9a]. Another brief summary of millets and the carpentry ruler is given in the similarly late Jialiang suanjing 《嘉量算經》 [A: Jialiang: Bk. 1: 9a–10a]. Some significant studies which have helped to clarify Zhu Zaiyu’s researches into the various rulers, coins, and millets, are [B: LIUF 1933: 298 (theoretical relationships); B: YANGYL R2009e: 30–33, 36–40 (theoretical relationships); B: CHUANGPL 1960: 80–89 (theoretical relationships with actual measurements); B: ZHENGRD 1990 (theoretical relationships with actual measurements)].

B: YANGYL R2009e: 37–38 and B: QIU/GM et al 2001: 69] have both made the point that Zhu Zaiyu’s conclusions about rulers from prehistoric times are but poorly founded conjectures. [C: Kenneth ROBINSON 1980: 103] calls it “sheer fantasy”.

Wang Mang 王莽 (~45 – +23) was a nephew of the empress of the Han Emperor Yuandi 漢元帝, who usurped the Han throne in year +9, and reigned as Emperor of the Xin 新 dynasty until his overthrow in +23. He instituted several monetary reforms and created a large number of new coins,

**Fig. 4: 3b caption**  (This caption is a sidetrack, but I provide an explanation for the sake of completeness. Incidentally, it provides a good example of the sort of confused historical analysis that Zhu Zaiyu was wont to employ in his musical metrology.)

a In building up his theory of measurement and musical pitch, Zhu Zaiyu had relied on the *daquan* coin as a support for his construction of the *lüchi*, that is, $1 \text{lüchi} = 9 \times \text{diameter of the daquan coin}$. Unfortunately the *daquan* was a creation of Wang Mang (see Note 19). Zhu Zaiyu was anxious to dissociate his measurement system from anything to do with the usurper, and in this caption he tries to attribute the *daquan* to King Jing of Zhou 周景王 (reigned −544 – −520), and he also contrives to equate its size to the legitimate *cun* 寸 of the Western (Former) Han dynasty (−206 – +9). Regrettably, both arguments are false. The caption in **Fig. 4: 3a** is actually the 2nd half of a longer caption to another illustration in *Lülü jingyi* 《律呂精義》 [A: *Lülü jingyi*: Inner Bk. 10 (Lüshu: Fasc. 4: 96a–b); A: *Lülü jingyi* / FENG 1998: 792]. The 1st part of the entire caption in *Lülü jingyi* reads:


This is followed by the 2nd half of the caption in **Fig. 4: 3b**, in which Zhu Zaiyu interprets the *Hanshu* passage quoted in the 1st half:

a An exegetical note to *Zhouli* 《周禮》 [Rites of Zhou] says that the *daquan* was minted by King Jing of Zhou. b *Hanshu*: 〈Treatise [on food and commodities]〉 says also, “… as the coinage of the Zhou dynasty used both small and big coins in a mutually balanced way …”. These things clearly prove that [the big coin *daqian = daquan*] did not originate with Wang Mang. *Huainanzi* 《淮南子》 [Book of the Master of Huainan] says that 12 foxtail millet grains make 1 *cun*, so this was the system of the Han dynasty. c The 〈Treatise〉
say that the \textit{daqian} had a diameter of 1.2 \textit{cun}, meaning that [Wang] Mang took the \textit{cun} of the Han system of measurement and made it equal to 1.2 \textit{cun} of his system.\textsuperscript{d} That is why the \texttt{〈Treatise〉} says “[Wang Mang] changed the regulations of the Han dynasty”, and not that he changed the coinage of Zhou.

\textsuperscript{b} The \texttt{Zhouli} reference is [B: \texttt{Zhouli}: (Ch. 1 Zhongzai, the Minister of Heaven 天官冢宰: Outer Treasury 外府); B: \texttt{Zhouli} / ZHENG et al 2000: Vol. 7: 190–193]. It recounts a story about King Jing of Zhou, originally recorded in \texttt{Guoyu 《國語》} [Discourses of the states]: (Bk. 3 Discourses of Zhou Pt. 3 周語下) [B: \texttt{Guoyu} / ctext 2006–: http://ctext.org/guo-yu/zhou-yu-xia/zh\hbox{n}24533; B: \texttt{Guoyu} / YI \& HOU 1995: 130; C: \texttt{Guoyu T1985: 305}]. This says that King Jing did mint a \textit{daqian} coin in the year −524. But it is a false lead, because whatever coin it was that King Jing minted, it was not the one used by Zhu Zaiyu and illustrated in \texttt{Fig. 4: 2} and \texttt{Fig. 4: 3}, and which was indubitably minted by Wang Mang. Zhu Zaiyu tries to save the situation by saying, [A: \texttt{Lüli jingyi: Inner Bk. 10 (Lüshu: Fasc. 4: 97a); A: \texttt{Lüli jingyi / Feng 1998: 793}] “Therefore the \textit{daquan} was created in the Zhou dynasty, and Wang Mang [merely] followed in that example.” This is, however, insufficient to free his \textit{lüchi} from the taint of any dependence on Wang Mang, unless he further shows that Wang Mang’s \textit{daquan} coin was the same size as King Jing’s \textit{daqian}. He offers no evidence to support that assumption, and no written records exist to document it. The question would be settled conclusively if archaeological specimens of King Jing’s \textit{daqian} coin came to light, but none have been found.

\textsuperscript{c} Zhu Zaiyu bases his statement about foxtail millets on \texttt{Huainanzi (–139)}, written in the Han dynasty by LIU An 劉安 (c. −179 – −122). (See [B: \texttt{Huainanzi}: Bk. 3 〈Patterns of heaven 天文〉; B: \texttt{Huainanzi / ctext 2006–: http://ctext.org/huainanzi/tian-wen-xun/zh\hbox{n}3070; B: \texttt{Huainanzi / He 1998: 258; C: Liu T2010b: 182–183}]. \texttt{Huainanzi’s} text here is corrupt, and there are variant readings and interpretations: the cited references give the version on which Zhu Zaiyu’s reading is based.) It says, “The number of the musical pitches is 12. Hence [the width of] 12 awns equals 1 foxtail millet grain, and 12 foxtail millet grains equal 1 \textit{cun}. 律之數自二十三粟而當一粟二百三十二粟而當一寸”. Zaiyu cites \texttt{Huainanzi’s} 12 foxtail millet grains, which fit into 1 \textit{cun}, in order to suggest a (fallacious) naturalistic justification for his next statement, that Wang Mang did the same to fit his 1.2 \textit{cun} = 12 \textit{fen} into the 1 \textit{cun} of the Han system.

\textsuperscript{d} In the last sentence Zhu Zaiyu claims that 1 \textit{cun} (Han) = 1.2 \textit{cun} (Wang Mang). If this were true, the Han \textit{cun} might have conferred some legitimacy on Wang Mang’s \textit{daquan} coin, which, according to the \texttt{Hanshu: 〈Treatise〉}, had a diameter of 1.2 \textit{cun} (Wang Mang). Unfortunately it is contradicted by the archaeological evidence. Rulers and other measuring instruments excavated from Han times show that the standard unit of length \textit{chi} remained remarkably constant through the Western (Former) and Eastern (Latter) Han dynasties (−206 – +220), including the Wang Mang interregnum in between (+9 – +23). In fact, there exists reasonably reliable archaeological evidence to show that the \textit{chi} had remained the same size as far back as the Eastern Zhou (−340). Its size was 1 \textit{chi} (Zhou) = 1 \textit{chi} (Han) = 1 \textit{chi} (Wang Mang) = 10 \textit{cun} = 231 mm [B: QiuGM et al 2001: 151, 156,
Hanshu says that Wang Mang’s daquan coin had a diameter of 1.2 cun, i.e. 1.2 × 23.1 mm = 27.7 mm. This agrees well with its measured size of 27.3 ± 0.8 mm (p. 210). Zhu Zaiyu’s whole argument on the daquan is thus roundly refuted.

Fig. 4: 3b Huainanzi: Bk. 3 〈 Patterns of heaven 天文 〉 [B: Huainanzi / ctext 2006–: http://ctext.org/huainanzi/tian-wen-xun/zh#n3070; B: Huainanzi / XIONG & HOU 1997: 133; C: LIU T2010a: 134] is the earliest text to provide numerical values for all 12 fundamental pitches, calculated by the method of subtraction and addition by ⅓ [sanfen sunyi 三分損益]. The numbers are expressed only approximately using whole numbers of 2 digits. In Fig. 4: 3b Zhu Zaiyu gives the numbers for the 12 pitches according to Huainanzi, but he has changed zhonglü [6-E] from 60 to 60½, and yingzhong [12-B] from 42 to 43, to bring them more into line with his equal tuning. His calculations are detailed in Lüxue xinshuo 《律學新說》 [A: Lüxue: Bk. 2: 31b–35a; A: Lüxue / FENG 1986: 131–136]. The numbers in Fig. 4: 3b, however, are still too low in precision to bring out the real differences between subtraction and addition by ⅓ and 12-tone equal tuning.


22 [B: QIUGM 1992: 105; B: QIUGM et al 2001: 407] write the mean length as 31.904 cm, without evaluating a standard deviation. QIU also measured the widths of the border on the 39 baochao specimens. Their mean width and standard deviation are 208.6 ± 0.6 mm (my evaluations).

23 http://numismatics.org/search/EastAsian , accessed 23 May 2011. The website lists several hundred specimens of kaiyuan tongbao and daquan coins, but only a small fraction of them are provided with size measurements. These coins can also be seen on the websites of many antique dealers and collectors.

24 The kaiyuan tongbao had a wide circulation during the Tang dynasty, and over the course of some 300 years underwent numerous pressings. Varieties of the coin may be distinguished by different marks on their backsides. Pressings from the early period (621–845) have no markings, or bear a crescent moon mark, on the back. A late variety called the Huichang kaiyuan 會昌開元, distinguished by an additional character on its back side, was minted from 845 onwards. It has been excluded from my survey. (On the history of the kaiyuan tongbao and the Huichang kaiyuan, see [B: PENGXW R2007: 214–217; C: PENG T1994: 246–250].) Zhu Zaiyu explicitly cautions against using the Huichang kaiyuan, and recommends that only coins from the first pressings be used as standards for his acoustical ruler, as only these conform to size [A: Lüxue: Bk. 2: 15ab; A: Lüxue / FENG 1986: 108–109].

25 For a single kaiyuan tongbao coin, with the sample size \( n = 26 \), mean diameter \( \bar{x} = 25.88 \) mm and standard deviation of the population estimated to be \( s_{n-1} = ± 1.8 \) mm, the standard deviation of the mean is \( s_{n-1} / \sqrt{n} = ± 0.35 \) mm. For 10 such coins lined up, the sum of 10 means becomes \( 10\bar{x} = 258.8 \) mm, and the standard deviation of this sum is \( 10 s_{n-1} / \sqrt{n} = ± 3.5 \) mm.
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27 For a single daquan coin, with the sample size \( n = 24 \), mean diameter \( \bar{x} = 27.33 \) mm and standard deviation of the population estimated to be \( s_{n-1} = \pm 0.8 \) mm, the standard deviation of the mean is \( s_{n-1}/\sqrt{n} = \pm 0.17 \) mm. For 9 such coins lined up, the sum of 9 means becomes \( 9\bar{x} = 246.0 \) mm, and the standard deviation of this sum is \( 9s_{n-1}/\sqrt{n} = \pm 1.5 \) mm.

28 Several other experimental verifications of Zhu Zaiyu’s rulers and coins may be mentioned, but they have all been superseded by [B: ZHENGRD 1990]. [B: CHUANGPL 1960: 84–86] measured a number of (more than 12) ancient coins, and chose one kaiyuan tongbao with a crescent moon mark as the best representative, to derive an acoustical ruler of 255.25 mm. [C: Kenneth Robinson 1980: 103] measured kaiyuan tongbao coins from the Ashmolean Museum at Oxford; he found that they ranged in size from 24 to 27 mm, from which he derived a duchi of 254 mm (= 10 inches). [B: LIUY 1992: 58] took measurements from another crescent-moon kaiyuan tongbao coin, and derived a duchi of 254.8 mm.

29 [B: YANGYL R2009e: 32–33 (originally published 1937)] took measurements on 48 drawings in Lüxue xinshuo 《律學新說》 and Lüli jingyi 《律呂精義》, and obtained an average value for Zaiyu’s acoustical ruler = 254.8 mm. In Dai’s monograph of 1986 [B: DAINZ 1986: 209–211], he repeated the same 48 measurements of Yang, and obtained a slightly smaller average value of 253.2 mm for the acoustical ruler; but in the revised edition of 2011 [B: DAINZ rev. 2011: 104], Dai repudiated the whole method as unreliable, saying that the printed paper changed in size with age.

30 The shrinkage of the print has already been mentioned in Ch. 1. Yet the question may be raised, whether the shrinkage (or expansion?) arises from the paper, or the printing block, or both. These doubts can be laid to rest with quantitative measurements. Comparison of the 2 prints TA141/278 and TA141/2377 shows that their differences in size are much more pronounced vertically than horizontally (typically 3–4 mm top to bottom, or about 1.5%; and −0.5 to +0.5 mm left to right, or about 0.03%). The amounts of shrinkage are also unequal between top and bottom, and between left and right. Such non-uniform shrinkage can only come from the wooden printing block, not from the paper. Moreover, some pages of print exhibit cracks, which always occur in a horizontal direction (for example in [A: Caoman: 42a.1 (TA141/278 and TA141/2377); A: Caoman: 43a (TA141/278); A: Xuangong: 13a (TA141/278)]; all these cracks are also visible on the print [A: Yuelü quanshu http://nrs.harvard.edu/urn-3:FHCL:3744719]). The wooden printing blocks have shrunk vertically across their grain in an uneven way, causing the wood to crack open horizontally, as often happens.

The stability in size of the paper is proved by further evidence. There is a bronze (copper?) printing plate of the Daming baochao, unearthed from the site of the former Ming mint at Nanjing: its size is 319 × 212 mm [B: MaFH et al [1988–]: Vol. 5 (2009): No. 3218 (p. 408, 616)]. The dimensions of the border on the paper prints of the Daming baochao are (319.0 ± 1.1) × (208.6 ± 0.6) mm [Note 23], and in the 7 diagrams of Lüxue xinshuo 《律學新說》 (tabulated in Fig. 4: 6) in the print TA141/2377, the dimensions of the baochao border are (318.71 ± 0.25) × (208.01 ± 0.38) mm. The width of
208 mm is constant between the baochao specimens and TA141/2377, and the length of 319 mm is constant between the printing plate, baochao specimens, and TA141/2377 (within errors of measurement). The paper has not changed in size, and measurements along its horizontal length (the direction in which all the acoustical rulers are drawn) are particularly reliable.

Note that the acoustical chi is not simply its length as drawn in the diagrams, but an abstraction equal to the mean of the lengths. That is why its standard deviation is the sd of the mean = ± 0.10 mm, and not simply the sd of the lengths of the border = ± 0.29 mm.

The Princeton University Library Catalog gives this information for TA141/2377Q https://pulsearch.princeton.edu/catalog/4007564:

律學新說四卷 [Lüxue xinshuo in 4 Books], 框 frame 25 × 20.2 公分 cm, ...
操縵古樂譜 [Caoman guyue pu], 框 25.7 × 20 公分:
旋宮合樂譜 [Xuangong heyue pu], 框 25.4 × 20 公分.

The stated dimensions agree with my measurements in Fig. 4: 5 only approximately.

The length of the huangzhong pipe is 1 chi = 255 mm, and its external diameter is 0.05 chi = 12.7 mm (from Fig. 4: 8). The height of each column of text in Lüxue xinshuo《律學新說》 is 244 mm, and the width is (187 / 12) = 15.6 mm (from measurements of the inner text frame in Fig. 4: 5). Thus the columns of text are not a literal depiction of 12 huangzhong pipes, but I have no doubt that they are meant to be a symbolic representation of them.

Recall the lüchi inscription (p. 203), which says that the circumference of the huangzhong measuring pipe is 9 fen⁹ = 1 cun⁹ = 1 chi⁹ / 9. Eqn. 4: 6 \( \pi_0 = l_0 / 9 \) merely restates this relationship in a simpler mathematical form.

In this note I give some supplemental comments on Zhu Zaiyu’s square, circle, and π.

There is a very simple pictorial explanation for Zhu Zaiyu’s formula (Eqn. 4: 7) \( \pi_0 \approx 40/(9\sqrt{2}) \). It is shown in Fig. 4: Note 35 (p. 218), and is self-explanatory. (This diagram belongs to the present note, not to the main text. But due to some horrible bug in Microsoft Word, the diagram cannot be shown in an endnote, so I am forced to put it in the main text, where it does not belong.) The diagram illustrates Zhu Zaiyu’s fascination, amounting to an obsession, with the circle, square, and the numbers 9 and 10. The same kind of thinking permeates his lifelong concern with the Jialiang measuring vessel 嘉量 [A: Lüxue: Bk. 4: 1a–12b; A: Lüxue / FENG 1986: 222–237; A: Lülü jingyi: Inner Bk. 10 (Lüshu: Fasc. 4: 103b–110b); A: Lülü jingyi / FENG 1998: 801–815; A: Jialiang: Bk. 1], and the numerical diagrams Hetu 河圖 [Yellow River Chart] and Luoshu 洛書 [Luo River Script], both connected to the Yijing《易經》 [A: Lüli rongtong: Preface; A: Lüxue: Bk. 1: 1b–2a, 9b–10a; A: Lüxue / FENG 1986: 10–11, 26].
This is not the place to delve into Zhu Zaiyu’s numerology, but an obvious contradiction in Fig. 4: Note 35 should at least be explained. The caption says, “9 is circular, as an image of heaven. [...] 10 is square, as an image of earth.” But the diagram shows just the opposite, the circular arc = 10, and the square side = 9. Zhu Zaiyu explains his meaning in his commentary surrounding the diagram [A: Yuexue xinshuo [A new discourse on music]: 42a–48b]. The title of the diagram “The true and natural numbers of heaven = 9 & earth = 10” quotes from the Yijing, [B: Yijing; (Appended commentary Pt. 1 繫辭上); B: Yijing / ctext 2006–: http://ctext.org/book-of-changes/xi-ci-shang/zh?en=on#n46928; C: [Yijing] T1899: 365] “Heaven is 1, earth is 2, heaven is 3, earth is 4, heaven is 5, earth is 6, heaven is 7, earth is 8, heaven is 9, earth is 10.” And according to an ancient Chinese cosmology, heaven is round and earth is square (see for example, [B: Lüshi Chunqiu 《呂氏春秋》 / by Lü Buwei 呂不韋 (? – −235) et al : Bk. 3: 〈The cyclic principle 圜 道〉; B: Lüshi / ctext 2006–: http://ctext.org/lv-shi-chun-qiu/yuan-dao/zh?en=on#n23214; C: LÜ T2000: 109]). Therefore, “9 is circular, as an image of heaven. 10 is square, as an image of earth.” On the other hand, 10 is the number associated with the Hetu, whose diagram is round; and 9 is the number associated with the Luoshu, whose diagram is square [A: Lüli rongtong: Preface (Lishu: Fasc. 2: 1b–3b); A: Lüxue: Bk. 1: 9b–10a; A: Lüxue / FENG 1986: 26]. Zhu Zaiyu also makes an appeal to the ancient classic of astronomy Zhoubi suanjing 《周髀算經》, which says, [B: Zhoubi: Bk. 1; B: Zhoubi / ctext 2006–: http://ctext.org/zhou-bi-suan-jing/juan-shang/zh#n59430; C: CULLEN 1996: 174] “The circle derives from the square, the square derives from the trysquare 矩, and the trysquare derives from 9×9 = 81. … Heaven is round and earth is square.” This then justifies the diagram, with its circular arc = 10, and square side = 9.

His numerological mysticism notwithstanding, Zhu Zaiyu was enough of a pragmatic empiricist to verify his value of $\pi$ 朱 by measurement [A: Lüxue: Bk. 1: 10b–11a; A: Lüxue / FENG 1986: 29]. He made a diagram like Fig. 4: Note 35, with the square side = 9 cun 寸 (= 0.9 chi 尺). Using a small slip of paper cut into 1 cun length, he moved it around the circle, marking each point with a needle, and found that the circumference was just 40 cun. Given that the error in $\pi$ 朱 is only about 1 part in 3000 (more precisely $(\pi - \pi)/\pi = 1/2845$), amounting to an error of 0.36 mm in the circumference, it would be surprising if his rough method of measurement detected any error.

In fact, Zhu Zaiyu’s huangzhong pipe, jialiang measuring vessel, and formula for $\pi$ 朱 together form a self-consistent metrological system. Zhu Zaiyu calculated the volume of the huangzhong pipe in 2 ways: $V_\alpha$ using the pipe circumference $O_0$ from Eqn. 4: 6, and $V_\beta$ using the dimensions of the jialiang measuring vessel ($V_\alpha$ in [A: Lüxue: Bk. 4: 12ab; A: Lüxue / FENG 1986: 236–237]; $V_\beta$ in [A: Lüxue: Bk. 4: 7a–8a; A: Lüxue / FENG 1986: 229–230; A: jialiang: Bk. 1: 15a–17a]). The 2 approaches appear to to be entirely different and independent of each other, but their results $V_\alpha$ and $V_\beta$ turn out to agree exactly. This looked like such a marvellous confirmation of his whole metro-
logical theory to Zhu Zaiyu that he described it in detail in his 1584 Preface to *Lüxue xinshuo*, enthusing that it was “the most wondrous thing in computational art 算術至妙者也” [A: *Lüxue*: Preface: 2b–3a; A: *Lüxue* / FENG 1986: 3]. Without the benefit of algebraic formulas, he could not have known that the marvellous agreement is a mathematical consequence of his formula for π朱. If the true value of π were used instead, the exact agreement would disappear. The interdependence of π朱 and the 2 different methods of calculation Vα and Vβ has never been noted before — even Zhu Zaiyu himself did not know it. It can readily be shown by a few algebraic transformations, but I omit the proof as it would carry us too far afield. I state it here as a formal proposition, phrased in terms of the volumes of the measuring vessel Jialiang and the pipe Huangzhong.

**PROPOSITION**

Let

\[ l_0 = 1 \text{ chi} \quad \text{and} \quad d_0 = \frac{l_0}{9 \pi朱} \]

(length and diameter of Huangzhong by Eqn. 4: 6 and Eqn. 4: 7)

and let the volume of Huangzhong be

\[ V_\alpha = \frac{\pi朱}{4} l_0 d_0^2 \quad \text{or} \quad V_\beta = \frac{\text{Jialiang}}{1600} \]

Then

\[ \pi朱 = \frac{40}{9\sqrt{2}} \]

if and only if

\[ V_\alpha = V_\beta \]

**PROOF**

Reserved for another study

Writers commenting on Zhu Zaiyu have been almost unanimous in their criticism of his use of π朱 [B: LIUF 1933: 296; FENG Wenci 馮文慈 in A: *Lüxue* / FENG 1986: 288; B: CHENWN 1992: 114–118; B: DAINZ 2008: 268; etc]. It is a product of mysticism, it is unscientific, and it is of inferior accuracy compared to the best value of π available in his day. 1100 years before Zhu Zaiyu, ZU Chongzhi 祖沖之 (429–500) had already found that [B: *Suishu*《隋書》 [History of the Sui dynasty (581–618)] / Zhonghua 1973: (Bk. 16) 388; B: GUOSC 2010: 270; C: MARTZLOFF TR2006: 281]

\[ 3.1415926 < \pi < 3.1415927 \]

Eqn. 4: Note 35.1

ZU gave an ‘approximate ratio 約率’ \( \pi_2 = 22 / 7 = 3.142857 \ldots \) which is certainly approximate, but he gave another ‘precise ratio 密率’ \( \pi_1 = 355 / 113 = 3.14159292 \ldots \), which is a closer approximation to π than π朱 = 3.142697 \ldots. Yet Zhu Zaiyu rejects π1 and π2 as unnatural, and prefers his own π朱 instead [A: *Lüxue*: Bk. 1: 10b; A: *Lüxue* / FENG 1986: 27; A: *Lüli zhenglun*: Bk. 2: 4a–5b]. Is he not letting his numerological superstitions prevail over his rational judgement?

Zaiyu’s choice of π朱 may not be as capricious as it seems. He had after all verified its accuracy by measurement (however roughly), and without an electronic calculator which pops up π = 3.141592653590 \ldots at the touch of a button, how could he tell which of π朱, π1, π2, or some other value was in fact the most accurate? The question can bear a closer examination.
Zu Chongzhi’s mathematical writings have not survived. His numbers $3.1415926 < \pi < 3.1415927$ and $355/113$ are quoted in Suishu without proof, and look complicated; whereas $\pi$ is derived from a simple diagram, and verified by Zhu Zaiyu’s own measurement.

In China, the value of $\pi$ was first calculated by what we today would regard as a mathematically correct method by Liu Hui 刘徽 (fl. 263), in his annotation of the anonymous mathematical text Jiuzhang suanshu《九章算術》 [9 Paragraphs on mathematical methods] [B: Jiuzhang / GUO 2009: 39–56; C: Jiuzhang suanshu T1999: 88–98; C: Jiuzhang suanshu T2005: 144–147, 176–185, 769–778]. Starting from a regular 6-sided polygon inscribed in a circle of radius 10 cun, Liu dissected it repeatedly into a $6 \times 2^1$-gon, $6 \times 2^2$-gon, $6 \times 2^3$-gon, $6 \times 2^4$-gon, $6 \times 2^5 = 192$-gon. Evaluating the area of the 192-gon, he demonstrated that the area $A$ of the circle lies between the bounds $314.1024 = 314.169/625 < A < 314.2704 = 314.169/625$. Eqn. 4: Note 35.2. We may interpret this as a rigorous inequality $3.14024 < \pi < 3.142704$. Liu was then content to use the simpler approximation $\pi_4 = 3.14$. He goes on to cite a more precise ratio $\pi_3 = 3927/1250 = 3.1416$, but this is only an astute estimate, not rigorously proven. (Liu does suggest that $\pi_3$ may be proved by continuing the polygon dissection to a $6 \times 2^9 = 3072$-gon, but he did not actually write out those further steps.) $\pi_4$ is not compatible with the more accurate estimate $\pi_3$, but it does not violate the rigorously proven bounds of Eqn. 4: Note 35.2.

Many centuries later, Zhao Youqin 赵友欽 (fl. 1329) set out to test the accuracy of several values of $\pi$ that had been in common use, by means of a variant of Liu’s polygon dissection method. Starting with a square inscribed in a circle, he repeatedly dissected it until he got to a $4 \times 2^{12} = 16384$-gon (the calculation shows only the step from the square to the 8-gon explicitly). With this procedure, he verified that $\pi \approx 3.1415927$ and thereby demonstrated that Zu Chongzhi’s $\pi_1 = 355/113$ is the most accurate ratio [B: Gexiang / Guo 2008: Bk. 5: 13a–18a; B: GUOSC 2010: 419–421; C: Jiuzhang suanshu T1999: 99–100]. The accuracy of $\pi_3 = 3.1416$ is established on the way. He did not test Zu’s inequality Eqn. 4: Note 35.1, which remained unproven. Zhao’s original treatise Gexiang xinshu《革象新書》 [New treatise on gexiang (the heavenly bodies)] was apparently printed sometime in the years 13xx, but it soon became a rarity, and a revised and abridged edition made by Wang Wei 王禕 (1322–1373) gained circulation instead [B: Gexiang / Siku F2008: 〈Abstract 提要〉: 1b]. The Siku quanshu《四庫全書》 [Complete library in 4 treasuries] carries both Zhao’s original treatise, titled as Yuanben Gexiang xinshu《原本革象新書》, and Wang’s abridged edition, titled as Chongxiu Gexiang xinshu《重修革象新書》. In the abridged edition, Zhao’s original proof of $\pi$ is reduced to an outline of his method, and the crucial demonstration from the square to the 8-gon is deleted [B: Gexiang / Wang Siku F2008: Bk. 2: 29b–32b]. Thus it does not furnish a full proof of the accuracy of $\pi_1$ nor $\pi_3$.

Jiuzhang suanshu is a highly revered classic of Chinese mathematics, so naturally Zhu Zaiyu knew it well: he cites its contents freely in Lüxue xinshuo [A: Lüxue: Bk. 1: 2b; A: Lüxue / Feng 1986: 12]. He
was equally familiar with *Chongxiu Gexiang xinshu*, for he quotes from this work in 4 places in *Lüli rongtong* (DETAIL references below). These 4 quotations agree in wording with WANG’s abridged edition, but not with ZHAO’s original version. Apparently he only saw the abridged edition, but not ZHAO’s original treatise with its full proof of $\pi_1$ and $\pi_3$. Thus the approximations which we today know to be more accurate, $\pi_1$, $\pi_3$, and Eqn. 4: Note 35.1, were not established by proofs known to Zaiyu, while the proven approximations, $\pi_2$ and $\pi_4$, lie outside the bounds of Eqn. 4: Note 35.2 and are less accurate than $\pi_朱$, which does lie within those bounds. It was therefore perfectly logical for him to prefer $\pi_朱$ over the other approximations. Though $\pi_朱$ is but a guess inspired by numerology, it is supported by marvellous agreements in Zaiyu’s metrological theory, and verified by Zaiyu’s own measurement. Of course, by modern standards of mathematical rigour, verification by measurement does not have the status of logical proof, and experimentally, $\pi_朱$, $\pi_1$, $\pi_3$, and Eqn. 4: Note 35.1 are all compatible with Zaiyu’s rough measurement. And we may fault Zhu Zaiyu for not having appreciated the far-reaching potential of LIU Hui’s sequential dissection procedure, but we do so only from hindsight with our knowledge of integral calculus.

DETAIL Quotations in *Lüli rongtong*《律曆融通》 from *Chongxiu Gexiang xinshu*《重修革象新書》 (abridged), and corresponding references in *Yuanben Gexiang xinshu*《原本革象新書》 (original)

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<td>趙友欽曰唐一行已前没滅之術不同 [...]</td>
<td>〈盈虛〉96ab Bk. 2: 11a–12a</td>
<td>Bk. 2: 4b–5b</td>
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<td>趙友欽曰地中有子午卯酉四向 [...]</td>
<td>〈正方〉108b Bk. 2: 25a</td>
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<td>趙友欽曰舊云日未出二刻半天先明 [...]</td>
<td>〈更點〉111a Bk. 1: 24b–25a</td>
<td>Bk. 2: 14a</td>
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<td>趙友欽曰日月之食其所行交道有常數 [...]</td>
<td>〈定數〉121ab Bk. 1: 18b–19a</td>
<td>Bk. 3: 11ab</td>
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One of the earlier writers to appreciate the value of Zhu Zaiyu’s work was JIANG Yong 江永 (1681–1762). In his late treatise *Lüli chanwei*《律呂闡微》 [*Explicating the minute subleties of the musical pitches*] (1757), JIANG gives an enthusiastic exposition of Zhu Zaiyu’s music theory, but he notes the inaccuracy of $\pi_朱$, and painstakingly recalculates all of Zhu Zaiyu’s pipe dimensions with the improved value $\pi_0 = 3.14159265$, obtained from Eqn. 4: Note 35.1 by interpolation (pipe lengths and diameters same as Zhu Zaiyu, but circumferences, cross-sections, and volumes are recalculated) [B: *Lüli chanwei / Siku*: Bk. 3: 16a–18a, Bk. 4: 1a–18a]. Although these corrections are no doubt justified from a rational scientific standpoint, yet from a practical perspective, such minute corrections, to pipe parameters which exert little influence on the sound in any case, really have no audible effects in music.
In 1933 BARBOUR wrote a short paper on π, which seems to have been forgotten by every writer on Zhu Zaiyu. Working from the limited numerical data on Zaiyu’s pipe lengths, diameters, and cross-sections given in [C: AMIOT 1779], BARBOUR did a brilliant piece of arithmetical reverse-engineering, and correctly deduced that Zhu Zaiyu used the approximation π朱 = 20 (2 1/2) / 9. He alone had the sympathetic understanding to say that, although Zhu Zaiyu might have used other approximate values for π, “it is not unreasonable to suppose that […] he preferred the simplicity and the symbolism of the doctrine that, if the chord of the quarter-circle is 9, the arc thereof is 10.” [C: BARBOUR 1933: 72]

Zaiyu’s numbers for the dimensions of the 36 pipes are reproduced in [C: HSÜEH 1973: 130–132].

I mention a curious remark by Zhu Zaiyu in his late treatise Lüli zhenglun 《律呂正論》 (1610). He writes [A: Lüli zhenglun Bk. 3: 1a] “The pitch pipe lü does not have a mouth cutout, [but] the panpipe xiao does. 律無吹口，簫有吹口.” Yet in his many drawings of these pipes, including both lü and xiao, they all show mouth cutouts (see Fig. 4: 8, Ch. 5, etc), and he even specifies their size to be 0.017 6 chi. Against this weight of evidence, it is only sensible to ignore this one contrary remark.

To convert between frequencies and cent values, the following formulas may be used. Let a reference pitch of frequency f₀ be assigned the cent value ¢₀ (e.g. pitch A₄ with f₀ = 440 Hz and ¢₀ = 0 ¢). Then a pitch of frequency f has the cent value ¢, given by

\[
\frac{\xi - \xi_0}{1200} = \frac{\log(f/f_0)}{\log 2}
\]

Or equivalently, a pitch with cent value ¢ has the frequency f, given by

\[
f_0 = 2^{(\xi-\xi_0)/1200}
\]

These formulas are exact, and the logarithms may be calculated in any base (2, e, 10, or any positive number) — they all result in the same ¢ value.

The ‘classical’ calculations on the frequencies of Zhu Zaiyu’s pipes are [B: YANGYL R2009c: 256–259; C: Kenneth ROBINSON 1980: 104–110; B: CHENWN 1992: 95–96]. YANG gives no details about his calculation method, but his huangzhong [1-C] pitch is 315.032 Hz, which would be the case for a closed pipe. CHEN’s calculation confirms that of YANG. But Zhu Zaiyu’s pipes are open. ROBINSON bases his calculations on open pipes; his huangzhong [1-C] pitch is 646.5 Hz, and the octave of 1 186 ¢ cited in the text is based on his work.

The physics of this complicated excitation mechanism is discussed by [C: FLETCHER & ROSSING 1998: Ch. 16].
XU's formula for the pipe frequency is \[ f = \frac{v}{2 \left( l + 2 \times 0.306 d - 0.5 \Delta c \right)} \]

where \( f \) = pipe frequency, \( l \) = pipe length, \( d \) = pipe diameter, \( \Delta_c = 256 \times 0.0176 = 4.506 \text{ mm} \), and \( v \) = speed of sound = 340 m s\(^{-1}\).

There is yet another curious problem. XU's hypothesis makes the mouth cutout shorten the pipe and raise its pitch. CHEN actually reports an experiment with the opposite result. CHEN constructed two pipes of identical length = 245 mm and identical diameter = 15 mm, but one of them has a mouth cutout of size 6.5 mm and the other has a plain mouth. When they were blown, the pipe with the plain mouth sounded a pitch of 334.25 Hz, while the pipe with the mouth cutout sounded a lower pitch of 322.40 Hz. As CHEN says, this is a question which demands further investigation.

After I did my check on the calculation of XU's formula, I found that my criticism had already been voiced by LIUY 1997: 24.

CHUANG may have performed tests on many pipes, but his published results only list measurements on the 3 huangzhong pipes (double, proper, and half-length); his huangzhong proper = 633 Hz [p. 57]. His pipes have a different mouth cutout than Zhaiyu's [p. 92]. His data tend to confirm the calculations of YANGYL R2009: 256–259, but since the mouth cutouts of his pipes do not conform to those of Zhaiyu, his results cannot be applied to them. CHEN does not say whether his pipes are open or closed, but in his experiment huangzhong proper = 315.03 Hz [p. 90], so he must have used closed pipes. Also, his pipes have no mouth cutout. His data come very close to the calculated results of YANG, but again, they cannot apply to Zhaiyu's pipes.

If the calculation of Eqn. 4: 8 (p. 221) is adjusted to the slightly higher temperature (21°C, \( v = 343.7 \text{ m s}^{-1} \)) and slightly shorter acoustical chi (254.8 mm) in the experiment of LIU, the calculated pitch would be 660.1 Hz = E5 + 2.3 c, i.e. 1.4 Hz or 3.6 c higher than the results on p. 221. This would increase the discrepancy between the theoretical and experimental values even further.

We can have full confidence in Zhaiyu's judgement of the huangzhong pitch at the Imperial Taichang Court, as it is based on direct aural evidence. The Manager of Music [Dianyue 典樂, C: HUCKER 1985: No. 6684] at the Zheng court, YOU Shixian 尤世賢 (? – ?), had demonstrated 3 hymns for the worship of the Imperial Ming ancestors by playing them on sheng 穩 brought over from the Imperial Music Office [Shenyue Guan 神樂觀]. CAI Yuanding 蔡元定, on the other hand, lived 400 years before Zhaiyu. Although CAI had written much about the huangzhong pipe in
his theoretical treatise Lülixinshu《律呂新書》, he had not constructed any actual musical instrument to define its pitch in practice. Zhu Zaiyu’s opinion on Cai’s huangzhong pitch is therefore more inferential or conjectural. See [A: Lüxue xinshuo: Bk. 2: 14b, 40a; A: Lüxue / FENG 1986: 107, 141; A: Lüli jingyi: Inner Bk. 5 (Lüshu: Fasc. 1: 114ab–115ab), Outer Bk. 1 (Lüshu: Fasc. 5: 4ab, 6b, 9ab); A: Lüli jingyi / FENG 1998: 165–168, 834, 837, 842].

[A: Lüxue xinshuo: Bk. 2: 41a–49b; A: Lüxue / FENG 1986: 144–164; see Ch. 3] shows the 3 hymns in score, with melody by LENG Qian 冷謙 (1368, rev. 1388) for voice and sheng 笙, arranged with caraman 操缦 accompaniment for qin 琴 and se 瑟 by Zhu Houwan and Zhu Zaiyu. The 3 tunes are:

1. (Shouhe 壽和) “思皇先祖 In remembrance of our Imperial forefathers”, for the 1st offering
2. (Yuhe 豫和) “對越至親 Face to face with our closest kin”, for the 2nd offering
3. (Ninghe 寧和) “惟前人功德 By the virtuous works of our ancestors”, for the 3rd offering

The original tunes (without accompaniment) can be found in Taichang xukao《太常續考》[Handbook of the Court of Imperial Sacrifices / Sequel] [B: Taichang / Siku F2008: Bk. 2: 38b–39b]. For transcriptions and studies, see [C: AMIOT 1779: 184–185; C: COURANT 1914: 130–131; C: LAM 1998: 148–150]. The transcriptions by AMIOT would render these 3 hymns as the 1st pieces of Chinese music made known to the West.
Chapter 5

The instrumentation of Zhu Zaiyu’s music

Zhu Zaiyu was a practical musician who constructed his own musical instruments, and no doubt he played many of them as well. Unfortunately none of his actual instruments have survived. But we can be glad that he has left for us detailed drawings and descriptions of all his instruments, in his scores Xiangyin Shiyue pu《鄉飲詩樂譜》[Songs of the 《Shijing》 for performance at the Country Banquet], Xiaowu xiangyue pu《小舞鄉樂譜》[Music of the country to accompany the minor dances], Lingxing xiaowu pu《零星小舞譜》[Choreography for the minor dances at the Lingxing Temple], and most importantly in the treatise Lüli jingyi《律呂精義》[Precise principles of the musical pitches].¹ This chapter introduces the musical instruments used by Zhu Zaiyu, following his description of them in Lüli jingyi.

(NB OCTAVE REGISTER OF huangzhong 黃鍾 [1-C] This Chapter was written at an early stage of the project, when I was still confused about the octave register of huangzhong. Music examples for the yue and sheng are transcribed 1 octave too low, with proper-huangzhong written as [1-C], instead of the more appropriate [1-C]. Music examples for the qin and se are transcribed 1 octave too high, with proper-huangzhong written as [1-C], instead of the more appropriate [1-C]. I apologize for these errors, and hope that they will be corrected in a later publication.)

THE 8 KINDS OF MUSICAL INSTRUMENTS [bayin 八音]

Traditionally, Chinese musical instruments are classified in 8 categories according to the materials which make up their sounding parts, and they are referred to as the ‘8 kinds of musical instruments’ or ‘8 sonorous materials’ [bayin 八音].² The term bayin appeared very early in the ancient texts, and the following oft-quoted passage from Shangshu 《尚書》[Classic of ancient documents] (composed c. −1300? – c. −400?) is probably the locus classicus:³

Poetry gives voice to the heart and mind, song prolongs the voice, tones follow the song, and musical pitches harmonize the tones. The 8 kinds of musical instruments sound in mutual concord, with no disorder among them. Gods and men are brought into harmony thereby.

詩言志歌永言聲依永言聲和聲八音克諧無相奪倫神人以和
What then are these 8 kinds of musical instruments, and how do they function in music? More information is provided in several later texts. *Zhouli* [Rites of Zhou] (? – c. −150) gives us a list of the 8 types of sonorous materials: 4

The Grand Master is in charge of the 6 yang and 6 yin pitch-pipes, whose notes match the tones of yin and yang. 5 […] The notes are all sounded by the 8 kinds of musical instruments: metal, stone, earth, leather, silk, wood, gourd, and bamboo.

大師掌六律六同以合陰陽之聲 [...] 皆播之以八音金石土革絲木匏竹

As examples of these 8 kinds of instruments, those of metal may be typified by bells, stone by stone chimes, earth by the *xun* 塤 (an egg-shaped wind instrument made of clay), leather by drums, silk by string instruments like zithers, wood by the zhu 柝 (a box-like instrument made of wood) and *yu* 戬 (a wooden tiger), gourd by the *sheng* 笙 (a reed instrument with pipes attached to a gourd), and bamboo by flutes and pipes. *Guoyu* [Discourses of the states] relates the words of the master musician Líng Zhōujiū 伶州鳩 (fl. −522) 6, who has this to say about their musical functions: 7

Tones harmonize music, and musical pitches regulate the tones. Instruments of metal and stone start off the music, instruments of silk and bamboo propel it along, poetry gives voice to it, song chants it, gourds express it, earthen instruments assist it, and instruments of leather and wood give it rhythm.

聲以和樂律以平聲金石以動之絲竹以行之詩以道之歌以詠之匏以宣之瓦以贊之革木以節之

As we shall see (Ch. 6: Ch. 7), Zhu Zaiyu does actually employ his musical instruments very much in the manner as described by Líng Zhōujiū.

Almost all of the instruments that Zhu Zaiyu uses in his music are described in *Lüli jingyi*: Inner (Ch. 10 Diagrams of musical instruments 樂器圖樣第十). This long Chapter is a veritable organological treatise in itself, embracing historical references to the instruments, details of their construction, and touching on aspects of performance technique. The musical instruments are classified in the traditional 8 types according to their sonorous materials, and listed in 3 grades of priority. (1) Instruments blown by mouth: guan, *xiao*, yue, *di*, *chi*, *sheng*, *yu*, *xun* — these have the highest priority, because they are the instruments of human breath; (2) the zithers *qin* and *se*, which are an essential accompaniment to the human voice in song; and (3) instruments of metal, stone, leather, and wood, which merely provide the rhythm [A: *Lüli jingyi* Inner Bk. 8 (*Lùshū* Fasc. 4: 3b); A: *Lüli jingyi* / FENG 1998: 603]. In
the descriptions below I shall follow Zhu Zaiyu’s categorization, abstracting much of my information from this Chapter.

**CLASS 1  BAMBOO**

Zhu Zaiyu describes 5 instruments in this category: *guan* 管, *xiao* 箫, *yue* 篪, *di* 篠, and *chi* 簏. They are all pipes of various descriptions. They can of course be made from bamboo, but other materials, including jade, bone, bronze, and glass have all been used, not to mention plastic.

*Guan* 管

The *guan* is simply the pitch-pipe [*lüguan 律管*] discussed in Ch. 4. Note that this is not the double-reed pipe commonly used in Chinese music today, which goes by the identical name *guan*. Pitch pipes take pride of place among all the instruments of Zhu Zaiyu, because they are more than mere musical instruments — they embody the *principles* of musical pitch [*A: Lüü jìngyi: Inner Bk. 8 (Lüshu: Fasc. 4: 4a); A: Lüü jìngyi / FENG 1998: 604–605*]. There are 3 sizes: 12 big double-length pipes, sounding double-*huangzhong* 倍黃鍾 [1-C] through double-*yingzhong* 倍應鍾 [1-B]; 12 medium-size proper-length pipes, sounding *huangzhong* [1-C] through *yingzhong* [1-B]; and 12 small half-length pipes, sounding half-*huangzhong* [1-C] through half-*yingzhong* [1-B]. They may be played singly one pipe at a time, or tied up into sets of 12 or 6 pipes each, for convenience in playing. The 12 medium-size single pipes are illustrated in **Fig. 5: 1**, and their numerical dimensions were discussed in Ch. 4.
Fig. 5: 1 Proper-length medium guan.

[A: Lülü jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 5a) (A: Lülü jingyi / FR1968: Inner Bk. 8: 9)]

12 pitches from huangzhong [1-C] through yingzhong [1-B].
The *xiao* is sometimes called the panpipe [paixiao 排簫]. Each individual pipe is the same as a *guan*, and made of bamboo. 16 pipes are bound together to form a set of *xiao*. The big *xiao* set consists of the pipes double-*huangzhong* [1-C] through proper-*jiazhong* [1-D], and the small *xiao* set consists of the pipes proper-*huangzhong* [1-C] through half-*jiazhong* [1-D]. The big *xiao* is illustrated in Fig. 5:2. Again, this *xiao* is not the same instrument as the identically-named *xiao* used in Chinese music today. The modern *xiao* is a single pipe with holes along the side. Zhu Zaiyu’s *xiao* is a set of pipes with no holes along the side, but each one is a pipe open at both ends.

![Fig. 5:2 Set of big xiao.](A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 13b) (A: Lüli jingyi / FR1968: Inner Bk. 8: 26))

16 pitches from double-*huangzhong* [1-C] through proper-*jiazhong* [1-D].
Yue 篎

Zhu Zaiyu seems to believe that the musical instrument *yue* 篎 was originally a measuring instrument — the measuring pipe *lüyue* 律龠 of antiquity. The measuring pipe *lüyue* was the embodiment of *huangzhong* 黃鍾 itself: its length formed the acoustical ruler, its capacity inside was 1/2 *ge* 合, and it could be filled with exactly 1 200 millet grains, whose weight was 1/2 *liang* 兩 (see Ch. 4). With the passage of time, the measuring function of the *lüyue* was forgotten, and it became the musical pipe *yue*, which the feather dancer holds in his hand as a prop for his dance (see Ch. 3) [A: *Lülü jingyi*: Inner Bk. 8 (Lushu: Fasc. 4: 16b–17a, 20b); A: *Lülü jingyi* / FENG 1998: 629–630, 638]. But elsewhere he states that the *yue* was originally an instrument of music and dance, which was then borrowed for metrological use [A: *Lüxue*: Bk. 4: 1a; A: *Lüxue* / FENG 1986: 222]. We need not be overly concerned about the historical (in)accuracy of such contradictory speculations, but may simply accept the pipe *yue* as one of Zhu Zaiyu’s many musical reconstructions.

The dimensions of the musical pipe *yue* are the same as the double-length pitch-pipe [*lüguan* 律管]. The *yue* differs from the pitch-pipe, however, in that it has 3 or 6 holes at the side, and by fingering the holes, one pipe can produce several different tones. By means of overblowing at the 5th, the 3-hole *yue* can play a 7-note gamut, and the complete 12-note gamut can be played on the 6-hole *yue*. As there are 12 double-length pitch-pipes, each sounding the octave below one of the 12 proper-length pitches, so there are 12 differently-sized *yue* of each variety (3 holes and 6 holes). Their lowest tones sound the octave below the 12 proper pitches, and they form a set of transposing instruments over 12 pitch ranges. **Fig. 5:** shows 8 different *yue* in the high pitch range, and a fingering chart for the 3-hole and 6-hole *yue* with lowest tone on double-huangzhong [1-□].
Fig. 5: Yue. (Please see NB on octave register (p. 244))

- ▲ Small yue (lowest tone on each pipe from double-yize [5-#G] to double-yingzhong [8-B]).
  [A: Lülü jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 19a) (A: Lülü jingyi / FR1968: Inner Bk. 8: 37)]

- ▼ Fingering chart for the yue.
Di 筮

The di is very similar to the yue. They are both pipes with holes at the side, and their only difference is in the mouthpiece. The yue has a mouth cutout like the pitch-pipe, guan, and xiao, but the mouthpiece of the di extends beyond its end by 5 fen 分 (= 0.05 chi). It is stopped by a wooden plug, which is cut away on one side to leave a slit for the player’s breath to get through. Again, this di 筮 is not the same as the common modern instrument di 笛. The modern di 笛 is a transverse flute with a mouth-hole on one side, but the di 筮 is held longitudinally and blown from the end. 8 big di are illustrated in Fig. 5: 4, with the lowest pitch of each pipe from double-huangzhong [1-C] to double-jiazhong [1-D].

![Fig. 5: 4 Big di.](image)

[A: Lüli jingyi: Inner Bk. 8 (Lishu: Fasc. 4: 22b) (A: Lüli jingyi / FR1968: Inner Bk. 8: 44)]

Lowest pitch of each pipe from double-huangzhong [1-C] to double-jiazhong [8-D].
**Chi 箫**

The *chi* is uniquely different from the other pipes, in that it is blown from a mouth-hole set in the middle of the pipe. It has 6 finger holes, and can produce 11 or 12 different pitches. It is reportedly very difficult to play, and intonation depends very much on the player’s embouchure and breath control [A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 27a–b); A: Lüli jingyi / FENG 1998: 651]. It comes in 2 sizes. The big size is illustrated in Fig. 5: 5. In the early 20th century, MAHILLON reconstructed the two *chi* from their description by AMIOT, and they are described in his *Catalogue.*

![Fig. 5: 5 Big chi.](A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 25b) (A: Lüli jingyi / FR1968: Inner Bk. 8: 50)]
CLASS 2  GOURD (sheng 笙 AND yu 竽)

There is basically only 1 instrument in the category gourd, but it comes in many sizes, and there are many variations in the number of pipes and in their arrangement and tuning. This instrument is the sheng 笙. The big sheng is called the yu 竽. Zhu Zaiyu usually reserves the name sheng for the smaller instrument, although it is also used as a generic term to include both the small sheng and the big yu.

The sheng is an instrument with a very ancient history. It is mentioned many times in classical texts like the Shijing 《詩經》 [Classic of poetry] (c. −1000 – c. −600); and Zhouli describes an official called Shengshi 笙師 [Master of Sheng], who was in charge of the sheng and yu, as well as other musical instruments like the yue, xiao, chi, di, guan, xun 壤, chongdu 春度, ..., for performances at official ceremonies. 6 sheng have been recovered from the tomb of Marquis Yi of Zeng 曾侯乙, who lived or died in year −433, and there are other archaeological specimens of comparable antiquity. The oldest sheng had a body grown from a gourd, with about 10 to 20 or more pipes inserted into the gourd and sticking out from its top, arranged to make a shape like the wings of a phoenix. The player blows into the hollowed-out gourd, and each pipe is sounded by a bamboo reed at its base when its air-hole is stopped by the player’s finger. By stopping up the air-holes of several pipes at once, the player can produce harmony; and this is a standard traditional performance technique on the instrument. By the time of Zhu Zaiyu, the gourd was usually replaced by a block of wood, and the bamboo reeds were replaced by copper ones. This is the construction recommended by Zaiyu [A: Lülü jingyi: Inner Bk. 2 (Lüshu: Fasc. 4: 28a–29a, 35a); A: Lülü jingyi / FENG 1998: 652–654, 667–668]. Zhu Zaiyu describes 4 sizes of sheng and yu, with 13, 19, or 24 reeds each; Fig. 5: 6 and Fig. 5: 7 illustrate a yu and a sheng, both with 19 reeds. For comparison, the modern sheng usually has 17 reeds. The 17-reed sheng was already in common use in Zhu Zaiyu’s time, although he did not approve of it [A: Lülü jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 34a); A: Lülü jingyi / FENG 1998: 666]. The sheng has been in continuous use in Chinese music from antiquity to the present day, and its construction and design are continually undergoing modification and development. Some of them would have astonished Zhu Zaiyu.
Fig. 5:6  Yu and sheng with 19 reeds.

[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 32a) (A: Lüli jingyi / FR1968: Inner Bk. 8: 63)]

The yu and sheng with 19 reeds are the same size. Real gourd on right, substitute gourd on left.
Fig. 5: Gourds of sheng and yu with 19 reeds.
[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 30ab) (A: Lüli jingyi / FR1968: Inner Bk. 8: 59–60)]

△ sheng 笙.  △ = mouthpiece    yu 箫.  ▶
Although both the sheng and yu shown in Fig. 5: 6 and Fig. 5: 7 have the same size and the same number of pipes and reeds, they do not sound the same notes. This is possible because the lengths of the pipes on the sheng and yu are fake. The sounding pitch of each pipe is determined not by its apparent length, but by the position of an air-hole bored on the inside of each pipe, so as not to spoil the pipes’ beautiful looks. Fine tuning is done by placing little blobs of wax on the reeds. As Fig. 5: 7 shows, the actual range of the 19-reed yu is from double-huangzhong [1-C] to proper-ruibin [7-♯F], and for the 19-reed sheng it extends from double-ruibin [7-♯F] to half-huangzhong [1-Č]; the sheng sounds half an octave higher than the yu. The even bigger 24-reed yu has a range of 2 octaves from double-huangzhong [1-C] to proper-yingzhong [12-B], and the even smaller 13-reed sheng has a range of 1 octave from proper-huangzhong [1-C] to half-huangzhong [1-Č].

Zhu Zaiyu has provided 2 plans for tuning the 19-reed yu and sheng, and they are transcribed in Fig. 5: 8. For both instruments, the tuning begins with huangzhong [1-C], and proceeds through a sequence of 8-pitch intervals and octaves, to end up with the starting pitch huangzhong [1-C] after 20 steps. He was so pleased with these tuning plans that he remarks after each one, [A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 33b–34a); A: Lüli jingyi / FENG 1998: 663–666] “These 19 reeds form an endless cycle, and therefore nothing can be added or eliminated. 此十九簧循環無端是故添減不得”. These instruments can be used for music in any transposition. Now it is obvious to see, that the two tuning sequences are derived from the classical method of subtraction and addition by ⅓ [sanfen sunyi 三分損益]. If the sanfen sunyi method were carried out strictly, each 8-pitch interval would have the ratio 3/2, and after 20 tuning steps, the last pitch would be 13-♯B, which is higher than huangzhong [1-C] by the Pythagorean comma (23. 460 c). The last tuning interval ♯E–C would be a wolf. It is precisely in order to overcome this problem that Zhu Zaiyu created his new equal tuning. If the two tuning
sequences of Fig. 5: 8 truly “form an endless cycle”, free from the wolf, all the 8-pitch intervals must be equally-tempered. Zhu Zaiyu achieved this by tuning the sheng to the equally-tempered pitch-pipes. 13

If we compare Zhu Zaiyu’s tuning sequences with Western tuning methods, we find that his sequence for the 19-reed sheng is the same as the 19th-century method of tuning the piano by ear, as discussed in the tuning plan of JORGENSEN [C: JORGENSEN 1991: 5]. If done on the piano, and playing only single notes at a time and without the aid of counting beats, the difficulty of judging the perfect 5th intervals by ear rendered this an inaccurate method of tuning. Modern piano and organ tuners achieve accuracy only by playing 2 notes together, and listening to the beats between their upper harmonics. Zhu Zaiyu did not know about beats, but the pitch-pipes and sheng are able to play sustained tones, and he specifically asks that every pair of tuning pitches (huangzhong 黃鍾 [1-C] + linzhong 林鍾 [8-G], linzhong + taicou 太蔟 [3-D], etc.) be played together to test their consonance. Moreover he was guided by his pitch-pipes, which provided a ready-made set of equally-tempered pitches, as far as his pipers could play them (see Ch. 4). So perhaps he achieved better results than the 19th-century piano tuners!

The sheng and yu are unique among Chinese wind instruments, in that they can play several notes simultaneously. Indeed, in traditional music for the sheng, it is common practice for the player to add harmony to the main melody in parallel perfect 5ths and 4ths (to use ethnologically inappropriate terminology). Because the sheng has a strong lower register and a weak upper register, harmony added above the melody does not cover it, and the perceived melody remains the same as without harmony, but its texture is coloured in a characteristic way. The similarity to the mixture stop in organ registration is obvious. The sheng is often called a ‘mouth organ’, although ‘mouth harmonium’ may be a more suitable analogy, considering that all its pipes are reed pipes. Zhu Zaiyu explicitly asks for harmony in his music for the yu [A: Lülü jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 34b); A: Lülü jingyi / FENG 1998: 667].

METHOD OF PERFORMANCE ON THE BIG AND SMALL yu

On the outside of each pipe engrave the name of its pitch and octave register (proper pitch or double pitch). If the score says huang, look for the pipe inscribed with the words ‘double-huangzhong [1-C]’ above its air-hole, and stop it with the left thumb. On the pipe with the words ‘proper-huangzhong [1-C]’, stop it with the left index finger. On the pipe with the words ‘double-linzhong [8-G]’, stop it with the right middle finger. On the pipe with the words ‘proper-linzhong [8-G]’, stop it with the right index finger. 4 reeds sound together, but it is all just one huangzhong. Wait for the qin and se to finish their 2 bars of caoman figurations, and then change fingers. Do the same for the other pitches.
The pitch range and pipe arrangement show that this is for the big yu with 24 reeds. Although Zhu Zaiyu speaks only of the yu, no doubt the method applies to the sheng as well. Fig. 5: 9 illustrates this, together with another example from a modern work on Chinese music instrumentation. (NB In the music transcriptions, the harmony notes ad lib are not shown, but this method of performance is indicated by the word [harmony] on the parts for sheng and yu.)

![Fig. 5: 9 Playing harmony on the yu and sheng.](https://example.com/fig5_9.png)

[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 34b); B: HuDT 1982: 55]

- Example by Zhu Zaiyu. (Please see NB on octave register (p. 244))
- Example for modern sheng by Hu Dengtiao 胡登跳.

**CLASS 3 EARTH (xun 墤)**

The xun is the only musical instrument in this class. It is a truly primitive instrument. The earliest xun, dating from about 7000 years ago, was discovered at Hemudu in Yuyao County in Zhejiang 浙江省餘姚縣河姆渡, and 2 xun from about 6000 years ago were unearthed at Banpo at Xi’an in Shānxī 陝西省西安半坡. These most primitive specimens had only 1 blowhole and no finger-holes. Many more xun dating from the Shang dynasty (c. −1600 – −1045), now equipped with finger-holes, have been recovered. The classic texts do not lack for mention of the xun, although it was never as popular an instrument as the qin, se, or sheng (one locus in Zhouli is cited on p. 253).

The xun is usually shaped and sized like a goose or chicken egg, with a hollow body made of clay. There is a blowhole at the top, and several finger-holes on the body. Its construction and design have never been standardized, and the number and placement of finger-holes, methods of blowing, and sounding pitches, all vary from instrument to instrument. Zhu Zaiyu describes a big xun and a small
xun — both have 5 finger-holes, and are 3.5 cun (= 89 mm) high, but the big one is 2.4 cun in diameter at the base, and the small one is 1.75 cun (Fig. 5: 10). A more sumptuous model from the Qing court (1644–1912) is shown for comparison.
Fig. 5: 10  Xun.
[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 37a) (A: Lüli jingyi / FR1968: Inner Bk. 8: 73)]

■ Xun from the Qing court (1644–1912).  6 finger-holes, height 85 mm.
■ Small xun of Zhu Zaiyu.  5 finger-holes, height 3. 5 cun (= 89 mm).
The class of silken instruments includes all those sounded by a string, which in ancient times was made from silk. There are many instruments in this class, and it includes some of the most popular instruments used in Chinese music today, like the zithers zheng 箜篌, yangqin 揭琴, … the lute-like pipa 琵琶, ruan 阮, … and bowed strings like the erhu 二胡, gaohu 高胡, … . Of these many instruments, only the qin 琴 and se 瑟 were used in formal ceremonial music, and only these 2 instruments are described by Zhu Zaiyu.

In Lülü jingyi: Inner Bk. 9 [A: Lülü jingyi (Lüshu: Fasc. 4: 39b–41b); A: Lülü jingyi / FENG 1998: 677–685], Zhu Zaiyu begins his discussion of the qin and se with an ode on the qin, and another ode on the se; he proposes that these may be engraved on the underbelly of the respective instruments. The ode on the qin 〈Qin zhen 琴箴〉 appears to be Zhu Zaiyu’s own composition. It contains 260 characters, and begins thus:

Its measurements following the original design of Shennong, in reverent emulation of [his]
Element Fire with its number 7, 15 […]

揆神農之初制 16 尚火德之數七 […]

However, it has apparently gone unrecognized that the ode on the se 〈Se ming 瑟銘〉 is not the work of Zhu Zaiyu, but instead was written by the late-Song – early-Yuan dynasty musician XIONG Penglai 熊朋來 (1246–1323), author of the Sepu 《瑟譜》 [Music score for the se] [B: Sepu]. 17 It begins as follows, and runs to 1189 characters:

When Paoxi created [many] things, he made the first se by stretching strings over the wood of the phoenix tree. 18 […]

庖犧氏之創物兮始弦桐以爲瑟 […]

In his quotation of the 〈Se ming〉 in Lülü jingyi, Zhu Zaiyu does not name its author. But he had already quoted the same ode in its entirety in his own identically-named early treatise Sepu of 1560 《瑟譜》 [Notes on the se] [A: Sepu / Jiguge F1989: Bk. 8: 1a–3a]; and in Sepu, he duly attributes it to XIONG Penglai, and gives it its proper title 〈Se fu 瑟賦 [Rhapsody on the se]〉. 〈Se fu〉 must have been a favourite poem of Zhu Zaiyu’s, for in addition to quoting it in its entirety twice in his own extant works, he apparently also wrote a commentary on it. This commentary, entitled Se ming jieshu 琴銘解疏 [Explanatory exegesis on the 〈Se ming〉], is listed among the titles of Zaiyu’s writings on his memorial stele 19. Unfortunately it is no longer extant, and it was already noted as lost in the Henei
xian zhi of 1825 《河內縣志》 [Gazetteer and history of Henei county] 20. XIONG’s 〈Se fu〉 is not found in his well-known Sepu, and that may be the reason why it has escaped the notice of musicologists until now. But it is anthologized as the very first item in the literary collection Yuan wenlei 《元文類》 [Classified literary anthology of the Yuan dynasty] / compiled by SU Tianjue 蘇天爵 (1294–1352) 21, and in this context it cannot be unknown to students of Chinese literature. 〈Se fu〉 is also found collected into the compendious Gujin tushu jicheng 《古今圖書集成》 [Encyclopedic compendium of books ancient and modern] / compiled by CHEN Menglei 陳夢雷 (1651–1741) et al. and printed under Imperial auspices in 1726. 22

The qin and se are ancient instruments, and their origins are shrouded in the mists of legend. 23 They are often mentioned together in the classical literature. The song 〈Guan ju 關雎〉 from Shijing 《詩經》 [Classic of poetry], for example, has this line: 24 “The young maiden so fair and kind — with qin and se I will befriend her. 窈窕淑女琴瑟友之 ”. Archaeological findings indicate that the se developed earlier than the qin, and that about −xxx it was already in widespread use throughout north and south China, when the qin was still undergoing development in north China. The tomb of Marquis Yi of Zeng (see p. 253), situated in the south in the area of Chu 楚 (present-day Hunan) and dated to −433, contained 12 se, which in shape and design are already quite close to their classical form. In contrast, it contained only 1 qin, and that one has 10 strings and a neck extending out from its sound-box, quite unlike the classical form of the qin which survives today. 25 The se must have been a very popular instrument in those ancient times. But whereas the qin has flourished and continued its life up to the present as a living musical instrument, with a large corpus of musical scores specially written for its performance 26, use of the se declined with the ages. Its repertoire is much smaller than that for the qin, and in the modern era, the instrument is used only in the worship ceremony for Confucius. 27 Its modern successor is the zheng 箏.

Qin 琴 28

The qin is a zither about 1.2 m in length 29, and stretched with 7 strings over its sound-box. The strings are numbered 1 to 7 from the lowest-sounding string at the top (farthest from the player), to the highest string at the bottom (nearest the player). The tuning depends on the scale of the piece being played (see below). There are 3 basic methods of playing: on the open string [sansheng 散聲], on the stopped string [shi yin 実音, also called anyin 按音], or in harmonics [fanyin 泛音]. In each case the strings are plucked with the right hand. When the string is being plucked, the left hand does nothing on the sansheng, or it may stop the string firmly on the sound-board for the shiyin, or it may touch the string lightly at various nodal points to produce the fanyin. The nodal points are marked by 13 small inlaid markers arrayed across the top of the sound-board, and numbered 1 to 13 from right to left. In the music of Zhu Zaiyu, only open and stopped notes are used; there are no harmonics. For Zhu Zaiyu
(and his father Zhu Houwan 朱厚烷), the use of harmonics, as well as the common practice of sliding the left hand along the string to produce various glissandos and portamentos [chuo & zhu 绸注], and trills and vibratos [yin & nao 吟猱], are all frivolous and excessive ‘sounds of Zheng 郑聲’, unsuitable for the restrained moderation of ceremonial music [A: Lüli jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 13b), Outer Bk. 8 (Lüshu: Fasc. 6: 42b); A: Lüli jingyi / FENG 1998: 214, 1071]. There may also be an acoustical reason for Zhu Zaiyu’s avoidance of harmonics, of which he was not aware. Harmonic tones sound at exact integral multiples of the fundamental frequency \(1\times = \text{fundamental}, 2\times = \text{octave above}, 3\times = \text{octave + ‘perfect 5th’}, 5\times = 2 \text{octaves + ‘Major 3rd’}, \ldots\) \(^{30}\), and the pitches are in just intonation. They would disagree with both the classical tuning using the principle of subtraction and addition by \(\frac{1}{3}\) [sanfen sunyi 三分損益], as well as Zhu Zaiyu’s new equal tuning. \(^{31}\)

**Fig. 5: 12** shows the sound-board of the qin, and the positions of the 13 nodal markers. **Fig. 5: 11** shows 3 sizes of qin (big, medium, small) described by Zhu Zaiyu. Zaiyu’s big qin is 5.5 chi (= 1.402 m) in length, but all 3 sizes are identical in construction, only scaled differently. There exist many tunings for the qin, with a bewildering variety of inconsistent and confusing names used by different writers over the centuries. They are all called variously *diao* 調 or *yun* 均, and these terms generally mean a mode or a scale or a scalar gamut. Zhu Zaiyu denotes his qin tunings by the names ‘proper tuning [*zheng diao 正調*]’, ‘level tuning [*ping diao 平調*]’, ‘clear tuning [*qing diao 清調*]’, and ‘se tuning [*se diao 瑟調*]’. The last 3 names — level tuning, clear tuning, and se tuning are collectively known as the 3 *qingshang* modes 清商三調, and they have long been associated with a form of chamber music for voices and instruments current in the Han dynasty (-206 – +220) and later, called *xianghege* 相和歌. In literature, they are known through the poetic anthology *Yuefu shiji* 《樂府詩集》 [Collected poems of the Music Bureau] compiled by GUO Maoqian 郭茂倩 (1041–1099), which contains the lyrics of many *xianghege*, grouped under the respective headings of these 3 modes [B: Yuefu: Bk. 30–40]. However, this being a purely literary anthology, it says nothing about the actual musical meanings of the 3 *qingshang* modes. A clue more directly relevant to music is given by CHEN Zhongru 陳仲儒 (? – ?), in an account from the year 519 recorded in *Weishu* 《魏書》 [History of the Wei dynasty (386–557)] by WEI Shou 魏收 (507–572). CHEN describes the tuning of the qin and a 13-stringed ‘monochord’ [*lüzhun 律準*], and remarks that “its se tuning takes *gong* as its principal, the clear tuning takes *shang* as its principal, the level tuning takes *jue* as its principal 其瑟調以宮為主清調以商為主平調以角為主”. This cryptic remark has given rise to debate, and scholars are divided in their opinions about its meaning. \(^{32}\) Zhu Zaiyu applied the terms level tuning, clear tuning, and se tuning to his qin tunings, and made his own interpretation of CHEN’s remarks. Whatever their historical accuracy, his interpretation and nomenclature are largely clear and consistent, and they are what we must go by when reading his music.
The strings of the qin may be tuned in a 5-tone gamut [yun 均] (which is used almost invariably today), or a 7-tone gamut (which is much less common). For playing in the 5-tone gamut (in all 12 transpositions), Zhu Zaiyu has provided tuning tables and diagrams for the medium qin [A: Lülü jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 1b–6b); A: Lülü jingyi / FENG 1998: 190–202]. He calls this the level tuning [ping diao 平調], and it places huangzhong 黃鍾 [1-C] on the open 3rd string, if the huangzhong gamut is used. (For those transpositions which do not employ the pitch huangzhong, the 3rd string is tuned to a neighbouring pitch, dalü 大呂 [2-C] or double-yingzhong 倍應鍾 [12-B] instead.) For playing in the 7-tone gamut (in all 12 transpositions), tuning tables and diagrams for all 3 sizes of qin are provided [A: Lülü jingyi: Inner Bk. 7 (Lüshu: Fasc. 3: 1b–3b, 5a–6b), Outer Bk. 8 (Lüshu: Fasc. 6: 35b); A: Lülü jingyi / FENG 1998: 389–395, 399–404, 1060]. The proper tuning [zheng diao 正調], applied on the big qin, tunes the open 4th string to huangzhong [1-C]. The level tuning [ping diao 平調], applied on the medium qin, tunes the open 3rd string to huangzhong (just as in the standard 5-tone huangzhong gamut). The small qin may be tuned in the clear tuning [qing diao 清調] with huangzhong on the open 2nd string, or it may be tuned to an extra-high pitch called the se tuning [se diao 瑟調], with huangzhong on the open 1st string. (For those transpositions which do not contain the pitch huangzhong, the neighbouring pitch dalü [2-C] is used instead.) Zhu Zaiyu prefers the se tuning, because he believes it was the primary tuning of the ancients. In his qin tablatures, pieces written in the 7-tone gamut are notated in the se tuning. **Fig. 5: 13** shows 4 sample tuning diagrams from Lülü jingyi. The 5-tone level tuning and 7-tone se tuning, each in 12 transpositions, are transcribed in **Fig. 5: 14**.
Fig. 5: 11  Big, medium, and small qin.
[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 38b)
(Exemplar at Princeton University Gest Library TA141/278 v.8)]
Fig. 5: 12 Qin soundboard and markers.
[B: YANGYL R2009f: 186]
Fig. 5:13  Tuning diagrams for the qin.
[A: Lüli jingyi: Inner Bk. 6 & 7 (Lüshu: Fasc. 2: 3b, Fasc. 3: 5a) (Exemplar at Princeton University Gest Library TA141/278 v.6 & 7)]

▲ ▲ 5.1  5-tone huangzhong [1-C] gamut.  ▲ ▲ 7.1  7-tone huangzhong [1-C] gamut.
▲ ▼ 5.2  5-tone dalü [1-C#] gamut.  ▼ ▼ 7.2  7-tone dalü [1-C] gamut.
**Qin tunings in the 5-tone gamut**

[Lüli jingyi Inner Bk. 6 (Lüshu: Fasc. 2: 3b-6a)]

Pitch transcription: *huangzhong* 黃鐘 =  projectName texture  = gong 宫

5.1 黃鍾均 huangzhong gamut

5.2 太鈞均 dalü gamut

5.3 太巋均 taicou gamut

5.4 夾鍾均 jiazhong gamut

5.5 姑洗均 guxian gamut

5.6 仲呂均 zhonglü gamut

5.7 房宮均 ruibi gamut

5.8 林鐘均 linzhong gamut

5.9 夷則均 yize gamut

5.10 南呂均 namlü gamut

5.11 無射均 wuji gamut

5.12 應鐘均 yingzhong gamut

**Qin tunings in the 7-tone gamut**

[Lüli jingyi Inner Bk. 7 (Lüshu: Fasc. 3: 5a-7b)]

Pitch transcription: *huangzhong* 黃鍾 =  projectName texture  = gong 宮

7.1 黃鍾均 huangzhong gamut

7.2 太鈞均 dalü gamut

7.3 太巋均 taicou gamut

7.4 夹鍾均 jiazhong gamut

7.5 姑洗均 guxian gamut

7.6 仲呂均 zhonglü gamut

7.7 房宮均 ruibi gamut

7.8 林鐘均 linzhong gamut

7.9 夷則均 yize gamut

7.10 南呂均 namlü gamut

7.11 無射均 wuji gamut

7.12 應鐘均 yingzhong gamut

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**Fig. 5: 14** Tunings for the *qin*. [Please see p. 269, and NB on octave register (p. 244)]

[A: Lüli jingyi: Inner Bk. 6 & 7 (Lüshu: Fasc. 2: 2b–6a, Fasc. 3: 5a–7b)]

- 5-tone gamut in 12 transpositions, for medium *qin* in level tuning [ping diao 平調].
- 7-tone gamut in 12 transpositions, for small *qin* in se tuning [se diao 瑟調].
In Zhu Zaiyu’s tuning tables and diagrams for the qin, the octave registers are not always clearly shown. For example, in Fig. 5:13 for tuning 5.1 (5-tone huangzhong gamut), the pitches of the 1st and 6th strings are both indicated simply as linzhong 林鍾 [8-G], although the 6th string actually sounds 1 octave higher than the 1st string. In the corresponding entry of the tuning table [A: Lüli jingyi: Inner Bk. 6 (Lüshu: Fasc. 2: 3a); A: Lüli jingyi / FENG 1998: 195], the 1st and 2nd strings are notated as double-lin[zhong] 林倍 [8-G] and double-nan[lü] 南倍 [10-A] respectively, while strings 3 – 7 are notated as proper-length pitches (proper-huang[zhong] 黃正 [1-C] – proper-nan[lü] 南正 [10-A]), correctly showing the octave difference. When interpreting such information, my earlier remarks concerning transcription pitch and its octave register (Ch. 3, Ch. 4) must be borne in mind. The qin is a bass instrument (in its lower range), whose modern standard tuning is usually taken to be C2-D2-F2-G2-A2-C3-D3. This is just the tuning 5.1 (if it were notated at the correct octave register), but transposed up about 1 pitch, when we remember that the real pitch of huangzhong [1-C] is close to E5, and my transcription is written about 4 pitches (= Major 3rd, if correctly notated) below sounding pitch. In practice, the pitch of the qin is not absolutely fixed, and even the ‘standard tuning’ of C2-D2-F2-G2-A2-C3-D3 is only a conventional representation. If it is played as a solo instrument (so that there is no need to match its pitch to that of other instruments), it is usually tuned by ear somewhat lower than ‘standard tuning’, and the 3rd string (nominally F2) will often sound some pitch between D2 and F2. (The 5th string will then sound somewhere between F2 and A2.) Indeed, as TANG Jianyuan 唐健垣 notes, if an attempt is made to tune the 5th string up to A2, the higher strings may break from excessive tension. I have verified this on my own qin. Zhu Zaiyu’s qin tuning 5.1, when properly interpreted, has its 3rd string huangzhong sounding at about E2. It is thus entirely consistent with the experience of modern practice. (NB In the transcriptions, I have written all qin parts 3 octaves lower than the original notation, with proper-huangzhong = [1-C], to produce a sounding pitch about E2.)

Se 瑟

The se is a large zither of up to about 2.1 m in length. It has 25 strings, each of which is stopped by a bridge over the sound-board. The positions of the bridges (and the string thickness and tension) determine the pitch and tuning; they are arranged so that the lowest-sounding string is at the top (farthest from the player), as with the qin. Zhu Zaiyu’s se is simply placed on the floor when played. Its strings are plucked to the right side of the bridges by both right and left hands (see Ch. 6), and only open-string notes are used. Zhu Zaiyu describes 3 sizes of se, corresponding to the 3 sizes of qin. The big se is 9 chi (= 2.295 m) in length, but it (or perhaps the small se) must not be so heavy that it cannot be carried on the shoulder of the se player’s guide. The 3 sizes of se are illustrated in Fig. 5:15.
Fig. 5: 15  Big, medium, and small se, with 25-strings.
[A: Lüli jingyi: Inner Bk. 8 (Lüshu: Fasc. 4: 39a)
(Exemplar at Princeton University Gest Library TA141/278 v.8)]
The 25 strings of the se cover a range of 2 octaves. Their pitches are clearly shown on a diagram with a tuning plan, which is repeated in both Lülü jingyi and Caoman guyue pu (Fig. 5:16). The diagram is intended to be pasted at the head of the se, and it may have formed part of the treatise Xiange yaozhi 《弦歌要旨》 by Zhu Zaiyu’s father Zhu Houwan (see Ch. 1). The instructions tell us to tune the pitches of strings 1( ), 3( ), 5( ), 6( ), 8( ), 10( ), 12( ) to the tones of a qin, stopped at marker 9 (2/3 of open string length, sounding a ‘perfect 5th’ above), or at marker 10 (3/4 of open string length, sounding a ‘perfect 4th’ above). The qin itself must be tuned in the standard 5-tone proper tuning (= level
tuning), shown as qin tuning 5.1 in Fig. 5: 13 and Fig. 5: 14. For the other strings in between — 2(♯C), 4(♯D), 7(♯F), 9(♯G), 11(♯A) — the instructions simply say, “Tune it to a pitch on the qin stopped somewhere between markers 9 and 10”, which is uncharacteristically vague for Zhu Zaiyu. The pitches of the higher octave (strings 13 – 25) are tuned by comparing with the lower octave (strings 1 – 12) of the se itself. Alternatively, the se may be tuned using a sheng instead of a qin [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 5: 40a–b); A: Lülü jingyi / FENG 1998: 1067–1068; identically in A: Caoman: 19ab]. Zhu Zaiyu has given yet another, more accurate, tuning method for the se, but it requires the use of 2 qin, tuned to 2 different transpositions of the 7-tone gamut [A: Lülü jingyi: Inner Bk. 7 (Lüshu: Fasc. 3: 17b–19a); A: Lülü jingyi / FENG 1998: 425–428].

The cautionary remark about octave registers, noted earlier for the qin, must certainly apply to the se. It is my misfortune not to have heard a real se, but considering its size, it must be a bass instrument. From the above description of its tuning procedure, it appears that its lower octave should sound as the stopped notes of a qin in the standard qin tuning 5.1. Therefore I have transcribed its part as for the qin, with proper-huangzhong = [1-C]. Since this does not come from actually listening to a se, the result may not be entirely reliable. If the transcription does not indicate the real octave register of the se, the player must interpret the transcription in such a way that it makes sense for the real instrument.

The se has not always been tuned in the manner as Zhu Zaiyu describes. XIONG Penglai (1246–1323) tuned his se in a 12-tone gamut quite similar to that of Zhu Zaiyu, but his higher octave C–B is placed on strings 14–25, and string 13 is tuned “extremely clear” — probably meaning ¼-huangzhong [1-C]. Later on, QIU Zhilu 豳之稑 (1781–1850) tuned his se entirely differently, in a 7-tone gamut with staggered octaves; and the official se of the Qing dynasty (c. 1746) was tuned quite differently again, in a 5-tone gamut like the modern zheng. The lack of a common tuning practice for the se can be seen as a reflection of the fact that it has been an obsolete and rarely-used instrument for many centuries already, so that players find themselves afloat on their own devices, without an anchor to any steady tuning tradition.

CLASS 5 METAL (BELLS 鍾)

CLASS 6 STONE (STONE CHIMES 磬)
CLASS 7  LEATHER

CLASS 8  WOOD
1 Descriptions of Chinese musical instruments, classified according to the ‘8 sonorous materials’, can be found in several older treatises, for example [C: van AALST 1884: 47–83; C: AMIOT 1779: 27–84 (which contains some fine diagrams redrawn from the works of Zhu Zaiyu)]. Modern reference works like Grove music, Die Musik in Geschichte und Gegenwart, or The Garland encyclopedia of world music have generally adopted other (more historical or more functional) categorizations, although of course they contain descriptions of more or less the same instruments. For photographs of actual instruments, including specimens both ancient and modern, the beautiful picture-books [B: LIUDS 1992; B: LIUDS & YUANQY 2008] may be recommended; or indeed, the reader may simply search the internet.

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5 The 6 yang and 6 yin musical pitches produced by the pitch-pipes are just the 12 fundamental pitches, divided into 2 complementary sets of yang and yin. Zhouli itself explains (in […] in the quoted passage):

- The yang pitches are huangzhong 黃鍾 [1-C], dacou 大簇 [= taicou 太簇 3-D], guxian 姑洗 [5-E], ruibin 被賓 [7-Å], yize 夷則 [9-Å], wuyi 無射 [11-Å].

- The yin pitches are dalü 大呂 [2-Å], yingzhong 應鍾 [12-B], nanlù 南呂 [10-A], hanzhong 函鍾 [= linzhong 林鍾 8-G], xiaolü 小呂 [= zhonglù 仲呂 6-Å], jiazhong 夾鍾 [4-Å].

On the matching of the yin and yang tones mentioned in this quote, please see Ch. 3.
Ling Zhoujiu 伶州鸠 (? –?) was the official in charge of music at the court of King Jing of Zhou 周景王 (reigned –544 – 520). Zhoujiu’s speech to King Jing took place in the 23rd year of the king’s reign, i.e. –522 (see Note 7).


[Note 8] [C: Mahillon 1893–1922 : Vol. 2 : 162–169; C: Amiot 1799 : 76–77, Pl. 6 (facing p. 48)].


Feng Guangsheng 冯光生 gives a non-technical account with good pictures, in 〈Ch. 4 Winds 〉 of Music in the age of Confucius / edited by SO [C: SO 2000: 89, 95–98].

Some modern developments in sheng design can be seen in [B: LiuDS 1992: 154–161].

An ‘8-pitch interval’ is, of course, a perfect fifth. Since intervals of fifths and fourths and so forth are never described as such in classical Chinese music theory, I have tried to avoid using such ethnologically inappropriate terminology. The classical Chinese term for generating a series of intervals of perfect fifths is geba xiangsheng 隔八相生, meaning ‘mutual generation across an interval of 8 [pitches]’. The same objection may be raised against the term ‘octave’ too. But since the term ‘octave’ is so firmly established, I have accepted its use.


Shennong 神農 was a mythological sage-king of antiquity, coming after Paoxi 庖犧 (Note 18). It is generally thought that he represents an early agricultural stage in Chinese civilization, and tradition credits him with the invention of farming and the discovery of herbal medicine, among other things. (See, for example, Yijing 《易經》 [Classic of changes]: 〈Appended commentary Pt. 2 繫辭下〉 [B: Yijing / ctext 2006–: http://ctext.org/book-of-changes/xi-ci-xia/zh?en=on#n46944; B: Yijing / Guo & Huang 1996: 533; C: Yijing T1899: 383]; Huainanzi: Bk. 19 〈Cultivating effort 勉務〉 [B: Huainanzi / ctext 2006–: http://ctext.org/huainanzi/xiu-wu-xun/zh#n3425; B: Huainanzi / Xiong & Hou 1997: 1034; C: Liu T2010a: 766–767].) Later accounts augment his list of inventions with the qin or se. The qin emulates Shennong’s number 7 because it has 7 strings.

In the lore of the 5 Elements (wuxing 五行, = Water, Fire, Wood, Metal, Earth), which came into vogue during the late Zhou and Han dynasties, Shennong is associated with the Element Fire and
the number 7. Many of the mystical and numerological associations of 5-Element theory are neatly expounded in an ancient almanac, the 〈Yueling 月令 [Monthly ordinances]), (〈Yueling〉 is today transmitted in 3 texts. The earliest is Lüshi Chunqiu 《呂氏春秋》 [LÜ’s Spring and Autumn compendium] by LÜ Buwei (–235), where it makes up the 1st Chapters of each of Lüshi Chunqiu’s 12 Books of 〈Almanacs 纪〉. An almost identical version, but gathered together all in one piece, appears as Ch. 6 of Liji 《禮記》 [Book of rites]. Huainanzi: Bk. 5 〈Seasonal rules 時則〉 contains a somewhat different variant version. We find in it these words [B: Lüshi / ctext 2006–: http://ctext.org/lv-shi-chun-qiu/si-yue-ji/zh#n23219; B: Lüshi / ZHU et al 1995: 152–154; C: LÜ T2000: 115–116; B: Liji / ctext 2006–: http://ctext.org/liji/yue-ling/zh#n9798; B: Liji / JIANG & HUANG 2007:249–250; C: [Liji] T1885: Vol. 27: 268–269]:

In the 1st month of summer [...] Its king is Yandi, its god is Zhurong. Its creatures are feathery. Its musical tone is zhi [5-sol], its pitch centers on zhonglü [6-E]. Its number is 7. [******] In this month occurs [the seasonal ether of] Beginning of Summer [...] the flourishing Element is Fire.

孟夏之月 […] 其帝炎帝其神祝融其蟲羽其音徵律中仲呂其數七 [******] 是月也以立夏 […] 盛德在火

Yandi is another name for Shennong, or a descendant of Shennong, and Zhurong is the god of Fire. Zhu Zaiyu’s ode, which freely associates the qin with Shennong, Fire, and the number 7, shows that he was fully in tune with ancient mythology and the mysticism and numerology of 5-Element theory.

16 揆神農之初制

17 In his edition of Lülü jingyi, FENG makes a full annotation of the 〈Se ming 瑟銘〉, but does not mention XIONG Penglai [A: Lülü jingyi / FENG 1998: 678–685]. The short study of Zhu Zaiyu’s Sepu by ZHAO [B: ZHAO Y 1995] makes no mention of the 〈Se fu 瑟賦〉 by XIONG Penglai. And in the Yinyue baike cidian 《音乐百科词典》 [Encyclopedic dictionary of music], CHEN Yingshi 陈应时 actually writes that XIONG Penglai composed 2 pieces of 〈Se fu〉, but they are both lost [B: MIAOTR et al 1998: 676 (s.v. 熊朋來)]!

18 Paoxi庖犧, also known as Fuxi 伏羲, was a mythological sage-king of antiquity. It is generally thought that he represents a prehistoric nomadic stage in Chinese civilization, when animals were beginning to be domesticated. An early text which describe Paoxi’s (legendary) achievements is Yijing: 〈Appended commentary Pt. 2 繫辭下〉 [B: Yijing / ctext 2006–: http://ctext.org/book-of-changes/xi-ci-xia/zh?en=on#n46944; B: Yijing / GUO & HUANG 1996: 532–533; C: [Yijing] T1899: 382–383], where he is credited with making nets for hunting and fishing, and creating the 8 trigrams [bagua 八卦] which go to make up the 64 hexagrams of the Yijing. Later accounts further glorify his achievements, and attribute the se or qin to his invention as well.
The phoenix tree, also called the Chinese parasol tree (梧桐 Firmiana simplex), is a deciduous tree indigenous to China. Its wood is used for making many musical instruments, including the qin and se.

19 Zheng Duanqing Shizi cizang shendaobei 鄭端清世子賜葬神道碑 [Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng] [B: Zheng shendaobei], written in 1624 by WANG Duo 王鐸 (1592–1652) on commission from Zhu Zaiyu’s 2nd son Zhu Yitai 朱翊鈦 (see Ch. 1).

20 [B: Henei 1825: Bk. 19 〈Jingji zhi 經籍志 [Historical documents]〉: 7ab].

21 [B: Yuan wenlei 《元文類》 / REN 1998: 335–336; B: Yuan wenlei / Siku: Bk. 1: 1a–4b], both clearly titled 〈Se fu 瑟賦〉 by XIONG Penglai 熊朋來. Yuan wenlei was first printed in the Yuan dynasty c. 1335, and originally bore the title Guochao wenlei《國朝文類》 [Classified literary anthology of the present National Dynasty].

22 [B: Gujin tushu / F1934: Vol. 739: 09ab 〈Se fu 瑟賦〉 by XIONG Penglai 熊朋來 of the Yuan dynasty].

23 Zhu Zaiyu’s ode on the qin and Xiong Penglai’s rhapsody on the se attribute the creation of these instruments to two figures of mythological antiquity, respectively Shennong and Paoxi. This is the most common tradition, but other versions of the legends reverse the attributions and credit Shennong with the se, and Paoxi with the qin instead. An early source of many such legends is the Shiben 《世本》 [Genealogies], an ancient work of anonymous authorship. This text was probably composed c. −234 – c. −228, but it became lost sometime after the Song dynasty (after 1279). Scholars have since partially reconstructed the work, by compiling fragments from it as they appear in quotations by later writers. [B: Shiben / Zhonghua R2008] collects together 8 reconstructed editions of Shiben, and the relevant fragments are found in the Ch. 〈Inventions 作篇〉 in each edition. (See edition by MAO Panlin 茂泮林 (? – 1845; editor’s Preface 1821): 107–108; edition by LEI Xueqi 雷學淇 (fl. 1814 – ?): 73–75; etc.) The reconstructed editions carry both versions of the legends on the creation of the qin and se (in the same edition). Since it is all a myth, the reader may feel free to side with whichever story suits her fancy.


25 Bo LAWEGREN gives a non-technical account of ancient se and qin, with good pictures of instruments from the tomb of Marquis Yi of Zeng, in 〈Ch. 3 Strings〉 of Music in the age of Confucius / edited by So [C: So 2000: 65–79].
26 The repertoire of the *qin* has been collected in a comprehensive anthology, the *Qinqu jicheng* 《琴曲集成》 [Comprehensive anthology of music for *qin*] [B: Zhongguo Yishu & Beijing Guqin 2010], in 30 volumes.

27 [B: SuLY [1985]] provides a good survey of the Confucian ceremony in Taiwan. Full scores of the music played at Tainan and Taibei are shown in Appendix 1 and Appendix 3, which indicate the use of both *qin* and *se*. On the situation in China, [B: YANGYL R2009i] gives a detailed description of the Confucian ceremonial music as it was practised at Liuyang 浏阳 in Hunan in 1956, with transcription of a performance in full score. However, the *qin* and *se* parts are transcribed not from the performance, but according to the score *Kongmiao dingji liyue beikao* 《孔廟丁祭禮樂備考》 [Research notes on the ceremonial music for the worship of Confucius at the Confucian Temple] (1840) by QIU Zhilu 邱之稑 (1781–1850) [B: YANGYL R2009i: 536–550]. YANG explains that their performance has fallen into disuse [p. 515, 536], yet on p. 543 he shows a photo of a performance with a player at the *se*! In later revivals of the Confucian ceremonial music in China, apparently(?) the *qin* is employed, but not the *se*. (Some notes on the Confucian ceremony are given in Ch. 3.)

28 For a brief introduction to the *qin* in English, the reader may wish to consult [C: YUNG 2002]. More technical details are provided in [C: ZHU Quan T1997].

29 The *qin* in my possession is 1.173 m in length.

30 The harmonics would be exact integral multiples of the fundamental frequency if the string were theoretically infinitely flexible. In real life, stiffness in the string will produce deviations from mathematical exactitude (anharmonicity). In string instruments like the *qin*, the differences are so small as to be imperceptible.

31 See [B: YANGYL R2009f] and Fig. 5: 12. The disagreements between harmonic tones and the other 2 tuning systems are greatest at the 5th harmonic (just ‘Major 3rd’, \( \frac{386}{408} \approx 0.946 \)) at markers 11, 8, 6, 3; *sanfen sunyi* \( \approx 408 \), equal tuning = 400 \( \varepsilon \)). The 3rd harmonic (just ‘perfect 5th’, \( \frac{702}{700} \approx 1.0029 \)) at markers 9, 5; equal tuning = 700 \( \varepsilon \)) agrees with *sanfen sunyi*, and its disagreement with equal tuning is insignificant compared to other inaccuracies in performance. With the 2nd and 4th harmonics (markers 7, and 10, 4) the tones make exact octaves with the open string, and all 3 tuning systems agree.


33 A clear survey of different scholarly opinions on the 3 *qingshang* modes is given by [B: CHENGJ 2009]. The survey is more succinct than comprehensive however, and CHENG does not discuss Zhu Zaiyu’s interpretation.
34 Zhu Zaiyu’s *qin* tunings are derived from CHEN Zhongru’s 3 *qingshang* modes in this manner: The terms *gong* 宮 = ¹, *shang* 商 = ², *jue* 角 = ³ normally refer to scale degrees, but *qin* players popularly (and confusingly) use them to denote the *qin* string numbers 1, 2, 3 as well. Since *huangzhong* is the principal tone of all tones, CHEN Zhongru’s remark “its *se* tuning takes *gong* as its principal, the clear tuning takes *shang* as its principal, the level tuning takes *jue* as its principal” may be interpreted to mean ‘its *se* tuning takes string 1 as *huangzhong*, the clear tuning takes string 2 as *huangzhong*, the level tuning takes string 3 as *huangzhong*’. These are then Zhu Zaiyu’s (7-tone) tunings for the small and medium *qin*. As for the proper tuning on the big *qin* with string 4 as *huangzhong*, it is inferred by extension, although CHEN Zhongru does not mention it. [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 35b); A: Lülü jingyi / FENG 1998: 1060]

35 This is Zhu Zaiyu’s opinion expressed in [A: Lülü jingyi: Inner Bk. 7 (Lüshu: Fasc. 3: 1b); A: Lülü jingyi / FENG 1998: 389]. In [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 35b); A: Lülü jingyi / FENG 1998: 1060], however, he calls the tuning with *huangzhong* on the 4th string the ‘proper tuning 正調’ = the ‘ancient tuning 古調’, and the other 3 tunings as ‘variant tunings 變調’. This may have been the opinion of his father Zhu Houwan, as Lülü jingyi: Outer Bk. 8 is Zhu Zaiyu’s account of Zhu Houwan’s treatise *Xiange yaozhi* 《弦歌要旨》 (see Ch. 1).


37 The *qin* player and musicologist TANG Jianyuan 唐健垣 notes that *qin* players of his acquaintance usually tune the 5th string somewhere between F2 and G2 (i.e. 3rd string between B♭D2 and B♭E2) [B: WANGBL 1971: 9–11]. On commercial recordings that I have heard, the 3rd string is usually tuned between B♭2 and F2.

38 In 〈Ch. 3 Strings〉 of *Music in the age of Confucius* / edited by SO [C: SO 2000: 67–73], Bo LAWEGREN shows a *se* from the tomb of Marquis Yi, of length 1.67 m. Other *se* from about the same period are as short as 1.04 m or 1.16 m. [B: LIUDS 1992: 198–199] and [B: LIUDS & YUANQY 2008: 307] show 2 big *se* from the early and late Qing dynasty, respectively of length 2.07 m and 2.13 m.

39 See Ch. 6. In Lülü jingyi [A: Lülü jingyi: Inner Bk. 9 (Lüshu: Fasc. 4: 44b–45b); A: Lülü jingyi / FENG 1998: 691–693] Zhu Zaiyu shows several drawings of the blind *se* player’s guide (a boy) carrying the *se* on his shoulder, and leading the blind musician along. The same drawings are repeated in Xiangyin Shiyue pu [A: Xiangyin: Bk. 1: 2b–4a]. These drawings are different from ones he had made in his early (1560) treatise *Sepu* [A: Sepu: Bk. 6: 2a–3a]. In *Sepu*, Zhu Zaiyu writes that the guide must be carrying a small *se*, which would be the same as the contemporaneous *zheng*. If the guide were to carry a big 25-string *se*, “it would be so big that it would topple the guide, and both guide and *se* player would fall to the ground. Isn’t that ridiculous!”

40 [B: Sepu / Siku: Bk. 1: 4b].
See [B: YANGYL R2009i: 543].

(Yuzhi) lülü zhengyi 《(御製)律呂正義》 [The (Imperially produced) correct meaning of music] [1713–1714] [B: Lülü Zhengyi / Siku F2008: Pt. 2 下編: Bk. 2: 36a–43b], (Yuzhi) lülü zhengyi houbian 《(御製)律呂正義後編》 [The (Imperially produced) correct meaning of music / Sequel] (1746) [B: Lülü Zhengyi houbian / Siku F2008: Bk. 63: 48a–57b].
Chapter 6
The orchestration of Zhu Zaiyu’s music

In his music scores intended for performance, Zhu Zaiyu is quite specific about the instrumental forces he wants. But he is flexible in his requirements, and he allows instruments to be added or reduced according to circumstances and availability. This chapter will discuss in order, (1) the orchestration of the full scores, (2) the ensembles in Xiangyin Shiyue pu [Songs of the Shijing [Classic of poetry] for performance at the Country Banquet] [A: Xiangyin], and (3) the concerted music for dance in Xiaowu xiangyue pu [Music of the country to accompany the minor dances] [A: Xiaowu].

Orchestration of the Full Scores

3 pieces of music by Zhu Zaiyu are notated in full score:

- The full score version of 〈Heyue Guan ju 合樂關雎 [Concerted music for the song Guan ju]〉, which takes up the whole of Xuangong heyue pu [Concerted music / transposable through all 12 pitches] [A: Xuangong: 2b–88a].

- The full score version of 〈Heyue Gugong 合樂股肱 [Concerted music for the song Gugong]〉, in Caoman guyue pu [Ancient music with zither figurations] [A: Caoman: 22b–62a].

- 〈Heyue Li wo zhengmin 合樂立我烝民 [Concerted music for the song Li wo zhengmin]〉, in Lülü jingyi [Precise principles of the musical pitches] [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 53b–71a); A: Lülü jingyi / FENG 1998: 1094–1129].

All 3 songs share the same format, and their orchestrations are identical. The orchestral forces (and dancers if required) are spelled out most clearly in Xuangong heyue pu, which is paraphrased below.

Performers in music and dance classes [A: Xuangong: 1a]

If there are many pupils, 80 performers may be employed. If there are fewer pupils, 40 may be used. (I shall call these the large orchestra and the small orchestra respectively.)
### Fig. 6: 1 Performers in music and dance classes (for concerted music in the full scores).

[A: Xiangong: 1a]

<table>
<thead>
<tr>
<th>[MUSICIANS]</th>
<th>[Small orchestra]</th>
<th>[Large orchestra]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Master of Music 樂正</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>B Banner holder 麓</td>
<td>0</td>
<td>or 1, for classes with many pupils</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Percussion]</th>
<th></th>
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<tbody>
<tr>
<td>C Zhu 1 player  or 1 player on upper court and 1 in lower court</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D Chongdu [春]icans 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E Bofu 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F Taogu 鞔[鼓] 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G Drum 鼓 1 player or 2 and doubles on yingu 鎬[鼓] and yingpi 鎬[鎌]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H Yu 鼎 1 player same as for (C) zhu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I Yong bell 鐲 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J Zhong bell 錐 1 player or 2, and doubles as singer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K Stone chimes 磬 1 player or 2, and doubles as singer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Zithers]</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L Qin 1 player or 2, and doubles as singer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M Se 1 player or 2, and doubles as singer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[Wind instruments]</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N Yu 竑 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O Sheng 竿 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P Xun 墧 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q Yue 簫 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R Xiao 簫 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S Chi 篮 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T Di 簿 1 player or 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U Guan 管 1 player or 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[DANCERS]</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>V Dance leaders 引舞 2 performers or 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W Civilian dancers 文舞 4 performers or 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X Martial dancers 武舞 Same as for civilian dances</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL PERFORMERS** 40 or 80
The total number of musicians is 20 for the small orchestra, and 40 for the large orchestra. The number of dancers stated, however, do not add up to 20 or 40, so apparently the total number of performers do not add up to 40 or 80, as Zhu Zaiyu states. We can check the actual numbers of dancers in Zhu Zaiyu’s dance choreographies. In *Eryi zhuizhao tu* [Diagrams of dance steps for 2 rows of dancers] [A: *Eryi*: 1a–36a; C: Wu 2008: 387–404], the steps for 4 dancers, in rows of 2×2, are illustrated. In *Liudai xiaowu pu* [Choreography for the minor dances of the 6 ancient dynasties] [A: *Liudai*: 1a–4a, 8a; C: Wu 2008: 224–228, 236], Zhu Zaiyu calls for 6 groups of dancers, with (a normal number of) 4 in each group. Since the groups perform one after another, a dancer can perform in several different groups alternately (e.g. dances 1, rest, 3, rest, 5, or dances 2, rest, 4, rest, 6), and fewer than 24 dancers should be needed. In *Lingxing xiaowu pu* [Choreography for the minor dances at the Lingxing Temple] [A: *Lingxing*: 157b–196a; C: Wu 2008: 507–527], large groups of 16 dancers, led by 2 dance leaders, are mobilised to draw out the Chinese characters ‘天下太平’ [peace on earth] on the dance floor. (The music in *Lingxing xiaowu pu* is in a different style and uses different instrumentation than the other ceremonial music discussed in this study, so it may not be directly applicable.) So we see that in his formal choreographies, Zhu Zaiyu regularly calls for 4 or 16 dancers, sometimes in multiple groups one after another, plus extra dance leaders, just as stated in Fig. 6:1. In less formal instructional situations, perhaps, their numbers may be more flexible.

There need be no discrepancy in the numbers of Fig. 6:1, however, for the performers may be complemented by the addition of extra singing pupils. On all 3 full scores 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉, when the singing starts, Zhu Zaiyu has put in a remark, [A: *Lüli Jingyi*: Outer Bk. 8 (*Lüshu*: Fasc. 6: 55a–b); A: *Lüli Jingyi* / *FENG* 1998: 1097–1098; A: *Caoman*: 24a–b; A: *Xuangong*: 4a–b] “Skilled singers sing a long note on the word Li [or Gu or Guan], student singers continue with the word Li [or Gu or Guan] in accord. Similarly with the other words of the song. 善歌者長聲唱立字 [或股字或關字] 學歌人接聲和立字 [或股字或關字。] 其餘放此”. Thus the 4 (or 8) singers listed in Fig. 6:1 (*zhong* bell, stone chimes, *qin*, and *se* players) may be the core group of “skilled singers” that Zhu Zaiyu has in mind, who will lead an extra chorus of student singers in the long notes of the songs. With the small orchestra of 20 musicians plus 4 dancers, 16 singing pupils will make up a total of 40 performers. If the large orchestra of 40 musicians is employed, and the dancers and dance leaders number 20, say, then 20 student singers will fill up the numbers to 80 performers. In the two orchestral plans of *Xuangong hejue pu* (Fig. 6:2, Fig. 6:3), these extra singers are not shown, but they may be easily accommodated in the lower court. And in the alternative plan of Fig. 6:9 (p. 300), Zhu Zaiyu has put in 16 singing pupils as an example.
Orchestral plans and the classical Orchestral Suspensions

In Ch. 2 I have already discussed the ceremonial space for the Country Banquet 鄉飲酒禮 and the Country Archery Meet 鄉射禮, as described in the classic text *Yili* 《儀禮》 [Protocol and ceremonial] [B: *Yili*], and the reader may wish to review that discussion before proceeding on this section.

At the beginning of every full score, Zaiyu admonishes and instructs the performers with these words [A: *Lüli jingyi*: Outer Bk. 8 (Lüshu: Fasc. 6: 53b); A: *Lüli jingyi* / FENG 1998: 1093; A: Caoman: 22b; A: Xuangong: 2b]:

All who wish to play ancient music must first choose a quiet place. The upper court, lower court, the eastern and western steps, all follow the ancient regulations. At the center of the upper court, a shrine to Confucius is set up, to inspire a proper respect. Pupils on the upper court kneel and sit on the floor, as in the ancient saying ‘sitting at their places on the ground’. In the lower court no seats are set, but all play standing up.

凡欲習古樂者必先擇一静處堂上堂下阼階西階悉如古制堂上正中一席設先聖先師位使人起敬堂上學者各跪而坐於地此古所謂席地坐也其堂下樂不設坐但立奏

In *Xuangong heyue pu*, Zhu Zaiyu gives two plans for his orchestral layout, one for the small orchestra of 20 musicians plus dancers, and another for the large orchestra of 40 musicians plus dancers (Fig. 6: 2, Fig. 6: 3). When read together with the list of performers in Fig. 6: 1, the two diagrams are almost self-explanatory. The Master of Music [Yuezheng 樂正] stands at the front of the upper court on the west side. The zithers *qin* and *se* play on the upper court, and the wind instruments play below, while percussion instruments are arrayed in both courts. The dancers dance in the lower court.
Musicians and dancers A, C, D ... U, W, X refer to Fig. 6:1.

[A: Xiangrong: Ip (Example at Princeton University's Gest Library, TAI41/2377 v.12)]

Fig. 6:2 Orchestral Plan 1, for small orchestra (20 players plus dancers and chorus).

Total 20 players in the so-called Single Suspension (1 instrument of each kind).
Fig. 6:3  Orchestral plan 2, for large orchestra (40 players plus dancers [and chorus]).
[A: Xuangong: 2a (Exemplar at Princeton University Gest Library TA141/2377 v.12)]

Musicians and dancers A, B, C, D, ... U, W, X refer to list in Fig. 6:1.
One point in these orchestral plans requires some discussion. The small orchestra of Fig. 6: 2 (20 players) is described as the Single Suspension, and the large orchestra of Fig. 6: 3 (40 players) as the Half Suspension. These terms refer to the classic text Zhouli 《周禮》 [Rites of Zhou] [B: Zhouli], which contains a prescription of how a court for music in the Zhou dynasty (Western Zhou –1045 – –771, Eastern Zhou –770 – –256) was to be hung with bells and stone chimes, graded according to feudal rank:

- The court of the King [Wang 王] was equipped with the Palace Suspension [Gongxuan 宮縣] — with instruments on all 4 sides.
- Feudal lords [zhuhou 諸侯] would boast the Carriage Suspension [Xuanxuan 軒縣]— with instruments on 3 sides (north, west, and east).
- High officials (Qing 卿 and Dafu 大夫) enjoyed the Half Suspension [Panxuan 判縣] — with instruments on 2 sides (west and east).
- Lower-ranking officials (Shi 士) must be satisfied with the Single Suspension [Texuan 特縣] — with instruments on just 1 side (east side only, or between the eastern and western steps).

(We pity the poor commoner, who had no music hall and nothing to suspend whatsoever.) The remarks in small type represent the exegesis of ZHENG Zhong 鄭眾 (? – 83) & ZHENG Xuan 鄭玄 (127–200), who wrote their commentaries to Zhouli some 300 to 450 years after the end of the Zhou dynasty [B: Zhouli / ZHENG et al 2000: Vol. 8: 712]. We see that Zhu Zaiyu’s small and large orchestral plans do conform respectively to the Single Suspension and Half Suspension arrangements of Zhouli.

However, discoveries in musical archaeology since the late 1970s have shown us that while the description of the Zhouli and its interpretation by ZHENG et al are essentially correct, the historical situation was more complicated than its idealization in that text. From a study of bells, stone chimes, and other relics from many archaeological sites, [B: WANGQL 2007] has traced a progressive development through the period of the Western Zhou. (As only sets of bells and stones chimes, unattached to their stands, have been recovered from the Western Zhou, conclusions about their arrangements involve a certain amount of reconstruction, and the following results are only probable inferences.) From the earlier years (–1045 – –922), only Single Suspensions containing 1, 2, 3, or 4 bells have been found, even among feudal lords [B: WANGQL 2007: 83–84, 165–166]. By the time of the late Western Zhou (–771), the system had evolved into the complete 4 grades, but not exactly conforming to the Zhouli specifications, as shown by the following examples [B: WANGQL 2007: 125–129, 154–170, 190–192]:

- Palace Suspension for the Zhou King — expected from Zhouli, but no actual example yet found.
- Carriage Suspension for the 3 Ducal Ministers [san Gong 三公 5, 3 top-ranking officials] — probably 2 examples [B: WANGQL 2007: 129, 169].
• Half Suspension for feudal lords and high officials (zhuhou 諸侯, Qing 卿, and Dafu 大夫) — several examples [B: WANGQL 2007: 166–168].

• Single Suspension for the lower-ranking officials (Shi 士) — probably 2 examples, with 9 and 10 bells in each [B: WANGQL 2007: 168].

The 3 higher grades had both bells and stone chimes, but the Shi were limited to bells only. The feudal lords were by now enhancing their prestige with the Half Suspension. But it was only in the Spring and Autumn period and later, when they began to claim hegemony, that they also awarded themselves with the extra privilege of the Carriage Suspension, as described in Zhouli. However the Orchestral Suspensions of the Eastern Zhou (approximately spanning the Spring and Autumn period (−770 – −476) and the Warring States period (−475 – −221)) have not yet been systematically studied, as they have been for the Western Zhou.

A few pictures from the Warring States period, when the system was at the height of its magnificence and entering into decline, must suffice for illustration. [Fig. 2: 2], which shows bells and stone chimes set up in a courtyard on both sides of a central banquet hall, exemplifies the Half Suspension arrangement. (Fig. 2: 1 may suggest a Single Suspension, but it is really impossible to tell, since the right side of the courtyard is not shown.) The tombs of the Zhou kings have not been found, and no example of the Palace Suspension has yet been discovered. The biggest and most spectacular example now known is the tomb of Marquis Yi of Zeng 曾侯乙 (fl. or died −433), unearthed in Hubei in 1978. With its set of 65 bells, 32 stone chimes, and many other musical instruments, it represents a uniquely ostentatious display of the Carriage Suspension, as befits the Marquis’s rank. (Fig. 6: 4, Fig. 6: 5) In the central chamber of the tomb, the bells are suspended at the west and south sides on an L-shaped rack, while the stone chimes are lined up on another smaller stand at the north side. Chunqiu Zuo zhuan《春秋左傳》 [Spring and Autumn annals / with commentary by Zuo] / attrib. ZUO Qiuming 左丘明 (c. −550? – c. −450?) mentions a 'bent suspension [quxuan 曲縣]' 7, which would very aptly describe the L-shaped bell stand. In one detail however Marquis Yi’s arrangement does not agree with the description of ZHENG et al, which says that the instruments should be hung on the north, west, and east sides. It has been suggested that Marquis Yi’s orchestra is open on its east side (instead of the south) for the benefit of the Marquis’s corpse, who is lying in the eastern chamber of the tomb, listening to the music! 8 (And the reader may not be too happy to learn that the Marquis also had 21 young ladies entombed together with him, some of them probably slaves or concubines who entertained him with his many musical instruments, even after death.)
Fig. 6:4  Model of the central chamber of the tomb of Marquis Yi of Zeng 曾侯乙 (−433) at the Hubei Provincial Museum in Wuhan. [http://picasaweb.google.com/116512474184071531500/TombOfMarquisYiOfZengHubeiMuseumWuhan#5548457179406072306, accessed 14 September 2012]

The arms of the L-shaped bell-rack measure 7.48 × 3.35 m, and a 7th se lies hidden under the rack at left. Some of the original artifacts were found scattered about in a disorderly way, but the main items are at their correct places. A drawing of the items in situ as they were discovered can be found at [B: Hubei 1989: Vol. 1: 68–69; C: FALKENHAUSEN 1993: 36–37].
Carriage Suspension, reconstructed from positions of instruments as found in the tomb. According to the analysis of Li, in an original systematic plan the bells were arranged in 2 tiers (Fig. 6: 5), but the final arrangement was changed to 3 tiers when extra bells were added at interment (Fig. 6: 4).

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Big bells [zhong &amp; bo]</td>
<td>钟, 钗</td>
</tr>
<tr>
<td>J</td>
<td>Medium &amp; small bells [zhong]</td>
<td>钟</td>
</tr>
<tr>
<td>K</td>
<td>Stones chimes</td>
<td>磬</td>
</tr>
<tr>
<td>M</td>
<td>Se</td>
<td>瑟</td>
</tr>
<tr>
<td>N</td>
<td>Yu</td>
<td>竿</td>
</tr>
<tr>
<td>O</td>
<td>Sheng</td>
<td>笙</td>
</tr>
<tr>
<td>R</td>
<td>Xiao</td>
<td>箫</td>
</tr>
<tr>
<td>S</td>
<td>Chi</td>
<td>篪</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21 or 22 players</td>
</tr>
</tbody>
</table>

In the treatise *Yuexue xinshuo* 《樂學新說》  *A new discourse on music*, Zhu Zaiyu made a study of these 4 classical Orchestral Suspensions, and, basing his interpretation on *Yili* 《儀禮》, he devised 2 more orchestral plans. To understand the reasoning behind his plans, let us first take a look at the relevant passage in *Yili*. 
On the eve before [the Great Archery Meet], the musicians hang up the musical instruments. On the east side of the eastern steps, the *sheng*-stonechimes are hung facing west. South of them are the *sheng*-bells, and south of these a single big bell, all set out in a row southward. A standing drum stands at the west side of the eastern steps, its drumhead facing south; on its east side is the *yingpi*, [hanging] with its drumhead facing south. On the west side of the western steps, the *song*-stonechimes are hung facing east. South of them are [a 2nd set of] bells, and south of these a [2nd] single big bell, all set out in a row southward. A [2nd] standing drum stands to the south of the big bell, with its drumhead facing east; on its north side is the *shuopi*. A [3rd] standing drum stands on the east side of the western steps, facing south. The bamboo instruments are situated between the standing drums. The *taogu* leans against the ropes on the west side of the *song*-stonechimes stand.

The quoted paragraph details the musical preparations for the Great Archery Meet, hosted by feudal lords of the high nobility. *Yili* does not say what kind of Orchestral Suspension is being prepared, but we understand that a feudal lord would be entitled to the Carriage Suspension. According to the orthodox interpretation, the instruments would be suspended from 3 sides of the court. Yet *Yili* speaks of but 2 rows of instruments, lined up on the east and west sides — but there are 3 sets of bells and stone chimes on each side, and 3 standing drums. Accordingly, Zhu Zaiyu offers a different interpretation of the classical Orchestral Suspensions. [A: *Yuexue* 33a] In every case, the bells and stone chimes would be lined up on the left and right sides of the court, but the Palace Suspension has 4 stands of them on each side, the Carriage Suspension has 3 stands, the Half Suspension has 2 stands, and the Single Suspension has 1 stand. In addition, they would have 4, 3, 2, or 1 drums respectively. A possible simplification is to half the number of instruments, by eliminating those on the right (west) side, and retaining only those on the left (east). Zhu Zaiyu makes his ideas explicit in 2 orchestral plans, each with its own list of performers. One is a Carriage Suspension, employing 35 musicians, and the second is another Single Suspension arrangement, employing 15 musicians. They are paraphrased and reproduced in Fig. 6: 6, and Fig. 6: 7, Fig. 6: 8.

We may note that Zhu Zaiyu prudently refrains from drawing any plans for the Palace Suspension. That is the Emperor’s prerogative.
**Table 6.1** Performers in the Single Suspension & Carriage Suspension, according to Zhu Zaiyu.

[A: Yuexue: 35a, 34a]

<table>
<thead>
<tr>
<th>[MUSICIANS]</th>
<th>SINGLE SUSPENSION</th>
<th>CARRIAGE SUSPENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Master of Music</td>
<td>樂正</td>
<td>1</td>
</tr>
<tr>
<td>B Banner holder</td>
<td>興麾</td>
<td>1 (or 0)</td>
</tr>
</tbody>
</table>

**[Percussion]**

| C Zhu | 祐 | 1 player (or 0) | 1 player |
| D Chongdu | 興麾 | 1 player, and doubles as singer | 1 player, and doubles as singer |
| E Bofu | 興麾 | 1 player, and doubles as singer | 1 player, and doubles as singer |
| G Jiangu [standing drum] | 建鼓 | 1 player at left steps and doubles on shuopi 朔 & yingpi 應 | 3 players, at right, left steps, & right steps each player doubles on shuopi 朔 & yingpi 應 |
| H Yu | 敲 | 1 player (or 0) | 1 player |
| I Single (big) bell | 特鍾 | 2 players, at left & right |
| J Bell set | 編鍾 | 2 players, at left & right |
| K Stone chimes set | 編磬 | 2 players, at left & right player at right doubles on taogu 鼓 |

**[Zithers]**

| L Big qin | 大琴 | 1 player, and doubles as singer a |
| L Medium qin | 中琴 | 1 player, and doubles as singer |
| I Small qin | 小琴 | 1 player, and doubles as singer |
| M Big se | 大瑟 | 1 player, and doubles as singer b |
| M Medium se | 中瑟 | 1 player, and doubles as singer |
| m Small se | 小瑟 | 1 player, and doubles as singer |

**[Wind instruments]**

Yili merely says “The bamboo instruments are situated between the standing drums”, and does not specify a fixed number. Zaiyu suggests perhaps 8 players, or perhaps double that number.

<p>| N Big yu (24 reeds) | 大竽 | 1 player |
| n Small yu (19 reeds) | 小竽 | 1 player |
| O Big sheng (19 reeds) | 大笙 | 1 player |
| o Small sheng (13 reeds) | 小笙 | 1 player |
| P Big xun (⊙ 7.5 cm) | 大埙 | 1 player |</p>
<table>
<thead>
<tr>
<th>Item</th>
<th>Instrument</th>
<th>Single Suspension</th>
<th>Carriage Suspension</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Small xun ((O^{ce}) 5.5 cun)</td>
<td>小埙</td>
<td>1 player</td>
</tr>
<tr>
<td>Q</td>
<td>Big yue (6 finger holes)</td>
<td>大籥</td>
<td>1 player</td>
</tr>
<tr>
<td>q</td>
<td>Small yue (3 finger holes)</td>
<td>小籥</td>
<td>1 player</td>
</tr>
<tr>
<td>R</td>
<td>Big paixiao [panpipes]</td>
<td>大排簫</td>
<td>1 player</td>
</tr>
<tr>
<td>r</td>
<td>Small paixiao [panpipes]</td>
<td>小排簫</td>
<td>1 player</td>
</tr>
<tr>
<td>S</td>
<td>Big chi (length 14 cun)</td>
<td>大篪</td>
<td>1 player</td>
</tr>
<tr>
<td>s</td>
<td>Small chi (length 12 cun)</td>
<td>小篪</td>
<td>1 player</td>
</tr>
<tr>
<td>T</td>
<td>Big di (6 finger holes)</td>
<td>大篴</td>
<td>1 player</td>
</tr>
<tr>
<td>t</td>
<td>Small di (3 finger holes)</td>
<td>小篴</td>
<td>1 player</td>
</tr>
<tr>
<td>U</td>
<td>Big bianguan [set of guan]</td>
<td>大編管</td>
<td>1 player</td>
</tr>
<tr>
<td>u</td>
<td>Small bianguan [set of guan]</td>
<td>小編管</td>
<td>1 player</td>
</tr>
</tbody>
</table>

Total Performers: 15

---

a Item F of Fig. 6: 1 on p. 282 (taogu) has been subsumed under item K of the present Table (stone chimes set), as both instruments are played by the same player in this orchestration.

b Yuexue xinshuo is misprinted here. In the facsimile edition [A: Yuexue / FR1968], the print has “small qin” and “small se” in Fig. 6: 7 [p. 66 = leaf 33b], but “big qin” and “big se” in Fig. 6: 6 [p. 67 = leaf 34a]. In all other prints and facsimile editions I have examined [A: Yuexue (Princeton U Gest) TA141/278 v.3; A: Yuexue http://nrs.harvard.edu/urn-3:FHCL:3744719 v.3; A: Yuexue / F[1988]; A: Yuexue / F1995; A: Yuexue / F2013], all of them of later date than the original print of [A: Yuexue / FR1968] (see Ch. 1), the sizes are reversed, so that they have “big qin” and “big se” in Fig. 6: 7 [leaf 33b], but “small qin” and “small se” in Fig. 6: 6 [leaf 34a]. All these misprints are Urtexte from Zhu Zaiyu’s own press in Henei. The edition [A: Yuexue / Siku F2008], which is not an Urtext, follows the misprint of the later prints. Since 3 sizes of qin and se (big, medium, small) are discussed in Lüli jingyi ([A: Lüli jingyi: Inner Bk. 7 (Lüshu: Fasc. 3: 1b–3b); A: Lüli jingyi / FENG 1998: 389–395]; also see Fig. 5: 12 and Fig. 5: 16), it would seem more likely that ‘big qin’ and ‘big se’ are intended here, if only to fully utilize all 3 sizes of these instruments.
Fig. 6.7 Carriage Suspension plan.
Musicians A, B, C, ... U refer to list in Fig. 6.6.

Musicians A, B, C, ... U refer to list in Fig. 6.6.
Fig. 6.8  Single Suspension plan.

Musicians A, B, C, O, refer to list in the Fig. 6.6.

On stage

Lower court

East steps

West steps

SINGLE SUSPENSION PLAN

H D

J

G

C E

K

B

A

B

C

D

E

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

内

上

下

中

外

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z

内

上

下

中

外

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z
As we can see from Fig. 6: 7, Zhu Zaiyu’s Carriage Suspension plan is a very good interpretation of the *Yili*, faithful in every detail. It is also very different from Marquis Yi’s plan in Fig. 6: 5. Marquis Yi’s arrangement features a ‘bent suspension’ with an L-shaped bell stand, but this finds no place in Zhu Zaiyu’s plans. Several explanations may be offered for the discrepancies. Perhaps the *Yili* is not describing a Carriage Suspension? or the orthodox exegeses of *Zhouli* (and *Yili*) by ZHENG et al may not be entirely reliable? or most likely perhaps, there were several different formats of the Carriage Suspension in use during Zhou times. As already mentioned (p. 287), from an examination of the archaeological evidence, [B: WANGQL 2007] has demonstrated that the system of Orchestral Suspensions was more complicated than its idealized descriptions in *Zhouli* (and other classic texts). However carefully and ingeniously they may be devised, Zhu Zaiyu’s plans for the classical Orchestral Suspensions are only based on these vague and confusing documentary sources, most of which were written hundreds of years after the events they purport to describe. As with all such plans, they can be no more than educated conjectures.

For the performance of Zhu Zaiyu’s music, a more pertinent observation is that the orchestral plans in *Yuexue xinshuo* do not quite agree with the plans in *Xuangong heyue pu*. The broad scheme is the same in all the plans: the Master of Music stands at the front of the upper court on the west side, the zithers *qin* and *se* play on upper court and the wind instruments play below, while percussion instruments are arrayed in both upper and lower courts. But their differences are just as obvious. Fig. 6: 8 and Fig. 6: 2 are both labelled as Single Suspensions, yet Fig. 6: 8 has 1 stand each of bells or stone chimes on left and right, but Fig. 6: 2 has 3 stands of them, all placed on the west side between the steps. As already mentioned (p. 287), in the Single and Half Suspensions plans of *Xuangong heyue pu* (Fig. 6: 2 and Fig. 6: 3), Zhu Zaiyu was following the orthodox interpretation of *Zhouli* [B: *Zhouli*: / ZHENG et al 2000: Vol. 8: 712]. This would place bells and stone chimes on 1 or 2 sides for the Single and Half Suspensions respectively, but permits an unlimited number of instruments on each side. Then in the two plans of *Yuexue xinshuo* (Fig. 6: 7 and Fig. 6: 8), he created instead a new interpretation of *Yili*, always placing bells and stone chimes on 2 sides, but with 1, 2, 3, or 4 stands on each side for the 4 grades of Suspensions respectively. Moreover, it seems incongruous that the Carriage Suspension of Fig. 6: 7, for feudal lords [*zhuhou* 諸侯], should have only 35 players, while the Half Suspension of Fig. 6: 3, for high officials (*Qing* 卿 and *Dafu* 大夫, both lower in rank than *zhuhou*) numbers as many as 40 players.

So which plans are we to use? Now Fig. 6: 2 and Fig. 6: 3 stand at the beginning of *Xuangong heyue pu*, right before the full score of *Heyue Guan ju*: there can be no doubt that they are the correct orchestrations to use in that song. And since the full scores of *Heyue Gugong* and *Heyue Li wo zhengmin* both specify exactly the same instrumentation as *Heyue Guan ju*, the orchestral plans of Fig. 6: 2 and Fig. 6: 3 will certainly serve for these 2 songs as well. We know that *Caoman guyue pu*
and *Xuangong heyue pu* were relatively early works of Zhu Zaiyu’s, written not long after his father’s release from prison and restoration to his fief in 1567 (see Ch. 1). If we understand that the orchestral plans of *Xuangong heyue pu*, based on Zhu Zaiyu’s early reading of the *Zhouli*, represent the orchestrations that he originally wrote for his music, while *Yuexue xinshuo* describes his later interpretation of the *Yili*, their differences should cause us no perplexity. Moreover, as is evident from the lists of performers in *Fig. 6: 1* and *Fig. 6: 6*, the 3 orchestral plans of *Fig. 6: 2*, *Fig. 6: 3*, and *Fig. 6: 7* actually call for the same musical instruments (disregarding the dancers); only their numbers and placements are different. They can very well be used interchangeably. For *Fig. 6: 8*, the main difference is that the 8 kinds of wind instruments are reduced to only 2 *sheng* and 2 *yu*. Since the various wind instruments all play in unison (or in octave doublings appropriate to their ranges), it is a simple matter to adapt the full scores to the reduced instrumentation of *Fig. 6: 8*: all the extra wind instruments can be left out. As to the part for *yong* bell 鏞 (I) of *Fig. 6: 2* and *Fig. 6: 3*, it can be played by the bell set 鏞鑗 (J) of *Fig. 6: 8*, transposed up 1 octave (see Ch. 5). Zhu Zaiyu intends his compositions to be a re-creation of the music of the Zhou dynasty. Viewed in this light, his orchestral plans in *Yuexue xinshuo* (*Fig. 6: 7* and *Fig. 6: 8*), as reconstructions of Zhou-era orchestras, are more than merely academic exercises of doubtful historical authenticity. They may be regarded as alternative orchestrations, applicable to actual performances of his musical compositions as well.

**Use of the various instruments in concerted music**

Zhu Zaiyu has provided a neat summary of how the various instruments are used in the concerted music [A: *Lüli jingyi*: Inner Bk. 9 (*Lüshu*: Fasc. 4: 87a); A: *Lüli jingyi* / FENG 1998: 776].

In all the concerted music:

- At the beginning of each song, the *zhu* is struck 3 times. At the beginning of each stanza, the *taogu* is rattled 3 times. At the beginning of each phrase, the *yong* bell is struck once. At the beginning of each word, the *zhong* bell is struck once.

- For each word, at the end of the 1st bar and the beginning of the 2nd, the stone chime is struck once.

- For every note played by the wind instruments, the *qin* plays 32 notes, and similarly for the *se*.

- After each phrase, the *yingu* is sounded once, and the *yingpi* is sounded once. The big drum sounds 3 times, alternating with the *yingpi*.

- At the beginning of the next phrase, the *yong* bell is struck. At the beginning of the next stanza, the *taogu* is rattled. All this is the same as before.
• Then when we come to the end of the song, scrape the *yu*.

凡合樂
每詩一篇之首擊柷三聲一章之首播鼗三通一句之首擊鑾一聲一字之首擊鍾一聲
一倡之尾一和之首擊磬一聲
每吹一聲琴彈三十二聲瑟亦如之
每一句畢擊鼓一聲應鞞一聲大鼓三聲應鞞間之
次句首擊鑾次章首播鼗皆同前也
至一篇終然後擽敔

To supplement this summary, I should add that there are 2 *taogu*, a big one and a small one (see Ch. 5). The big one announces the beginning of a song, and the small one announces the beginning of each stanza [A: *Lüli jingyi*: Inner Bk. 9 (Lüshu: Fasc. 4: 74a); A: *Lüli jingyi* / FENG 1998: 753].

The reader may well wonder, why are there so many formulaic regularities in the music — the 3-fold rattling of the *taogu* at the start of each stanza, the big *yong* bell marking the start of each phrase, the regular alternation of bells and stone chimes on each word, the fixed sequence of drum-strokes between phrases (*yingu – yingpi – gu – yingpi – gu – yingpi – gu – yingpi*), ...? Certainly, they are a mark of the imperturbable and stately progress of the ceremonial music. But they may also have served a practical function. Many of the musicians, including the *qin* and *se* players, were blind (see p. 308, and Fig. 6: 11 and Fig. 6: 13). These formulaic regularities were necessary audio cues to coordinate the blind ensemble. The Master of Music could not have just waved his hands, like a modern conductor!

**An alternative instructional ensemble**

The song 〈*Heyue Li wo zhengmin 合樂立我烝民*〉 (in *Lüli jingyi*: Outer Bk. 8) originally formed part of the unpublished treatise *Xiange yaozhi 《弦歌要旨》* [Essentials of song with string accompaniment], which Zhu Zaiyu learned from his father Zhu Houwan 朱厚烷 (see Ch. 1). As already mentioned, its full score and that of 〈*Heyue Gugong 合樂股肱*〉 [A: *Caoman*: 22b–62a] both specify the same instrumentation as the song 〈*Heyue Guan ju 合樂關雎*〉 in Xuangong heyue pu.

However, there is in *Xiange yaozhi* a chapter entitled (On the 6 musical instruments which must not be lacking when learning to sing the songs of the *Shijing 論學歌詩六般樂器不可缺*) [A: *Lüli jingyi*: Outer Bk. 8 (Lüshu: Fasc. 6: 48b–50b); A: *Lüli jingyi* / FENG 1998: 1084–1088; identically in A: *Caoman*: 20a–22a; C: Wu 2008: 378–383]. These 6 essential instruments are:
We note the use of the sheng as the primary wind instrument, just as in the Single Suspension plan of Fig. 6: 8. Zhu Zaiyu illustrates this ensemble with another plan employing just these 6 instruments, plus a chorus of 16 singers (Fig. 6: 9). A legend on the diagram says that the number of singers is immaterial. This gives an alternative instrumentation and ensemble setup for 〈Heyue Li wo zhengmin〉, and for 〈Heyue Gugong〉 as well, which may be used in singing classes. Zhu Houwan (or Zhu Zaiyu) recommends these two songs (among others) as examples of “the true legacy of the sounds of high antiquity, but unknown to players of the qin. […] Beginners learning to sing the songs of the Shijing should start with these songs […] which may almost be regarded as a gateway to the 300 songs [of the Shijing]. 真乃太古遺音而琴家不識也 […] 初學歌詩宜先學此 […] 庶幾三百篇由此而入也” [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 50b); A: Lülü jingyi / FENG 1998: 1088].

The full scores of 〈Heyue Li wo zhengmin〉 and 〈Heyue Gugong〉 can easily be adapted to the reduced ensemble of Fig. 6: 9. All the unavailable instruments should simply be left out (all wind instruments except sheng; stone chimes, chongdu, zhu, yu, and se). Since the zhu and yu are only used in the first and last bars, these 2 bars should be omitted entirely, as in the concerted music songs of Xiangyin Shiyue pu. But with only bells and no stones chimes, it is less clear for how long each note of the melody should be prolonged. In the full scores, bells and stone chimes alternate every bar, and each note of the melody is prolonged first for 1 bar with the bell, and then for a 2nd bar with the stone chimes. Caoman guyue pu [A: Caoman: 10a–13a] contains also a short score of 〈Gugong〉, in which only the words of the song and the instruments sheng, qin, and se are notated. The melody and caoman figurations are identical to the full score version [A: Caoman: 22b–62a], and each note of the melody is held for 2 bars as well. (That is, 32 notes of caoman figuration: the 1st bar with 16 caoman notes is notated in full, and the 2nd bar is indicated by repeat signs 从頭再作, written in the simplified characters of qin tablature (see Ch. 3).) On the other hand, in the songs with concerted music of Xiangyin Shiyue pu, which employ only stone chimes but no bells, every melody note is held for only 1 bar (16 notes of caoman figuration), and there are no interludes for percussion alone between every phrase of the songs (bofu, drum with yingu and yingpi). The evidence appears to favour the 2-bar prolongation. But since Fig. 6: 9 illustrates an instructional situation, perhaps Zhu Houwan and Zhu Zaiyu were not too particular, and both 1-bar and 2-bar prolongations might have been used.
Fig. 6:9 Playing the zither and taking delight in its strings, relying on a broad knowledge of analogies and enjoying the Shijing songs.

The voice must agree with the qin, the qin must agree with the sheng, sheng, qin, and voice sound as one.

\[
\begin{array}{cccccccc}
\text{S} & \text{S} & \text{S} & \text{S} & \text{S} & \text{S} & \text{S} & \text{S} \\
\end{array}
\]

High voices sing high, low voices sing low.

There is no other method to singing but that all voices must sound as one.

| (1) = taogu | (2) = bofu | (3) = drum | (4) = bells | (5) = qin | (6) = sheng | S = singer. |

An alternative instructional ensemble for (Heyue Li zao zengmin) and (Heyue Gu guang).

〔A: Lüli jingyi: Outer Bk. 8 (Lizhu Fac. 6: 51a) (A: Lüli jingyi / Feng 1998: 1089).〕

(1) = taogu, (2) = bofu, (3) = drum, (4) = bells, (5) = qin, (6) = sheng, S = singer.
We note in Fig. 6: 9 an important hint for the performance of Zhu Zaiyu’s music for voice. The caption on the left side of the page says, “High voices sing high, low voices sing low 聲高依高聲低依低“. As discussed in Ch. 4, the sounding pitch of Zhu Zaiyu’s huangzhong 黃鍾 [1-C] is 650 Hz, or about concert E5. This is in the soprano register, and while a literal performance in this pitch register is possible for boys, it is not so for men. Here Zhu Zaiyu tells us that such a literal interpretation is not intended: each person should sing in a pitch register comfortable for his own voice. (NB As there are never any women singers in Zhu Zaiyu’s music, I take this hint to transcribe all voice parts 1 or 2 octaves below Zaiyu’s original notation, i.e. huangzhong = [1-C], to sound at a pitch about E4, for treble voices, or huangzhong = [1-C], to sound at a pitch about E3, for men’s voices.)

Fig. 6: 9 bears the title “Playing the zither and taking delight in its strings, relying on a broad knowledge of analogies and enjoying the Shijing songs”. This is a reference to the classic text Liji 《禮記》 [Book of rites] (Ch. 18 On education 學記), which says, “If [a student] does not learn to play various tunes on the zither, he will not take delight in its strings. If he does not learn to acquire a broad knowledge of analogies and to rely on it, he will not enjoy the Shijing. 不學操縵不能安弦不學博依不能安詩”. For Zhu Houwan, this statement was a springboard from which he launched his whole treatise Xiangge yaozhi. The term caoman 操縵 occurs in the title, and it can be interpreted generally or specifically. In its general sense, as used in Liji and in the title here, it means no more than playing various tunes and tuning exercises on the zither. In Xiangge yaozhi Zhu Houwan expanded on this idea, and elaborated it into his whole theory of caoman as specific rhythmic figures played on the zither, which prolong every note of the song with its Alberti-bass-like figurations. (See Ch. 3.)

Summary of orchestral plans

The 3 songs (Heyue Guan ju 合樂關雎), (Heyue Gugong 合樂股肱), and (Heyue Li wo zhengmin 合樂立我烝民) are all identically scored for Zhu Zaiyu’s full orchestra. Their orchestration is however not fixed, and Zhu Zaiyu has provided several plans for their performing forces and orchestral layouts, to be used as suits the circumstances.

- The large orchestra employs 40 musicians. An extra chorus of singing pupils plus dancers will make this up to a total complement of 80 performers. See Fig. 6: 1 (p. 282) and Fig. 6: 3 (p. 286). This and the small orchestra (below) are Zhu Zaiyu’s original orchestrations, and either one may be used for the correct performance of his full scores.

- The small orchestra is half of the large orchestra, and has only 20 musicians. An extra chorus of singing pupils plus dancers will make this up to a total of 40 performers. See Fig. 6: 1 (p. 282) and Fig. 6: 2 (p.285).
As a variant to the large orchestra, the later Carriage Suspension plan of 35 musicians may optionally be used. See Fig. 6: 6 (p. 292) and Fig. 6: 7 (p. 294). This plan does not mention any dancers.

If a very small orchestra is desired, another later variant, the Single Suspension plan of 15 musicians, may be employed with some minor adjustments to the instrumentation (p. 295). See Fig. 6: 6 (p. 292) and Fig. 6: 8 (p. 295). This plan does not mention any dancers.

For the performance of *Heyue Gugong* and *Heyue Li wo zhengmin* in instructional and informal situations, a small ensemble of 6 instrumentalists may be employed, together with any number of singing pupils. Some adaptation of the music is necessary (p. 299). See Fig. 6: 9 (p. 300).

**THE ENSEMBLES IN Xiangyin Shiyue pu 《鄉飲詩樂譜》**

As explained in Ch. 2, Xiangyin Shiyue pu 《鄉飲詩樂譜》 [Songs of the *Shijing* [Classic of poetry] for performance at the Country Banquet] [A: Xiangyin] is Zhu Zaiyu’s attempt to re-create the musical programs of the Country Banquet 鄉飲酒禮 and the Country Archery Meet 鄉射禮, as described in the classic text *Yili* 《儀禮》 [Protocol and ceremonial] [B: Yili]. Additional information is gleaned from other classic texts like *Zhouli* 《周禮》 [B: Zhouli]. The ceremonial court is divided into an upper court at its northern end, and a lower court at the southern end. One group of musicians sits on-the upper court, where they perform the songs called *xiange* 《歌》 [song with string accompaniment]. A second ensemble performs standing in the lower court, and their repertoire consists of the songs called *shengzou* 《笙樂》 [song for *sheng*]. For the concerted music *heyue* 合樂, the 2 groups perform together, augmented by a battery of percussion instruments.

In the full orchestral scores discussed in the previous section, a prominent pair of instruments are the bells and stone chimes. As mentioned already, these play alternately every bar, and each note of the melody is prolonged first for 1 bar with the bell, and then for a 2nd bar with the stone chimes. On the contrary, all the songs in Xiangyin Shiyue pu employ only stones chimes, but no bells. Zhu Zaiyu explains that this arrangement is based on classical commentaries on the *Zhouli* 《周禮》, and he prefaces Xiangyin Shiyue pu with the following remark [A: Xiangyin: Preface: 1a–2a]:

**GENERAL DISCUSSION CONCERNING THE COUNTRY BANQUET — THAT IT USES STONES CHIMES BUT NO BELLS**

In all discussions of the setup of music, both bells and stone chimes are included. But in this case we have stone chimes but no bells, and that is why the commentaries say that the
instruments are few. When both bells and stone chimes are used, every caoman figure is repeated, and we say “beginning with the sound of gold and ending with the vibrations of jade”. When bells are not used, we do not say “beginning with the sound of gold”, but only “ending with the vibrations of jade”  [...] This is a small variation from the repeated caoman figures of the previous books.

總論鄉飲有磬無鍾
蓋凡言設樂皆有鍾有磬惟此有磬無鍾故云少耳夫有鍾有磬則其操縵從頭再作謂之曰金聲玉振其無鍾者則不謂之曰金聲但曰玉振  […] 此與前卷操縵所謂從頭再作者大同小異

Songs with string accompaniment [xiange 弦歌]

Zhu Zaiyu opens Xiangyin Shi Yue pu with 2 quotes from Yili [A: Xiangyin: Bk. 1: 1a]:

〈[Ch. 4] The Country Banquet〉 says: 20 “Place-mats are set at the side of the court, with the east side as the more senior position. The musicians number 4, with 2 se players, who enter first, led by 2 guides. The guides carry the se on their left shoulders, with the heads of the instruments behind. [They hold the se with] their [left] fingers crooked into the sound-holes on the bottom of the instruments, and the strings towards themselves, and with their right hands they guide the musicians. The Master of Music ascends [to the upper court] first, and stands at the east side of the western steps. The musicians enter and ascend by the western steps, and sit down facing north. Their guides sit facing east, present the se to the musicians, and then descend.”

鄉飲酒禮曰設席于堂廉東上工四人二瑟瑟先相者二人皆左何瑟後首挎越内弦右手相
樂正先升立于西階東工入升自西階北面坐相者東面坐遂授瑟乃降

The second quote, from 〈Ch. 5 The Country Archery Meet〉, is very similar. The 2 quotes give an extremely vivid (if in some respects overly-detailed) picture of the ceremonies, and tell us many facts about the musical setup on the upper court. In addition to the Master of Music, the upper group numbers 4 musicians, 2 of them playing the se 瑟. Yili does not say what the other 2 musicians do. In Xiangyin Shi Yue pu Zhu Zaiyu assigns them to the bofu 博拊, and he makes all 4 instrumentalists in the upper group (2 se and 2 bofu) double as singers (Fig. 6: 11). In the drawing the musicians are portrayed as men of mature age, so they would naturally sing in bass clef. The stone chimes are played by a (younger) 5th musician in the lower court (Fig. 6: 12). (NB Zhu Zaiyu does not actually say how many musicians play the bofu. 2 bofu players in the upper group is the most natural assumption. In the score transcriptions, I have put their number as [2].)
Several different ceremonial functions with music are described in *Yili* (see Ch. 2), and in spite of all its detail, that classic is not entirely specific about the job assignments of the upper group of musicians, and it never clearly states the number of singers. This has left room for various interpretations. The question is mentioned in *Yili*: Ch. 4, 5, 6, and 7. Based on his reading of these Chapters, Zhu Zaiyu has proposed several solutions, that in *Xiangyin Shiyue pu* being just one of them. His various solutions are summarized in Fig. 6:10. Zaiyu’s earliest interpretation is contained in the treatise *Sepu*《瑟譜》[Notes on the se] of 1560. In this early work Zhu Zaiyu has 2 se on the upper court, and since *Yili* requires some of the musicians to sing, he very naturally makes the 2 unassigned musicians into singers. In his later works, Zaiyu puts other instrumentalists on the upper court, makes the zither players (qin and se) do double duty as singers, and requisitions some percussion players for the singing group too. He also allows himself to deviate from the numbers specified in *Yili*. With all of his musical setups in Fig. 6:10, Zhu Zaiyu makes clear their basis in *Yili* by quotations or citations from that classic. But the small orchestra and large orchestra of *Xuangong heyue pu* are an exception, in that they are not accompanied by any mention of *Yili*, and they are also the arrangements which depart from *Yili* the most. In the previous section we saw that they are based on Zhu Zaiyu’s early reading of *Zhouli* instead (p. 296). The Carriage Suspension and Single Suspension of *Yuexue xinshuo* have also been discussed in the previous section. In this section we are concerned with the setup in *Xiangyin Shiyue pu*. As already noted, Zhu Zaiyu’s solution here is to have 2 se and [2] bofu players on the upper court, with all 4 instrumentalists doubling as singers.
**Fig. 6: 10**  **TABLE**  Musicians on the upper court, according to *Yili* and Zhu Zaiyu. In addition to the musicians listed in the table, the Master of Music also stands on the upper court.

<table>
<thead>
<tr>
<th>Source</th>
<th>Instrumentalists</th>
<th>Singers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Yili</em>《儀禮》</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Ch. 4 The Country Banquet 鄉飲酒禮第四)</td>
<td>2 <em>se</em></td>
<td>?</td>
<td>4</td>
</tr>
<tr>
<td>(Ch. 5 The Country Archery Meet 鄉射禮第五)</td>
<td>2 <em>se</em></td>
<td>?</td>
<td>4</td>
</tr>
<tr>
<td>(Ch. 6 The [Great] Banquet 燕禮第六)</td>
<td>2 <em>se</em></td>
<td>?</td>
<td>4</td>
</tr>
<tr>
<td>(Ch. 7 The Great Archery Meet 大射第七)</td>
<td>4 <em>se</em></td>
<td>?</td>
<td>6</td>
</tr>
<tr>
<td><em>Zhu Zaiyu</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Sepu</em>《瑟譜》: Bk. 6: 1b</td>
<td>2 <em>se</em></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>Xuangong heyue pu</em> 《旋宮合樂譜》: 1a, 1b Small orchestra (Fig. 6: 1, Fig. 6: 2)</td>
<td>1 <em>qin</em>, 1 <em>se</em>, 1 bell, 1 stone chimes (all doubling as singers) + 4 non-singing players</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>_____: 1a, 2a Large orchestra (Fig. 6: 1, Fig. 6: 3)</td>
<td>2 <em>qin</em>, 2 <em>se</em>, 2 bells, 2 stone chimes (all doubling as singers) + 5 non-singing players</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td><em>Xiangyin Shiyue pu</em>《鄉飲詩樂譜》: Bk. 1: 1b, 2a, 5a</td>
<td>2 <em>se</em>, [2] <em>bofu</em> (all doubling as singers)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><em>Lüli jingyi</em>《律呂精義》: Inner Bk. 9 (Lüshu: Fasc. 4: 46b–47a); <em>Lüli jingyi / FENG</em> 1998: 695–696</td>
<td>2 <em>se</em>, or 4 <em>se</em></td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td><em>Yuexue xinshuo</em>《樂學新說》: 33b–34a Carriage Suspension 軒縣 (Fig. 6: 6, Fig. 6: 7)</td>
<td>2 <em>qin</em>, 2 <em>se</em>, 1 <em>bofu</em>, 1 <em>chongdu</em> (all doubling as singers) + 3 non-singing players</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>_____: 34b–35a Single Suspension 特縣 (Fig. 6: 6, Fig. 6: 8)</td>
<td>1 <em>qin</em>, 1 <em>se</em>, 1 <em>bofu</em>, 1 <em>chongdu</em> (all doubling as singers) + 3 non-singing players</td>
<td>4</td>
<td>7</td>
</tr>
</tbody>
</table>
Fig. 6:11 The se and bofu players both sing.

The ensemble on the upper court plays and sings the songs with string accompaniment [xiange 弦歌]. Note that the musicians are portrayed as blind men of mature age. They would be singing in bass clef.
In Xiangyin Shiyue pu, stone chimes accompany every song, while the taogu is used only in the concerted music [heyue 合樂].

Fig. 6: 12 1 person in the lower court plays the stone chimes & doubles on taogu.


Yili tells us that the musicians were led by guides, because they were blind (Ch. 2). It was the practice to employ blind persons as musicians, as they were thought to possess especially acute hearing, and this was the only work they could do anyway. In Zhouli there is a description of an official (in the Zhou dynasty) called Gumeng 瞽矇 [Blind Musician], and Zhu Zaiyu has written an exegesis on it in Yuexue xinshuo [A: Yuexue: 40b–41a]. Zhouli's job description says:

The Blind Musicians play the taogu, zhu, yu, xun, xiao, guan, string instruments, and sing. They recite the Shijing and the genealogies of noble families. They play the qin and se. They perform the song(s) of the 9 virtues and songs in the 6 subjects of the Shijing. They serve under the Grand Master.

The Shiliao 眡瞭 [Musicians’ Guides] were a general corps of sighted musicians, whose main job was to guide the Blind Musicians. With his sense of detail, Zhu Zaiyu was concerned that the se was too big and heavy an instrument for these young workers to carry with only 1 hand, as instructed by Yili. In Sepu (1560), he writes that they must use a small se 瑟, like the modern zheng 箏 (Fig. 6: 13); for a big 25-stringed se would be so heavy and unwieldy that [A: Sepu: Bk. 6: 3a] “it would topple the guide, and even the musician whom he is leading would be swept to the ground. Wouldn’t that be ridiculous!” In later years he must have found some way to make a lighter 25-stringed se, or experimented to find a more efficient way of carrying it, for that is the instrument illustrated in Lülü jingyi (author’s Preface dated 1596) and Xuangong heyue pu (printed and presented at court in 1606) (Fig. 6: 13). He could have saved himself the trouble. We know today, from archaeological specimens, that the se of Zhou times looked like neither of the instruments in Zhu Zaiyu’s drawings, and it came in a variety of sizes. The large ones (about 2 m long) would have been quite unmanageable as Zaiyu feared, but the smaller sizes (less than 1 m – about 1.6 m) did not require an extraordinary athletic feat to carry them the way it is described in Yili. (See Ch. 5.)
Fig. 6: 13  Carrying the se on his left shoulder, with the head of the instrument behind, and guiding the musician with his right hand

- Zhu Zaiyu’s conception of 1560.  

- Zhu Zaiyu’s conception of 1596 and 1606.  
  [A: Lülì jingyi: Inner Bk. 9 (Lüshu: Fasc. 4: 45a) (A: Zhu / Li F2013: 1021).]  
  The same drawing is also shown in [A: Xiangyin: Bk. 1: 2b].
Songs for sheng [shengzou 笙奏]

The 6 songs (of the Shijing) for sheng presented a special problem for Zhu Zaiyu. Their lyrics are lost, and all that is known of their contents comes from the short 1-sentence prefaces which MAO Heng 毛亨 (fl. c. −200 – c. −1) wrote for each of them, and which have survived with his edition of the Shijing 《詩經》[Classic of poetry] (composed and compiled c. −1000 – c. −600) 27. They are cited by their titles in Yili, as forming a part of the musical programs for the Country Banquet and the [Great] Banquet. To recapitulate a little from Ch. 2, Yili: 〈Ch. 4 The Country Banquet 鄉飲酒禮第四〉 says:

28 The sheng players enter the lowercourt, and stand to the south of the stone chimes, facing north. [They] play [the songs] 〈*Nangai*〉, 〈*Baihua*〉, and 〈*Huashu*〉.

[*****]
Then these songs are performed alternately: the singers sing 〈Yu lì〉, the sheng play 〈*You geng*〉, the singers sing 〈Nan you jiayu〉, the sheng play 〈*Chongqiu*〉, the singers sing 〈Nanshan you tai〉, and the sheng play 〈*You yi*〉.

笙入堂下磬南北面立樂南陔白華華黍

[*****]
乃閒歌魚麗笙由庚歌南有嘉魚笙崇丘歌南山有臺笙由儀

The 6 lost songs for sheng are marked by 〈*...*〉 above. A straightforward reading of this passage (and the corresponding one in Yili: 〈Ch. 6 The [Great] Banquet 燕禮第六〉 29) can only mean that the songs 〈*Nangai*〉, … 〈*You geng*〉, … were instrumental pieces played by the sheng, and not songs sung by voices. (This may be a reason why their lyrics have not survived.) This interpretation is supported by all the standard references. 30

However that may be, Zhu Zaiyu was not satisfied with this state of affairs, and he (or his father Houwan, see Ch. 1) composed new lyrics to supplement the lost texts of these 6 songs. Citing various classical and historical references (see below), he concludes that these songs can and should be sung to the newly-composed lyrics. 31 The ensemble employs 3 sheng and 1 singer, who stand in the lower court, and the vocalist sings along together with the sheng, marking the rhythm with the chongdu 春牘 (Fig. 6: 14). In the drawing the musicians are portrayed as young men or boys, so the singer may be expected to sing in tenor / bass or treble voice.
Fig. 6: 14 3 sheng & 1 vocalist singing along stand to south of stone chimes.

The lower group plays the songs for sheng [shengzou 笙奏].

Note that the musicians are portrayed as young men or boys. The vocalist would sing in tenor / bass or treble.

a See p. 312.

b [B: Liji 《禮記》: (Ch. 45 The meaning of the Country Banquet 鄉飲酒義); B: Liji / ctext 2006−: http://ctext.org/liji/xiang-yin-jiu-yi/zh?en-on#n10415; C: [Liji]. T1885: Vol. 28: 439].
Whatever musical merits there may be in Zhu Zaiyu’s instrumentation of the songs for sheng, employing 3 sheng and 1 singer, his historical arguments attempting to justify it are actually quite fallacious. They are presented in a special paragraph entitled〈Disputation on “3 sheng and 1 he” / that the old interpretation of he as a small sheng is incorrect 辯三笙一和舊以和為小笙非是〉[A: Xiangyin: Bk. 1: 11b]. I have just explained in the last paragraph, how the Chapters〈Ch. 4 The Country Banquet〉 and〈Ch. 6 The [Great] Banquet〉 of Yili make clear that the songs for sheng are precisely that — instrumental pieces for sheng, based on (now lost) lyrics of the Shijing. Yili〈Ch. 5 The Country Archery Meet〉 adds a further sentence, 32 “3 sheng and 1 he make music 三笙一和而成聲”. The exegetical note by ZHENG Xuan 鄭玄 (127–200) explains, “3 persons play the sheng, 1 person plays the he, totalling 4 players. Erya explains, under the word sheng, that he is a small sheng. 33 三人吹笙一人吹和凡四人也爾雅曰笙小者謂之和”. All this is so abundantly clear that it hardly leaves room for dispute. But Zhu Zaiyu was not satisfied. He reviews the above explanations, and says, “I cannot but have my doubts. Why? With 3 persons playing the sheng, and then having 1 person play a small sheng, it does not make sense. 臣不能無疑焉何也三人吹笙一人吹小笙則不成文理矣”. He then goes on to cite a different argument. “The〈Treatise on music〉 in Songshu mentions the xianghege, concerning which it says, 34 ‘String (silk) and wind (bamboo) instruments respond to each other harmoniously, and the person who beats the jie sings.’ 宋書樂志有相和歌之説謂絲竹相和而執節者歌”. The rhythmic instrument jie was in ancient times called the chongdu, so the person who sings and beats the rhythm with the jie is the chongdu player. In this way Zhu Zaiyu arrives at Fig. 6: 14, which shows 3 musicians playing the sheng, and a 4th beating time with the chongdu and singing along.

The whole argument is transparently fallacious. It turns around a double entendre on the word he 和, which Yili uses in a special archaic sense to denote a small sheng, and Songshu uses in a general modern sense to mean ‘to respond harmoniously’. The instruments mentioned in Yili consist of big and small sheng exclusively, but the ensemble of Songshu contains no sheng at all. The Songshu is describing music of the Han dynasty (~206 – +220) and later, while the Yili is talking about that of the Zhou (~1045 – –256); the xianghege of the Han did not even exist in Zhou times. It is Zhu Zaiyu who does not make sense, by conflating the two. If Zhu Zaiyu were living today, he would simply have asserted his artistic freedom to create any instrumentation he pleases. However he lived in a different age with a different aesthetic, when adherence to age-old traditions was valued above any creativity. So he felt obliged to justify his music by a devious, but regrettably false, historical argument.

Concerted music [heyue 合樂]

The concerted music in Xiangyin Shiyue pu is performed by the combined forces of the upper and lower ensembles, playing the same music together. Zhu Zaiyu states this very clearly[A: Xiangyin: Bk. 4: 1a]:

...
In what is called concerted music, when the group on the upper court sings [the song] Guan ju, the group in the lower court also plays Guan ju in concert with it; when the upper group sings [the song] Quechao, the lower group also plays Quechao in concert with it. This is called concerted music.

所謂合樂者如堂上歌關雎則堂下亦奏關雎以合之如堂上歌鵲巢則堂下亦奏鵲巢以合之此之謂合樂也

Note that the upper group “sings”, while the group below “plays”. Does this perhaps reflect a lingering doubt in Zhu Zaiyu’s mind, whether he should have stuck a singer into the lower group in the songs for sheng after all? (NB In the score transcriptions, I have expressed this doubt by putting the number of voices for the concerted music in [brackets], thus: [5] = 4 on the upper court + [1] below.)

The songs with concerted music are conceived on a larger scale than the songs with string accompaniment or songs for sheng, and their instrumentation is augmented by a percussion battery the lower court. This plays the preludes, postludes, and interludes between each stanza of the songs. The percussion battery comprises the instruments taogu 鞗鼓, and the standing drum jiangu 建鼓 with small drums yingu 順鼓 and yingpi 應鼓 hanging on either side of it. It is illustrated in Fig. 6: 15, Fig. 6: 16a, and Fig. 6: 16b.
Fig. 6:15 1 player rattles the taogu & doubles on stone chimes.


The taogu is swung about so its 2 little strikers, attached like ears, rattle against the drum heads.

a See [A: Lüli jingyi: Inner Bk. 9 (Lushi: Fasc. 4: 71b); A: Lüli jingyi / FENG 1998: 744].

Fig. 6: 16a 1 player strikes the *yingu* & doubles on *jiangu* [standing drum] & *yingpi*.


The 2 diagrams show 2 sides of the same standing drum *jiangu*, with the larger *yingu* [leading drum] hanging on its west side and the smaller *yingpi* [responding drum] hanging on its east side.
The suspended drum of the Zhou dynasty is mentioned in Shijing and [Xiao dai] [Lj] but not in Zhouli or Yili. Yet Zhouli speaks of Drumming on the jingu to accompany the playing of bells; the jingu is a standing drum. The shuopi and yingpi hanging on both sides of the standing drum are called suspended drums.

Shijing speaks of “Yingpi, yingu, suspended drum”, and [Lj] says “the suspended drum is at the west, the yinggu is at the east”. The yingu and suspended drum are 2 names for the same instrument. The suspended drum is also called shuopi or yin; the yinggu is also called yingpi or ying.

Fig. 6: 1b 1 player strikes the yingu & doubles on jingu [standing drum] & yingpi.

A: Xiangyin: Bk. 1: 30b (L) – 31a (R) (A: Xiangyin / FR1968: Bk. 1: 60 (L) – 61 (R))]


[B: Zhouli 《周禮》: 〈Ch. 2 Situ, the Minister of the Earth 地官司徒: Drum Officer 鼓人〉; B: Zhouli / ctext2006–: http://ctext.org/rites-of-zhou/zh#n36799 ; C: [Zhouli] T1851: Tome 1: 265].
Summary of instrumentation for Xiangyin Shiyue pu

The instrumentation and performers of all the various musics (xiange, shengzou, heyue) in Xiangyin Shiyue pu are summarized in Fig. 6: 17.

Fig. 6: 17 TABLE Performers for the various musics in Xiangyin Shiyue pu.

<table>
<thead>
<tr>
<th>MUSICIANS</th>
<th>UPPER COURT</th>
<th>Xiang</th>
<th>LOWER COURT</th>
<th>Sheng-zou</th>
<th>Heyue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master of Music</td>
<td>樂正 1</td>
<td></td>
<td></td>
<td></td>
<td>descends after the 1st stanzas of the regular songs are done a</td>
</tr>
<tr>
<td>Percussion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chongdu</td>
<td>春牘 1 player</td>
<td>S</td>
<td>H</td>
<td></td>
<td>doubles as singer</td>
</tr>
<tr>
<td>Bofu</td>
<td>搏拊 [2 players]</td>
<td>X</td>
<td>H</td>
<td></td>
<td>double as singers</td>
</tr>
<tr>
<td>Jiaolu [standing drum]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stone chimes</td>
<td>磬 X 1 player</td>
<td>S</td>
<td>H</td>
<td></td>
<td>in heyue, doubles on taogu 鞉鼓</td>
</tr>
<tr>
<td>Zither</td>
<td>瑟 2 players</td>
<td>X</td>
<td></td>
<td>H</td>
<td>double as singers</td>
</tr>
<tr>
<td>Wind instrument</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xiang</td>
<td>笙 3 players</td>
<td>S</td>
<td>H</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL PERFORMERS</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

a [A: Xiangyin: Bk. 1: 44a].

CONCERTED MUSIC FOR THE DANCE IN Xiaowu xiangyue pu 《小舞鄉樂譜》

The music in Xiaowu xiangyue pu 《小舞鄉樂譜》 [Music of the country to accompany the minor dances] [A: Xiaowu] is intended to accompany the dances choreographed in Liudai xiaowu pu 《六代小舞譜》 [Choreography for the minor dances of the 6 ancient dynasties] [A: Liudai]. It consists of 2 songs from Shijing 《詩經》 [Classic of poetry] [B: Shijing], scored as concerted music: 〈Heyue Gaoyang 合樂羔羊 [Concerted music for the song Gaoyang]〉 for the civilian dances, and 〈Heyue Tuju 合樂兔罝 [Concerted music for the song Tuju]〉 for the martial dances. I have already discussed how these dances coordinate with the music in Ch. 3.
The instrumentation of 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 is identical, and quite similar to that of the full scores 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉. Although 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 are written in short score, without fully indicating every instrument on the scores directly, Zhu Zaiyu makes his intentions clear by appending a list of instruments and performers at the end of *Xiaowu xiangyue pu*. This list is paraphrased in Fig. 6: 17, and it may be compared with Fig. 6: 1 (p. 282) and Fig. 6: 6 (p. 292).

**Performers in music and dance classes**  

The regular number of performers is 14 musicians and 2 dancers (making up 16 performers), plus an unspecified number of music and dance pupils. If there are many pupils, the number of performers may be doubled, but there should not be too many. If the music is excessive, it becomes wanton; the lesser the better. If there are few pupils, it will be especially suitable to have less than 16 performers. [Note that if a reduced orchestra is used, the *sheng* is again treated as the irreducible core of the wind ensemble. This is the case in almost every one of Zhu Zaiyu’s reduced orchestrations — the Single Suspension in Fig. 6: 6, the group of 6 essential instruments on p. 298, and the lower ensemble in *Xiangyin Shi Yue pu*《鄉飲詩樂譜》 in Fig. 6: 17.]
**Fig. 6: 18 Table Performers in music and dance classes (for concerted music in Xiaowu xiangyue pu).**

[A: Xiaowu: 33a–b]

<table>
<thead>
<tr>
<th>[MUSICIANS]</th>
<th>[14]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[Percussion]</strong></td>
<td></td>
</tr>
<tr>
<td>Zhu, <em>yu</em>, bells, stone chimes</td>
<td>祝, 敲, 錘, 磬</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 1 player on each instrument if there are many players</td>
</tr>
<tr>
<td><em>Taogu</em>, drum, <em>yingu, yingpi</em></td>
<td>韌[鼓], 鼓, 榷[鼓], 懐[鎣]</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 1 player on each instrument</td>
</tr>
<tr>
<td><em>Bofu</em></td>
<td>搏拊</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2 players on the upper court and 2 the lower court (in which case the instruments on the upper court are called <em>bofu</em>, and those in the lower court are called <em>yagu</em> 雅鼓)</td>
</tr>
<tr>
<td><em>Chongdu</em></td>
<td>春幡</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2 on the upper court and 2 in the lower court</td>
</tr>
<tr>
<td><strong>[Zithers]</strong></td>
<td></td>
</tr>
<tr>
<td><em>Se</em></td>
<td>瑟</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Qin</em></td>
<td>琴</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2 or 4</td>
</tr>
<tr>
<td><strong>[Wind instruments]</strong></td>
<td>Wind instruments like <em>yu</em> etc. need not be used if they are unavailable. It is permissible to use only the <em>sheng</em></td>
</tr>
<tr>
<td><em>Yu</em></td>
<td>竽</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Sheng</em></td>
<td>笙</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Paixiao</em> [panpipes]</td>
<td>排簫</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Bianguan</em> [set of guan]</td>
<td>編管</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Yue</em></td>
<td>笙</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Di</em></td>
<td>笛</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Xun</em></td>
<td>墬</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><em>Chi</em></td>
<td>簫</td>
</tr>
<tr>
<td><strong>1 player</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><strong>[DANCERS]</strong></td>
<td>[2 instructors] but dance pupils cannot be absent</td>
</tr>
<tr>
<td>Civilian dancer</td>
<td>文舞</td>
</tr>
<tr>
<td><strong>1 performer</strong></td>
<td>or 2</td>
</tr>
<tr>
<td>Martial dancer</td>
<td>武舞</td>
</tr>
<tr>
<td><strong>1 performer</strong></td>
<td>or 2</td>
</tr>
<tr>
<td><strong>TOTAL PERFORMERS</strong></td>
<td><strong>16</strong></td>
</tr>
</tbody>
</table>
The parts for zither and voice in Xiaowu xiangyue pu

The performers and instruments shown in Fig. 6: 18 and the instrumentation notated on the score of Xiaowu xiangyue pu are not quite identical, and a few points need to be clarified. (Some of these remarks will be applicable to the concerted music of Xiangyin Shiyue pu as well.)

Fig. 6: 18 calls for the zithers qin and/or se, but only 1 line of caoman figurations is shown on the score of Xiaowu xiangyue pu. It may be interpreted for qin or se. Since it is not notated in qin tablature, but written in lüli notation 律呂譜 (see Ch. 3), it is like the line for se in the full scores of 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉. For this reason I have transcribed the part for se. With a little extra effort, it may be transcribed into qin tablature and played on the qin too.

A question of greater significance concerns participation of the voice. It may be noticed that no singers are indicated in Fig. 6: 18, and no voice line is shown in the score of Xiaowu xiangyue pu. The question may then be raised, are the two songs 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 perhaps meant for instrumental performance alone, without voices? This question is touched on in Ch. 2, and here I discuss it more fully. Consider the following points:

1. In the original score, the lyrics of both songs are printed in large type at the top of each column of music. (See Ch. 3.)
2. The lyrics of each song consist of 3 stanzas, with small variations between each stanza. However, in each song the music is strictly strophic and completely identical between all 3 stanzas. Yet it is printed out in full, one stanza after another. Why this waste of effort, if the words are not to be sung? If the music is to be simply repeated instrumentally, a repeat indication like 从頭再作 would have sufficed.
3. In Fig. 6: 18, many wind instruments are indicated, yet nothing of them is shown on the score itself. This should remind us that Xiaowu xiangyue pu must be understood as a short score, which does not show all the parts to be performed explicitly.
4. Both songs 〈Gaoyang〉 and 〈Tuju〉 are presented in versions with lyrics and melody alone, without caoman figurations, in Lüli jingyi 《律呂精義》 [A: Lüli jingyi: Outer Bk. 9 (Lushu: Fasc. 6: 85a–b); A: Lüli jingyi / FENG 1998: 1156–1157; C: WU 2008: 176–180], and in Xiangyin Shiyue pu [A: Xiangyin: Bk. 6: 9b–10a 〈Tuju〉, and 23a–b 〈Gaoyang〉]. (See Ch. 3, and transcriptions in Ch. 7. 35) These lyrics-and-melody scores complement exactly what the short score of Xiaowu xiangyue pu lacks. In this way they are analogous to part-books: the short scores with caoman figurations are for the use of the zither and percussion players, and the scores with lyrics and melody alone may be used by the singers and wind instruments.
The overarching premise of the treatise Xiange yaozhi《弦歌要旨》 [Essentials of song with string accompaniment] (originally written by Zhu Zaiyu’s father Houwan, see Ch. 1) is well expressed in the title of Zhu Zaiyu’s presentation of it in Lüli jingyi: Outer Bk. 8, 〈Ch. 7 Dissertation on singing with string accompaniment / that neither one nor the other may be neglected 論弦歌二者不可偏廢第七〉. This contains a chapter (or paragraph) with the title 〈The men of old never sang without [accompaniment by] strings, and neither did they ever play strings without singing 論古人非弦不歌非歌不弦〉 [A: Lüli jingyi: Outer Bk. 8 (Lüshu: Fasc. 6: 47b); A: Lüli jingyi / FENG 1998: 1082; identically in A: Caoman: 14b]. Zhu Houwan (and Zaiyu) claim that, as a rule, when the ancients sang the songs of the Shijing, it was always accompanied by the qin and se; and when they played the qin and se, they always sang songs of the Shijing. Similarly, the Preface to Caoman guyue pu is entitled 〈General thesis that the human voice is primary in music 總論樂以人聲爲主〉. It clearly emphasizes the primacy of the human voice. We can see that instrumental music with qin and se, played without participation of the voice, is something quite contrary to to Zhu Zaiyu’s aesthetic and philosophical principles.

Zhu Zaiyu’s preference for the voice can be seen in all other examples of his music. They include the 3 songs in full score 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉, and all the music in the 6 Books of Xiangyin Shiyue pu, 5 of which are written in the same short score format as Xiaowu xiangyue pu. 〈The songs in Xiangyin Shiyue pu: Bk. 6 indicate lyrics with melody only.〉 All these songs call for the voice, either explicitly on the scores themselves, or in Zhu Zaiyu’s explications attached to the scores. Even in the dubious songs for sheng of Xiangyin Shiyue pu, Zhu Zaiyu went to great lengths to include the voice in their performance (p. 312). Unless there are very good reasons to the contrary, the 2 songs 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 in Xiaowu xiangyue pu should not be treated any differently.

The evidence can leave no room for doubt, but that the 2 songs 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 in Xiaowu xiangyue pu must be performed with voice. Taking a hint from Fig. 6: 1, Fig. 6: 6, and Fig. 6: 17, the singers may be recruited from the zithers (qin and se), bofu, and chongdu players, and perhaps the bells and stone chimes players may be included too. A chorus of singing pupils may possibly be added (p. 283); but their numbers should be balanced against the number of dancers and other musicians, if we heed Zhu Zaiyu’s warning against the music becoming “excessive” and “wanton” (p. 318). The singers sing in unison with the wind instruments, and the melody is as shown in the lyrics-and-melody scores in [A: Xiangyin: Bk. 6: 9b–10a 〈Tuju〉, and 23a–b 〈Gaoyang〉]. Even without the help of these supplemental scores, their melodies are obvious enough: they are the notes played repeatedly by the zithers (qin and/or se) twice on each beat (every 1/8th note), transposed to the appropriate octave registers. Just because they are so obvious, Zhu Zaiyu has omitted them from the short scores, and so
it falls to their perverse fate, that the most obvious things are sometimes taken for granted and unwittingly neglected. (NB In the transcriptions of these songs I have indicated the parts for voice and wind instruments in small notes.)

**The parts for chongdu and bofu in Xiaowu xiangyue pu and Xiangyin Shiyue pu**

In the concerted music of *Xiaowu xiangyue pu* (《小舞鄉樂譜》) and *Xiangyin Shiyue pu* (《鄉飲詩樂譜》), the scores show both the *bofu* and *chongdu* marking the time in the percussion preludes, interludes, and postludes of the songs, when the voice is not singing. But in the melodic phrases with voice and zither(s), only the *bofu* is indicated. A literal reading must therefore leave the *chongdu* silent during these melodic phrases. However, when we look at the full scores of 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉, we see there the *chongdu* marking a non-stop beat all the way through the music. Keeping in mind that *Xiaowu xiangyue pu* and *Xiangyin Shiyue pu* are only short scores that may not indicate all playing parts all the time, it may be questioned if the *chongdu* should be playing continuously in the concerted music in these scores as well. Now in the dance choreography *Liudai xiaowu pu*, for which *Xiaowu xiangyue pu* provides the music, dance positions are illustrated at every beat (where 1 beat = ¼ note, making 8 beats for every dance turn; see Ch. 3) [A: *Liudai*: 5b–6a, 8b–104a; C: Wu 2008: 234–235, 237–284]. Similar illustrations of dance are shown in *Lüli jingyi*. In all these dance illustrations, each beat is described as 1 *chong*. With this hint, we can conclude that every beat of the dance is marked by the *chongdu*, without any interruption. This applies to the 2 songs 〈Heyue Gaoyang〉 and 〈Heyue Tuju〉 in *Xiaowu xiangyue pu* directly, and by analogy, it should apply to the concerted music in *Xiangyin Shiyue pu* as well. (NB In the transcriptions, the *chongdu* beats within each melodic phrase of the songs, where they are not explicitly notated in the original scores, are shown in small notes.)

A related question concerns both the rhythm instruments *bofu* and *chongdu*. In Zhu Zaiyu’s original scores, the *bofu* marks every 1/8th note with its alternating loud and soft strokes, and the *chongdu* marks every ¼ note. This is done continuously throughout the 3 songs 〈Heyue Li wo zhengmin〉, 〈Heyue Gugong〉, and 〈Heyue Guan ju〉 which are notated in full score. But in all the short scores of *Xiangyin Shiyue pu* and *Xiaowu xiangyue pu*, the notation replaces the *bofu* or *chongdu* stroke at the beginning of each bar by the stone chimes or bells, whose notes are written in the same column as the *bofu* or *chongdu* (Ch. 3, Fig. 6: 19). Perhaps this is meant to be executed literally, and the *bofu* or *chongdu* skips a beat at the beginning of each bar (Interpretation A). Or perhaps it is only a notational shortcut for the short scores, and they should be playing continuously with no skipped beat, as is done in the full scores (Interpretation B). I believe that interpretation B is highly plausible, yet nevertheless it rests solely on evidence by analogy. In this case, I have transcribed the original scores literally without any editorial additions (Interpretation A). The actual choices may be left to the performer.
*Bofu* rhythm

'Bofu rhythm in *Xiaowu xiangyue pu.* From [A: Xiaowu: 1b]

*Chongdu* rhythm

'Chongdu rhythm of Songs for *sheng* in *Xiangyin Shiyue pu.* From [A: Xiangyin: Bk. 1: 14a]

Either interpretation A or B may be valid. The transcriptions apply interpretation A.
NOTES

1 The 6 groups of dancers are as follows. For the civilian dances, there are personal dancers [renwu 人舞], phoenix dancers [huangwu 凤舞], and feather dancers [yuwu 羽舞]; and for the martial dances, there are 5-coloured-banner dancers [fuwu 帯舞], yak-tail dancers [maowu 旄舞], and shield dancers [ganwu 干舞] [A: Liudai: 1a–4a; C: Wu 2008: 224–228]. The numbers of dancers follow ancient feudal rules. For some brief notes on their historical context, please see Ch. 2.

2 The office or job title ‘Master of Music [Yuezheng 樂正]’ is discussed by Zhu Zaiyu in Yuexue xinshuo 《樂學新說》 [A: Yuexue: 24b]. The title Yuezheng is used in Yili 《儀禮》, and the office of Yueshi 樂師 is described in Zhouli 《周禮》. Zhu Zaiyu believes that they refer to the same official, and I would agree. In the context described here, his job is obviously analogous to that of the modern conductor.

In the classic references, the title Yuezheng is used in some texts, and Yueshi in others. For example, these texts say Yuezheng: [B: Yili: 〈Ch. 4 The Country Banquet 鄉飲酒禮〉; B: Yili / ctext 2006– : http://ctext.org/yili/xiang-yin-jiu-li/zh#n54653; B: Yili: 〈Ch. 5 The Country Archery Meet 鄉射禮〉; B: Yili / ctext 2006– : http://ctext.org/yili/xiang-she-li/zh#n54680; B: Liji 《禮記》: 〈Ch. 5 Royal regulations 王制〉; B: Liji / ctext 2006– : http://ctext.org/liji/wang-zhi/zh?en=on#n59353; B: Liji: 〈Ch. 6 Monthly ordinances 月令〉; B: Liji / ctext 2006– : http://ctext.org/liji/yue-ling/zh?en=on#n9782]. In other examples, the texts say Yueshi, and the locus classicus is [B: Zhouli: 〈Ch. 3 Zongbo, the Minister of Music 《周禮》: 〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Master of Music [Yueshi 樂師]〉; B: Zhouli / ctext 2006– : http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36975; B: Zhouli / ZHENG et al 2000: Vol. 8: 712–713; C: [Zhouli] T1851: Tome 2: 41–45]. See also [B: LÜZL 2015: 303; C: HUCKER 1985: No. 8270]. All references, Yuezheng or Yueshi, describe his job in similar terms — he directs the state music school, he teaches the pupils music and dance, and he leads the ceremonial music performances.

According to Zhouli, the Zhou music department had 4 Yueshi officials, who worked under the supervision of 2 Grand Directors of Music [B: Zhouli: 〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Grand Director of Music [Dasiyue 大司樂]〉; B: Zhouli / ctext 2006– : http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36971; B: Zhouli / XU & CHANG 2014: 477–487; C: [Zhouli] T1851: Tome 2: 27–40]. See also [B: LÜZL 2015: 35; C: HUCKER 1985: No. 6056].


4 For an introduction to the subject of musical archaeology in China and a survey of recent discoveries, the reader may consult the textbook-monograph [B: WANGZC 2003]. [B: LiCY 1996] is the authoritative study in this field. The series [B: Zhongguo yinyue wenwu daxi 1996–2001] and its sequel
[B: Zhongguo yinyue wenwu daxi 2006– ] are a comprehensive catalog of important archaeological relics, including musical instruments, wall paintings, etc, of interest to the history of Chinese music, with one volume devoted to each province of China.

The 4 grades of Orchestral Suspensions, and the archaeological examples which had then been discovered, are briefly discussed in [B: ZHUWW & LÜQC 1994: 125–132; C: FALKENHAUSEN 1993: 32–39]. [B: WANGQL 2007] is a systematic study of the Orchestral Suspensions of the Western Zhou period, incorporating the most up-to-date archaeological findings.

3 Ducal Ministers [san Gong 三公] See [B: LÜZL 2015: 16; C: HUCKER 1985: No. 4871].


Chunqiu Zuozhuan《春秋左傳》 [B: Chunqiu Zuozhuan / ctext 2006– : http://ctext.org/chun-qiu-zuo-zhuan/cheng-gong-er-nian/zh?en=on ; B: Chunqiu Zuozhuan / YU et al 2009: 747; C: LEGGE TR1970: Vol. 5: 339, 344] relates that in the 2nd year of Duke Cheng of Lu 魯成公二年 (−589), ZHONGSHU Yuxi 仲叔于奚, a Dafu 大夫 of Xinzhu 新築, was offered the reward of a city by the people of Wei 卫, for helping to save the army of Wei from a rout. He declined, and instead requested the boon of a bent suspension [quxuan 曲縣], which was granted. When Confucius (~551 – 479) heard of it, he disapproved, as the request was beyond Yuxi’s station of Dafu. In the exegesis to Zhouli [B: Zhouli: / ZHENG et al 2000: Vol. 8: 712], ZHENG et al quote this story from Chunqiu Zuozhuan, as evidence in support of their explanation of the Carriage Suspension.


11 Sheng-stonechimes [shengqing 笙磬] and song-stonechimes [songqing 頌磬]. Zhu Zaiyu explains, [A: Lülü jingyi: Inner Bk. 9 (Lüshu: Fasc. 4: 57b); A: Lülü jingyi / FENG 1998: 716] “In the Half Suspension, the sheng-stonechimes are placed to the east of the eastern steps. They are thick and small, their sound is clear and high-pitched, and so they sound well played together with the sheng and guan. […] The song-stonechimes are placed to the west of the western steps. They are thin and big, their sound is mellow and moderately-pitched, and so they sound well accompanying songs and hymns. 夫判縣者笙磬在阼階東其形厚而小其聲清而髙故與笙管協 …頌磬在賓階西其形薄而大其聲和而平故與歌頌協”. They are illustrated in Ch. 5. In this passage from Lülü jingyi, Zhu Zaiyu is of the opinion that Yili is describing the Half Suspension (see Note 14).

12 As with the stone chimes, sheng-bells [shengzhong 笙鍾] accompany the sheng, and song-bells [songzhong 頌鍾] accompany song [A: Lülü jingyi: Inner Bk. 9 (Lüshu: Fasc. 4: 72a); A: Lülü jingyi / FENG 1998: 746].

13 Single big bell [bo 鑮 = 鍾]. Zhu Zaiyu explains, [A: Lülü jingyi: Inner Bk. 9 (Lüshu: Fasc. 4: 48a); A: Lülü jingyi / FENG 1998: 698] “The big ones are bo bells, the small ones are bells arranged in sets, and those of intermediate size are single bells. 其大者為鍾鐘其小者為編鐘非大非小者為特鍾”. If we match the description in Yili to Zhu Zaiyu’s Carriage Suspension plan in Fig. 6: 7, the place where the bo should be is taken by the Single bell (I). The Single bell is illustrated in Ch. 5, and despite what Zhu Zaiyu says about its intermediate size, the drawing shows a big bell. I have therefore taken Zhu Zaiyu’s notion of bo to be ‘a big bell, individually suspended on its own stand’. In modern musical-archaeological usage, bo denotes a form of flat-bottomed bell, a meaning different from Zhu Zaiyu’s understanding of the term. For further discussion of bo, please see Ch. 5.

14 Zhu Zaiyu himself was confused as to the kind of Suspension Yili is describing. He discusses the classical Orchestral Suspensions in two nearly-identical passages in Lülü jingyi and Yuexue xinshuo [Note 9]. In Lülü jingyi he says that Yili does not mention the Palace and Carriage Suspensions, but probably does speak of the Half and Single Suspensions. In Yuexue xinshuo the same passage is changed to say that Yili does not mention the Palace and Half Suspensions, but probably does speak of the Carriage and Single Suspensions. That is, in Lülü jingyi he thinks that Yili is describing the Half Suspension, but in Yuexue xinshuo he thinks that it is the Carriage Suspension. He does not elaborate on this point in Lülü jingyi, but in Yuexue xinshuo he makes his interpretation explicit by 2 lists of performers and 2 orchestrals plans for the Carriage and Single Suspensions, as I explain in the following text. For this reason Yuexue xinshuo must be taken to be his definitive interpretation on this point.
Zhu Zaiyu’s change of interpretation incidentally provides a convincing piece of evidence to show that Yuexue xinshuo was written after Lülü jingyi, or at least after the organological chapter of Lülü jingyi \[A: Lülü jingyi: Inner Bk. 8–9 〈Ch. 10 Diagrams of musical instruments 樂器圖樣第十〉\]. If Zhu Zaiyu wrote Lülü jingyi first and then changed his mind later in Yuexue xinshuo, he might very well have neglected to correct his brief remarks made in the earlier work. But he would have to be an extremely careless worker (!) to have written Yuexue xinshuo first, and then changed his mind later in Lülü jingyi, but nevertheless left all his earlier lists and diagrams in Yuexue xinshuo in place without correction. This conclusion corroborates the evidence of several cross-references to Lülü jingyi from Yuexue xinshuo: 37b, 47a, 49a. (Such cross-references by themselves are not a reliable guide to the relative dates of composition of the two works, since they could easily have been inserted afterwards just prior to engraving, sometime before 1603. (See Ch. 1.)) The chronology of Zhu Zaiyu’s works is obviously a complex problem, to be reserved for further study.

15 The 2 rows of instruments lined up on 2 sides of the court would have given Zhu Zaiyu good cause for his earlier opinion in Lülü jingyi, that this is a Half Suspension (see Note 14).

16 [B: WANGQL 2007: 6] , after discussing both the documentary and the archaeological evidence, concludes that in the Zhou dynasty, the feudal sumptuary regulations on Orchestral Suspensions only applied to bells and stone chimes. Drums were used as accompanying instruments but not included in the rules, as most drums are not suspended instruments. However, the historical literature is confused, and Zhu Zaiyu was misled to include the drums.

17 [B: YANGYL R2009d: Vol. 2: 38] presents a diagram of a music hall or court of the Zhou dynasty, as interpreted from information in Yili, but he does not attempt to classify it as one of the 4 classical Orchestral Suspensions. YANG’s diagram may be compared with Fig. 6: 7: the two are basically similar.


19 [A: Xiangyin: Preface: 1a–b]. The classical commentaries on which Zhu Zaiyu bases his instrumentation (stone chimes but no bells) are found in [B: Zhouli: 〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Junior Dancing Master [Xiaoxu 小胥]〉 / ZHENG et al 2000: Vol. 8: 712–713].


21 [B: Zhouli 《周禮》：〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Blind Musician [Gumeng 瞽矇]〉; B: Zhouli / ctext 2006–: http://ctext.org/rites-of-zhou/zh#n36981; B: Zhouli / ZHENG et al 2000:}
They recite the *Shijing* and the genealogies of noble families” is a simple translation of this sentence, following the standard interpretation of ZHENG Xuan 鄭玄 et al [B: *Zhouli* / ZHENG et al 2000: Vol. 8: 725–726]. The job description of the 〈Junior Scribe [Xiaoshi 小史]〉, in the same book, has a similar phrase, with the same explanation: [B: *Zhouli* / ctext 2006–: http://ctext.org/rites-of-zhou/zh#n37016; B: *Zhouli* / ZHENG et al 2000: Vol. 8: 821; C: *Zhouli* T1851 : Tome 2: 110–111] “The Junior Scribes record the histories of the states, determine their genealogies, and distinguish their family relationships (placing the 1st ancestor’s shrine at the center, with those of the 2nd, 4th … generations of descendents ranked on his left, and the 3rd, 5th … generations ranked on his right) 小史掌邦國之志奠繫世辨昭穆”.

Zhu Zaiyu’s exegesis in *Yuexue xinshuo*, however, takes a different view, and rejects the reading of 世繫 as ‘genealogies’. Zhu bases his interpretation on a passage in *Liji* 《禮記》: 〈Ch. 19 On music 樂記〉 [B: *Liji* / ctext 2006–: http://ctext.org/liji/yue-ji/zh?en=on#n10153; B: *Liji* / JIANG & HUANG 2007: 568; C: *Liji* T1885: Vol. 28: 129–130]. *Liji* relates that Zigong 子贑 (−520 – ?), a disciple of Confucius, once asked Master Yi 師乙 what songs would be suitable for him (Zigong) to sing? To which Master Yi replied that each person would best sing those songs which matched his character, be it kind, honest, or decisive, etc. Those who appreciate the songs of Shang 商 are brave, and those who appreciate the songs of Qi 齊 are righteous. From this, Zhu Zaiyu draws a conclusion that from the character of a song, one can know the character of the singer, and tell the character of its times. He remarks, 〔A: *Yuexue* 41a〕 世 means the times, 奠 means to determine, 繫 means to belong. The *Commentary of MAO* and *Introductions of ZHENG* determine to what times (era) a song of the *Shijing* belongs, and this is what is meant by 世奠繫. 世猷時也奠猷定也繫猷屬也毛傳鄭譜定某詩屬某時即所謂世奠繫”. (MAO Heng 毛亨 (fl. c. −200 – c. −1) and ZHENG Xuan 鄭玄 (127–200) were two classical commentators on the *Shijing* 《詩經》 [Classic of poetry]; see [B: *Shijing* / MAO et al 2000].

Zhu’s interpretation of this sentence, in the context of *Zhouli* where it is describing the job of a low-ranking worker, appears to me as far-fetched and improbably high-flown. Moreover, it is contradicted by the unmistakable meaning of 繫世 = ‘genealogies’ in the 〈Junior Scribe〉 passage. Zhu’s thesis has some truth to it though. To take a modern example, during the Cultural Revolution (1966–1976), only revolutionary operas and ballets were permitted in China, and from the character of those songs, one can certainly tell the character of their times — so belligerent and bursting with destructive hatred.

The song(s) of 9 virtues [jiude zhi ge 九德之歌] is mentioned 2 times in *Zhouli*, but it provides no information as to what the song(s) may be. The orthodox opinion is that it concerns a passage in *Shangshu* 《尚書》 [Classic of ancient documents]: 〈Counsels of the Great Yu 大禹謨〉 (ancient script
Yu said, “Oh! consider this, O king [Shun 舜]. The virtue (of the ruler) consists in good government, and that government in the nourishing of the people. Water, fire, metal, wood, earth, and grain — these things must be duly maintained; the rectification of virtue, utilization of resources, and securing abundant means for a rich life — these must be harmoniously attended to. When these 9 things have been orderly accomplished, the 9 accomplishments will be celebrated in song. Caution the people with gentle words, correct them with the majesty (of law), exhort and encourage them with the 9 songs — so that all these benefits may not slip into decay and ruin.”

禹曰於帝念哉德惟善政政在養民水火金木土穀惟修正德利用厚生惟和九功惟敍九敍

This text (from 水火金木土穀惟修 to 俾勿壞) has been set to music by Zhu Zaiyu, using the popular tune 〈Jinzi jing 金字經 [Golden-character sutra]〉 in Lingxing xiaowu pu 《零星小舞譜》 [A: Lingxing: 9a, 11b–12a]. Several transcriptions are available, but I only mention the excellent study [C: JONES 1989], and the full-score transcription [C: WU 2008: 427–428]. (NB WU transcribes huangzhong [1-C] = he 合 as G instead of C, due to a confusion about the tonality of this song [p. 422].)

Instead of referring to a group of 9 songs, the 〈Song of 9 virtues〉 may be the title of 1 particular song. If so, what may it be? ZHU Xi 朱熹 (1130–1200) conjectures that it may be something like the 〈Gengge 賡歌 [Strophic song]〉 in Shangshu: 〈Counsels of Gaoyao (Yi and Ji) 梁陶謨（益稷）〉 [B: Shangshu / ctext 2006–: http://ctext.org/shang-shu/yi-and-ji/zh?en=on#n21106; B: Shangshu / GUO 2005: 41; B: Shangshu / KONG et al 2000: Vol. 2: 155–157; C: LEGGE TR1970: Vol. 3: 89–90] [B: Hui’an ji《晦庵集》 [Anthology from Hui’s studio]: Bk. 60: 〈Reply to Pan Zishan 答潘子善〉 (= Pan Shiju 潘時舉, fl. >1193); B: Hui’an / LIU 2010: 2911]. Zhu Zaiyu quotes ZHU Xi and concurs, even going so far as to say that the 〈Song of 9 virtues〉 is the 〈Gengge〉, whose lost music was the ancient 〈Shao 曜〉 of legendary perfection [A: Caoman: 3a–4b]. He (or his father Houwan) then sets it to music anew — it is the song 〈Gugong 股肱〉 in Caoman guyue pu 《操縵古樂譜》 [A: Caoman: 22b–62a], transcribed in Ch. 7.

The 6 subjects of the Shijing [liu 《詩》] are 6 topics which it was the responsibility of the Grand Master [Dashi 大師] to teach (to the Blind Musicians). Zhouli lists them as: the 〈Airs (of the 15 states) [Feng 風]〉, songs employing direct description [fu 賦], songs employing metaphor [bi 比], songs employing allusion [xing 興], the 〈Odes [Ya 雅]〉, and the 〈Hymns [Song 頌]〉. [B: Zhouli: 〈[Ch.] 3 Zongbo, the Minister of Spring (Ministry of Rites) 春官宗伯: Grand Master [Dashi 大師]〉; B: Zhouli / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36979; B: Zhouli /
ZHENG et al 2000: Vol. 8: 717–718. The liu 《Shi》 are more commonly called the liu yi 六義, which is their appellation in MAO Heng’s 毛亨 edition of the Shijing [B: Shijing / MAO et al 2000: Vol. 4: 13; C: LEGGE TR1970: Vol. 4: Prolegomena: 34)].

25 Grand Master [Dashì 大師] This official, described in Zhouli, is the leader of the corps of Blind Musicians [Gumeng 瞽矇], and we may expect, himself blind [B: Zhouli《周禮》: 〈Ch. 3 Zongbo, the Minister of Spring 春官宗伯: Grand Master [Dashì 大師 ]〉; B: Zhouli / ctext 2006–: http://ctext.org/rites-of-zhou/chun-guan-zong-bo/zh#n36979; B: Zhoulu / XU & CHANG 2014: 494–497; C: [Zhouli] T1851: Tome 2: 49–52; C: HUCKER 1985: No. 6020]. In addition to leading the Blind Musicians, one of his chief duties appears to be to ensure that the musical instruments are kept in tune, as we infer from the 1st part of his job description in Zhouli, “The Grand Master is in charge of the 6 yang and 6 yin pitch-pipes, whose notes match the tones of yin and yang 大師掌六律六同以合陰陽之聲” Zhu Zaiyu has written an exegesis on this passage, in the treatise Yuexue xinshuo《樂學新說》 [A new discourse on music] [A: Yuexue: 35b–37b].


For example, Shisanjing zhushu《十三經注疏》 [Exegeses on the 13 classics] [B: Yìlì《儀禮》 / ZHENG et al 2000: Vol. 10: 172–174], and Yìlì jingzhuan tongjie《儀禮經傳通解》 [Comprehensive exegeses on 《Yìlì》] by ZHU Xi 朱熹 (1130–1200) & HUANG Gan 黃榦 (1152–1221) [B: Yìlì tongjie / WANG 2010: (Bk. 7) 282–284].


33 [B: Erya 《爾雅》 [Dictionary / Approaching that which is correct]: 〈Ch. 7 Explaining music 釋樂第七〉; B: Erya / ctext 2006–: http://ctext.org/er-ya/shi-le/zh?en=on#n38384; B: Erya / GUO et al 2000: 172–173]

34 [B: Songshu 《宋書》 [History of the Song dynasty (420–479)] / by SHEN Yue 沈約 (441–513): Bk. 21〈Treatise on music Pt. 3 樂三〉; B: Songshu / Zhonghua 1974: 603].

35 For 〈Gaoyang〉, all versions of the melody are identical. But for 〈Tuju〉, the melodies in Xiaowu xiangyue pu [A: Xiaowu: 1a–27a] and Xiangyin Shiyue pu [A: Xiangyin: Bk. 6: 9b–10a] are the same, while the version in [A: Lülü jingyi: Outer Bk. 9 (Lüshu: Fasc. 6: 85a); A: Lülü jingyi / FENG 1998: 1156; C: Wu 2008: 176–178, 186] offers a few variants from the other two. (See transcriptions in Ch. 7.)

36 This is the reading of both Wu Zihui and Wu Zhi-wu, in their respective transcriptions from Xiaowu xiangyue pu and Xiangyin Shiyue pu [C: Wu 2008: 288–366 and B: WuZW 2007: 58–60].

37 [A: Lülü jingyi: Outer Bk. 10 (Lüshu: Fasc. 6: 90b–123a); A: Lülü jingyi / FENG 1998: 1168–1233; C: Wu 2008: 203–222]. Two dances are illustrated. The first is a dance with the dancers’ hands clasped inside big sleeves 大袖歛手舞, accompanied by the song 〈Li wo zhengmin 立我烝民〉, and the second is a dance with extended hands and small sleeves 小袖展手舞, accompanied by the song 〈Richu er zuo 日出而作 [I work when the sun rises]〉. The melodies of the two songs are similar but not identical, but in the portions which accompany the dances, both songs actually share the same melody. (Both songs are given with their melodies in [A: Lülü jingyi: Outer Bk. 8 (Lüshu: Fasc. 8: 51b–52a); A: Lülü jingyi / FENG 1998: 1090–1091].)

Chapter 7
Transcriptions

3 SONGS IN FULL SCORE
Fig. 7: 1a

ZHU Houwan & ZHU Zaiyu: 〈Yao yao [Song from the time of Yao] / Li wu zhengmin〉

Music: Lüji jingyi; Outer Bk. 8 (Liaoh: Fasc. 6: 51b); Lyrics: Shijing: 〈Hymns of Zhou: Si wen〉, 〈Major odes: Huangyi〉

Chinese: In manner "straight as a string of pearls"
The Master of Music first announces (Heyue Li wu zhengmin), and the banner holder repeats this as before. After the announcement he raises the banner, and then strikes the zhu.

(1) m. 1 Relf: Fa is a light stroke with the left hand, ba is a heavy stroke with the right hand.

(2) m. 1 Rofu & Chungdu: The rhythm must be even. As the ancients say, "The rhythmic intervals must be uniform."

(3) m. 5 Wind instruments: The instruments 任平, sheng 任, 任琅, yue 任, 任, li 任, and guan play nantii 南吕 [10-A] in unison.

(4) m. 5 Chorus: Skilled singers sing a long note on the word 在, student singers continue with the syllable li in accord. Similarly with the other words of the song.
ZHU Houwan & ZHU Zaizyu: ‘Heyue Li wu zhengmin [Song Li wu zhengmin with concerted music]’

(5) m. 13 Small drums: When the gǐngǔ 鼓 聲 sounds, the singers and wind instruments stop. They resume when the bell sounds.
朱厚烷，朱載堉：〈合樂立我烝民〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Li zhi zhegmmin [Song Li zhi zhegmmin with concerted music]〉
朱厚烷、朱載堉：〈合樂立我桑民〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Li wo zhengmin [Song Li wo zhengmin with concerted music]〉
朱厚烷，朱載堉：〈股肱〉  
ZHÜ Houwan & ZHÜ Zaiyu: 〈Gugong〉  
曲：操縵古樂譜：5b-9b；詞：《尚書》：〈昊田謬（益稷）〉  
Music: Caoman guque pu: 5b-9b; Lyrics: Shangshu: 〈The counsels of Gaoyao (Yi and Ji)〉  

Fig. 7: 2a
ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

Music: Cawun gugue pu; 22b-62b. Lyrics: Shangshu: ‘The counsels of Gao-yu (Yi and Ji)’

The Master of Music first announces ‘Heyue Gugong’, and the banner holder repeats ‘Heyue Gugong’. After the announcement he raises the banner, and then strikes the zhu.

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1. 1 Bofie: Fu 附 is a light stroke with the left hand, be 撃 is a heavy stroke with the right hand.
2. 1 Bofie & Chongda: The rhythm must be even. As the ancients say, ‘The rhythmic intervals must be uniform 間若一’.
3. 5 Wind instruments: The instruments gu, sheng 蓼, xun 素, yue 月, xiao 鳥, chi 㠱, di 鼬, and guan 管 all play in unison to support the chorus.
4. 5 Chorus: Skilled singers sing a long note on the word gu 附, student singers continue with the syllable gu in accord. Similarly with the other words of the song.
朱厚烷，朱載堉：〈合樂股肱〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Gugong [Song Gugong with concerted music]〉

(5) m. 13 Small drums: When the yingzi 鼓子 sounds, the singers and wind instruments stop. They resume when the bell sounds.
朱厚烷，朱載堉：〈合樂股肱〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Gugong [Song Gugong with concorted music]〉
朱勇. 《合璧联韵》: 《合璧联韵》(Song Guogu with concerted music)
朱厚烷, 朱載堉：〈合樂股肱〉
ZHOU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

2011-8-21, rev. 2012-3-28 朗成築
朱厚烷，朱載堉：〈合樂股肱〉
ZHOU Houwan & ZHU Zaiyu: 'Heyue Gugong [Song Gugong with concerted music]'
朱厚烷、朱載堉：〈合樂股肱〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Gugong [Song Gugong with concerted music]〉

2011-8-21, rev. 2012-3-28 陈成儒
ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’
朱厚烷、朱載堉：〈合樂股肱〉
ZHOU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’
朱厚烷、朱載堉：〈合樂股肱〉
ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

2011-8-21, rev. 2012-3-28 周成筠
朱厚烷, 朱載堉: 〈合樂股肱〉
ZHU Houwan & ZHU Zaiyu: 〈Heyue Gugong [Song Gugong with concerted music]〉
ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

Sheet music with various instruments and notation.
朱厚烷，朱載堉：〈合樂股肱〉

ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

(No natural text is transcribed as this is a music score sheet.)
朱厚烷，朱截堉：《合樂鼓肱》
ZHU Houwan & ZHU Zaiyu: ‘Heyue Gugong [Song Gugong with concerted music]’

2011-8-21, rev. 2012-3-28  胡成筠
The Master of Music first announces (Heyue Guan ju), and the banner holder repeats (Heyue Guan ju). After the announcement he raises the banner, and then strikes the zhu.

(1) m. 1 Bofu: Fa 附 is a light stroke with the left hand, bo 搏 is a heavy stroke with the right hand.
(2) m. 1 Bofu & Chongda: The rhythm must be even. As the ancients say: "The rhythmic intervals must be uniform 閒若一".
(3) m. 5 Wind instruments: The instruments guan 管, sheng 笙, yun 琴, yue 響, xiao 笛, chi 箬, di 笛, and guan 管 all play guan 管 in unison.
(4) m. 5 Chorus: Skilled singers sing a long note on the word guan 管, student singers continue with the syllable guan 管 in accord. Similarly with the other words of the song. 2011-8-24, rev. 2012-5-30 胡文英
ZHAI Zaiyu: 《Heyue Guan ju with concerted music》

(5) m. 13 Small drums: When the yingzi 鼓仔 sounds, the singers and wind instruments stop. They resume when the bell sounds.
朱载堉：〈合樂闡雎〉
ZHJ Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱载堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉

2011-8-24, rev. 2012-3-30 周成範
朱载堉：（全载曲谱）
Zhu Zaiyu: (Complete Guqin谱 with concerted music)
朱载堉：〈合樂關雎〉

ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉: 〈合樂闋睢〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱载堉：〈合樂關雎〉
ZHJ Zaiyu: 〈He Yue Guan Ju [Song Guan Ju with concerted music]〉

2011-8-24, rev. 2012-5-30  董成儒
朱载堉：《合樂關雎》
ZHU Zaiyu: 《Heyue Guan ju [Song Guan ju with concerted music]》
朱裁堉：《合樂關雎》
ZH J Zaiyu: 《Heyue Guan ju [Song Guan ju with concerted music]》

2011-8-24, rev. 2012-3-30 胡成菊
朱载堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：《合樂闡雎》
ZH: Zaiyu: 《Heyue Guan ju [Song Guan ju with concerted music]》

2011-8-24, rev. 2012-5-30 胡成篤
朱載堉：〈合樂觀雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱载堉：〈合樂闋雎〉

ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱载堉：〈合樂闋雎〉
ZHU Zaiyu: 〈Huyue Guan ju [Song Guan ju with concerted music]〉
朱载堉：〈合樂關雎〉
ZHJ Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
2 SONGS WITH DANCE
Fig. 7: 4a

ZHU Zaiyu: ‘Music for the song Gaoyang, in the style of the （Airs of Southern Zhao）’

曲本甲：《樂器詩詞》： 卷6: 23a-24a; 曲本乙：《樂器精義》：外篇卷9 (《樂書》：冊6: 85b); 詞：《詩經》：〈召南：羔羊〉

Music A: Xiangyu Shiqu po; Bk. 6: 23a-24a; Music B: Liuli jingyi; Outer Bk. 9 (Liushu: Fac. 6: 85b); Lyrics: Shijing: 〈Airs of Southern Zhao: Gaoyang〉

[B] 黃鐘之角 姑洗起調姑洗畢曲 Scale of huangzhong [1-C = do], mode on jue [mi], beginning and ending on guishan [5-E].

[B] Stanza 1, 2, 3. Rattle the taoxu 革鼓 3 times, and then strike the bell.

---

Song 〈Gaoyang〉 in 3 stanzas of 4 lines each.

[A] Total of 12 lines with 48 characters.

[B] At the end of each line, sound the yingzi 響鼓 once, and the big drum 3 times, alternating with the yingzi 喇鼓. Total 8 drumstrokes.
Fig. 7: 4b

All civilian dances are accompanied by the music of Gao yang.

Stanza 1 is the personal dance 羊舞, stanza 2 is the phoenix dance 鳳舞, and the last stanza is the feather dance 翼舞.

A: Xiaowu: stanza. leaf

Wind instruments

Dance

[Read Voice]

Stone chimes 鈴

Voices

Small drums

Big drum
朱載堉：〈合樂羔羊〉
ZHU Zaiyu: 〈Heyue Gaoyang [Song Gaoyang with concerted music]〉
朱載堉：〈合樂羔羊〉
ZHU Zaiyu: 〈Heyue Gaoyang [Song Gaoyang with concerted music]〉
朱載堉：〈合樂羔羊〉
ZHU Zaiyu: 〈Heyue Gaoyang [Song Gaoyang with concerted music]〉

[Score notation with instructions and musical symbols]

2. 9b  50  3. 14a  52  155

1. End of music for stanza 1. Personal dancers retire
2. End of music for stanza 2. Phoenix dancers retire
3. End of music for last stanza. Feather dancers retire

[Instructions and notation for various musical sections]
Fig. 7: 5a

ZHU Zaiyu:〈Tuju〉

Song 〈Tuju〉 in 3 stanzas of 4 lines each. Total of 12 lines with 48 characters.
The word 胡 in stanza 2 should be read in the 4th tone erti, following ZHENG.
(This remark cannot be found in the exegetical notes to Shiijing:〈Tuju〉 by ZHENG Xuaan 鄭玄 (127-200), in the edition Shisanjing zhushu《十三經注疏》.)

朱載堉:〈擬周南兔置譜〉
ZHU Zaiyu:〈Music for the song Tuju, in the style of the〈Airs of Southern Zhou〉〉

Stanzas 1, 2, 3. Rattle the taozi 鐙鼓 3 times, and then strike the bell.

Song 〈Tuju〉 in 3 stanzas of 4 lines each.
At the end of each line, sound the yingzi 隈鼓 once, and the big drum 3 times, alternating with the yingzi 隈鼓. Total 8 drumstrokes.

2011-9-24, rev. 2012-6-24 胡成芳
朱載堉：〈合樂兔置〉
ZHU Zaiyu: 〈Heyue Tuju [Song Tuju with concerted music]〉

Winds

Dance

[Voice]

Stone

Bell

Du

Zhu Yu

Po fa

Zhuo

Shen.drm

Big.drm

Sr

非構勿 Courier 新明華 新華字庫 宋體 姊妹 新民書房 新明華 新華字庫 宋體 姊妹 新民書房 新明華 新華字庫 宋體 姊妹 新民書房 新明華 新華字庫 宋體 姊妹 新民書房 新明華 新華字庫 宋體 姊妹 新民書房 新明華 新華字庫 宋體 姊妹 新民書房 新明華

[Sr]

2011-9-8, rev. 2012-6-20 胡成英
朱载堉：〈合樂兔置〉
ZHU Zaiyu: 〈Heyue Tuju [Song Tuju with concerted music]〉
朱載堉: 〈合樂兔置〉
ZHU Zaiyu: 〈Heyue Tuju [Song Tuju with concerted music]〉

Rotate positions to the right by one place

Uptowards turn

Dotwards turn

2011-9-8, rev. 2012-6-20 胡成芳
朱載堉：〈合樂兔置〉
ZHU Zaiyu: 〈Heyue Tuju [Song Tuju with concerted music]〉
朱載堉：〈合樂兔置〉
ZHU Zaiyu: 〈Heyue Tiju [Song Tiju with concerted music]〉
朱載堉: 〈合樂兔置〉
Zhù Zàiyù: 〈Heyue Tuju [Song Tuju with concereted music]〉
3 SONGS WITH STRING ACCOMPANIMENT

弦歌三終
Fig. 7: 6a

朱載堉：〈鹿鳴〉 弦歌三終：第一
Zhu Zaiyu: 〈Lu ming〉 3 songs with string accompaniment: No. 1

曲：《列吕精義》: 外篇卷7 (《列書》: 册6: 20b-21a); 詞：《詩經》: 〈小雅: 鹿鳴〉
Music: Li lü jing yi: Outer Bk. 7 (Li shu: Fasc. 6: 20b-21a); Lyrics: Shi jing: 〈Minor odes: Lu ming〉

Song 〈Lu ming〉 in 3 stanzas of 8 lines each.
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiangge Lu ming [Song Lu ming with string accompaniment]〉
曲：《鄉飲詩樂情》：卷1: 5b-8a, 卷2: 1b-4a, 7a-10a; 詞：《詩經》：〈小雅：鹿鳴〉
Music: Xiangye shiyue qu: Bk. 1: 5b-8a, Bk. 2: 1b-4a, 7a-10a; Lyrics: Shi jing: 〈Minor odes: Lu ming〉

[Stanza 1]

The Master of Music announces 〈Xiangge Lu ming〉.

2011-8-31, rev. 2012-6-1 胡成芳
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiangge Lu ming [Song Lu ming with string accompaniment]〉
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiang Ke Lu ming [Song Lu ming with string accompaniment]〉

2011-8-31, rev. 2012-6-1 胡成 '=0
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiangge Lu ming [Song Lu ming with string accompaniment]〉

[Stanza 2]
A: Xiangge Br. 2 leaf 1b

Voice

Stone chimes 1

Refu

Sc

Voice

Stone

Refu

Sc

2011-8-31, rev. 2012-6-1 胡成碧
朱載堉：〈弦歌鹿鳴〉
Zhu Zaiyu: 〈Xiang Ge Lu Ming [Song Lu Ming with string accompaniment]〉
朱載堉：〈弦歌鹿鳴〉

ZHU Zaiyu: 〈Xiange Lu ming [Song Lu ming with string accompaniment]〉
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiangge Lu ming [Song Lu ming with string accompaniment]〉

[Stanza 3]

A: Xiangge Bk. 2: leaf 7a

Voice

Stone-chimes

Refu

Sc

2011-8-31, rev. 2012-6-1 胡成芳
朱載堉：〈弦歌鹿鳴〉
ZHU Zaiyu: 〈Xiang Le ming [Song Lu ming with string accompaniment]〉

2011-8-31, rev. 2012-6-1 胡成瑞
朱載堉：〈弦歌鹿鳴〉

ZHU Zaiyu: 〈Xiangge Lu ming [Song Lu ming with string accompaniment]〉

2011-8-31, rev. 2012-6-1 魏成宏
Fig. 7: 7a

Zhu Zaiyu: ‘Si mu’ 3 songs with string accompaniment: No. 2

曲：《律吕精義》：外篇卷7 (《律書》：冊6: 21a-b); 詞：《詩經》：〈小雅：四牡〉

Music: Liu li jingyi; Outer Bk. 7 (Liushu: Fasc. 6: 21a-b). Lyrics: Shi jing: 〈Minor odes: Si mu〉

Song ‘Si mu’ in 5 stanzas of 5 lines each.
朱載堉: 〈弦歌四牡〉
Zhu Zaiyu: 〈Xiangge Si mu [Song Si mu with string accompaniment]〉

曲：《節歌詩樂歌》: 卷1: 8a-9b, 卷2: 12b-14a, 16a-17b, 19a-21a, 22b-24a; 詞：《詩經》: 〈小雅：四牡〉
Music: Xiangge shiyue pu: Bk. 1: 8a-9b, Bk. 2: 12b-14a, 16a-17b, 19a-21a, 22b-24a; Lyrics: Shi jing: 〈Minor odes: Si mu〉

[Stanza 1]

A: Xiangge: Bk. 1: leaf 8a

The Master of Music announces 〈Xiangge Si mu〉.

2011-8-31, rev. 2012-6-8 胡成筠
朱載堉：〈弦歌四牡〉
Zhu Zaiyu: 〈Xiang Si mu [Song Si mu with string accompaniment]〉

2011-8-31, rev. 2012-6-8 胡成茂
朱載堉：〈弦歌四牡〉
Zhu Zaiyu: 〈Xiang Si mu [Song Si mu with string accompaniment]〉

[Stanza 2]

2011-8-31, rev. 2012-6-8 胡成祐
朱載堉：〈弦歌四牡〉
Zhu Zaiyu: 〈Xiange Si mu [Song Si mu with string accompaniment]〉

[Stanzas 3-4]
A: Xiangge: Bk. 2: leaf [3.16a, 4.19a] [4.19b]

2011-8-31, rev. 2012-6-8 趙成芳
朱載堉：〈弦歌四牡〉
Zhu Zaiyu: 〈Xiangge Si mu [Song Si mu with string accompaniment]〉

[Stanza 5]
A: Xiangge: Bk. 2; leaf 22b

Voice

Stone

Refu

Sc

2011-8-31, rev. 2012-6-8 周成範
朱載堉：〈弦歌四牡〉
Zhu Zaiyu: 〈Xiang Si mu [Song Si mu with string accompaniment]〉
朱載堉：〈皇皇者華〉 弦歌三終: 第三

ZHU Zaiyu: 〈Huanghuangzhe hua〉 3 songs with string accompaniment: No. 3

曲: 《律呂精義》: 外篇卷7 (《律書》: 册6: 21b-22a); 詞: 《詩經》: 〈小雅: 皇皇者華〉

Music: Lǎnlǐ jīngyì; Outer Bk. 7 (Làshū: Fasc. 6: 21b-22a); Lyric: Shījīng: 〈Minor odes: Huanghuangzhe hua〉

Song 〈Huanghuangzhe hua〉 in 5 stanzas of 4 lines each.
Fig. 7: 8b

Zhu Zaiyu: ‘Xiangge Huanghuangzhe hua’ [Song Huanghuangzhe hua with string accompaniment]

Music: Xiangyan shiyue pu: Bk. 1: 10a-11a, Bk. 2: 26a-27a, 28b-30a, 31a-32b, 34a-35a; Lyrics: Shijing: ‘Minor odes: Huanghuangzhe hua’

[Stanza 1]

Voice

Stone chimes

Voice

Stone

2011-8-31, rev. 2012-6-9 胡成芝
朱載堉：〈弦歌皇皇者華〉
Zhu Zaiyu: 〈Xianghe Huanghuangzhe hua [Song Huanghuangzhe hua with string accompaniment]〉

[Stanzas 2-5]

A: Xianghe: Bk. 2: leaf [2.2a, [3.2b], [4.3a, [5.3a] 31a]

[4.3] 31b

[3.3 [2.2a, 3.2b, 4.3a, 5.3a] 31a]
朱載堉：〈弦歌皇皇者華〉
Zhu Zaiyu: 〈Xiange Huanghuangzhe hua [Song Huanghuangzhe hua with string accompaniment]〉

2011-8-31, rev. 2012-6-9 胡成瑞
3 SONGS FOR sheng

笙奏三絃
Zhu Zaiyu: 〈Nangai〉 3 songs for sheng: No. 1

Music & lyrics: Lüli jingji, Outer Bk. 7 (Lišu: Fasc. 6: 22a-23a)

Fig. 7: 9a

Song 〈Nangai〉 in 3 stanzas of 8 lines each. Newly composed.

2012-6-25 周成芳
朱載堉：〈箏奏南陔〉
Zhu Zaiyu: 〈Shengzou Nangai [Song Nangai for sheng]〉

曲：《鄉樂詩集》：卷1: 14a–16b, 卷2: 4b–7a, 10a–12b; 詞：《律吕精義》：外篇卷7 (《律書》: 册6: 22b)
Music: Xiangyue shiyue pu: Bk. 1: 14a–16b; Bk. 2: 4b–7a, 10a–12b; Lyrics: Luli jingyi: Outer Bk. 7 (Lushu: Fasc. 6: 22b)

**[Stanza 1]**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Staff</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheng 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Voice 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Stone chimes 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Drum 1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

The Master of Music announces 〈Shengzou Nangai〉.

---

(1) m. 2 Sheng: The sheng always plays one long note, which contains hidden within it the common rhythm. The other notes are similar.
朱載堉：〈笙奏南陔〉
Zhu Zaiyu: 〈Shengzou Nangai [Song Nangai for sheng]〉
Zhu Zaizyu: 《笙奏南陔》

2011-8-31, rev. 2012-6-2 胡成芳
朱載堉：〈笙奏南陔〉
Zhou Zaiyu: (Shengzou Nancai [Song Nancai for sheng])

[Stanza 2]

A: Xiangyu: Bk. 2: leaf 34 4b [Harmony]
朱載堉：〈笙奏南陔〉
Zhu Zaiyu: (Shengzou Nangai [Song Nangai for sheng])

2011-8-31, rev. 2012-6-2  吳盛著
朱載堉：〈笙奏南陔〉
Zhu Zaiyu: 〈Shengzou Nangai [Song Nangai for sheng]〉
朱載堉：〈白華〉 堂奏三経：第二
ZHU Zaiyu: (Baihua) 3 songs for sheng: No. 2

曲、詞：《律吕精義》：外篇卷7 (《律書》）冊6c: 23a-b
Music & lyrics: Lüli jingyi; Outer Bk. 7 (Lüshu; Fasc. 6: 23a-b)

Fig. 7: 10a

Song 〈Baihua〉 in 5 stanzas of 5 lines each. Newly composed.
朱載堉：〈笙奏白華〉
ZHU Zaiyu: 〈Shengzou Baihua [Song Baihua for sheng]〉

曲：《曉秋詩樂集》 卷1: 16b-18a, 卷2: 14a-16a, 17a-19a, 21a-22b, 24a-26a; 詞：《律呂精義》 外篇卷7 (《律書》): 冊6: 23a-b

Music: Xiāngyín shìyue ji: Bk. 1: 16b-18a, Bk. 2: 14a-16a, 17a-19a, 21a-22b, 24a-26a; Lyrics: Lǜlì jīngyì: Outer Bk. 7 (Lǜshū: Fasc. 6: 23a-b)

[Stanza 1]

A: Xiāngyín Bk. 1: loud

The Master of Music announces 〈Shengzou Baihua〉.

2011-8-31, rev. 2012-6-10  胡成芳
朱載堉：〈笙奏白華〉
ZHU Zaiyu:〈Shengzou Baihua [Song Baihua for sheng]〉

2011-8-31, rev. 2012-6-10 胡成芳
朱戴埜：〈笙奏白華〉
ZHU Zaiyu: 〈Shengzou Baihua [Song Baihua for sheng]〉

[Stanza 2]

A: Xiangguzi Bk. 2, leaf 14a

[Song]

第 Sheng 1

Voice 2

石 Stone chimes 1

存 Cuomo 1

Voice 3

石 Stone 1

[2.] 華 彼

白

華 [，]

然

如

君
朱載堉：〈箏奏白華〉
ZHU Zaiyu: 〈Shengzou Baihua [Song Baihua for sheng]〉
朱載堉：〈笙奏白華〉
ZHU Zaiyu: 〈Shengzou Baihua [Song Baihua for sheng]〉

[Stanzas 3-5]


黑 Sheng

歌 Voice

勞 Stone chimes

聲 Chengan 1

聲 Chengan 1

45 [I.18a] 46 47 [I.21b]

48 49 [I.25a] 50

2011-8-31, rev. 2012-6-10 肖成茂
朱載堉: 《華黍》笙樂三絃；第三
Zhu Zaiyu: 《Huashu》3 songs for sheng; No. 3

曲，詞: 《律呂精義》: 外篇卷7 (《律書》: 中6: 23b-24a)
Music & lyrics: Lüli jingyi: Outer Bk. 7 (Lishu: Fasc. 6: 238-24a)

Song (Huashu) in 5 stanzas of 4 lines each. Newly composed.
朱載堉：〈笙奏華黍〉
Zhu Zaiyu: 〈Shengzou Huashu [Song Huashu for sheng]〉

曲：《樂府詩集》 封1: 18b-19b, 封2: 27a-28b, 30a-31a, 32b-34a, 35a-36b; 詞：《律吕精義》 外篇卷7 (《律書》: 册6: 23b-24a)
Music: Xiangyu shiyue pu: Bk. 1: 18b-19b; Bk. 2: 27a-28b, 30a-31a, 32b-34a, 35a-36b; Lyrics: Lali jingyi: Outer Bk. 7 (Lishu Fasc. 6: 23b-24a)

[Stanza 1]

The Master of Music announces 〈Shengzou Huashu〉.

2011-8-31, rev. 2012-6-12 陈思嘉
朱載堉：〈笙奏華黍〉
ZHU Zaiyu: 〈Shengzou Huashu [Song Huashu for sheng]〉
3 SETS OF SONGS ALTERNATIM

間歌三終
歌曲《鱼丽》

朱载堉: 《鱼丽》

Zhu Zaiyu: 《Yu Li》

曲: 《律吕精义》: 外卷卷7 (《律吕》: 册6: 24a-b); 詞: 《诗经》: 《小雅: 鱼丽》

Music: Lüli jingyi; Outer Bk. 7 (Lüli: Fasc. 6: 24a-b). Lyrics: Shi Jing: 《Minor odes: Yu li》

Song: 《Yu li》 in 6 stanzas, with 3 stanzas of 4 lines each, and 3 stanzas of 2 lines each.
朱載堉：〈弦歌魚麗〉
Zhu Zaiyu: 〈Xiangge Yu Li [Song Yu li with string accompaniment]〉

曲：《鄉飲詩樂清》： 卷1: 20a-21a, 卷3: 1a-2a, 3b-4b, 6a-7b; 詞：《詩經》：〈小雅：魚麗〉

Music: Xiangge Shiyou Qu: Bk. 1: 20a-21a, Bk. 3: 1a-2a, 3b-4b, 6a-7b; Lyrics: Shiying: 〈Minor odes: Yu Li〉

[Stanza 1]

At: Xiangge Bk. 1: leaf 20a 20b

The Master of Music announces 〈Xiangge Yu Li〉.

20b
朱載堉：〈弦歌魚麗〉
Zhu Zaiyu: 〈Xiangge Yu Li [Song Yu li with string accompaniment]〉
朱載堉：〈弦歌魚麗〉
Zhu Zaiyu: 〈Xiang Ye Li [Song Yu Li with string accompaniment]〉

[Stanzas 4-6]

2011-9-1, rev. 2012-6-14 王成芳
朱載堉：《弦歌魚麗》
Zhu Zaiyu: 《Xiangge Yu Li [Song Yu Li with string accompaniment]》
朱載堉：〈由庚〉 關歌三族：第一之下
ZHU Zaiyu: 「You geng」 3 sets of songs alternatim: No. 1B

曲．詞：《律吕精義》：外篇卷7 (《律書》：冊6b-25a)
Music & lyrics: Lilü jingyi: Outer Bk. 7 (Liu: Fasc. 6: 24b-25a)

Song (You geng) in 4 stanzas of 4 lines each. Newly composed.
朱載堉：〈笙奏由庚〉
ZHU Zaiyu: (Shengzou You geng [Song You geng for sheng])

曲：《鄉飲樂歌》：卷1: 21a-22b, 卷3: 2a-3b, 4b-5b, 8a-9a; 詞：《律呂精義》：外篇卷7 (《律書》：冊6: 25a)
Music: Xiangyin shiyue pu: Bk. 1: 21a-22b, Bk. 3: 2a-3b, 4b-5b, 8a-9a; Lyrics: Lulu jingyi: Outer Bk. 7 (Lushu: Fasc. 6: 25a)

[Stanza 1]

A: Xiangyin Bk. 1: leaf

The Master of Music announces (Shengzou You geng).
朱載堉：〈笙奏由庚〉
ZHU Zaiyu: 〈Shengzou You geng [Song You geng for sheng]〉

[Stanza 2]

A. Xiangyin Bk. 3, leaf [19] 2a  [Harmony] [19] 20

2011-9-1, rev. 2012-6-14 胡成芳
朱載堉：〈笙奏由庚〉
ZHU Zaiyu: 〈Shengzou You geng [Song You geng for sheng]〉
朱载堉：〈笙奏由庚〉
ZHU Zaiyu: 〈Shengzou You geng [Song You geng for sheng]〉

[Stanza 3]
朱载堉：〈笙奏由庚〉
ZHU Zaiyu: 〈Shengzou You geng [Song You geng for sheng]〉

[Stanza 4]

A. Xiangzi: Bk. 3: leaf 56a

Harmony

Sheng

Voice 1

Stone chimes 1

�江 Chonghu 1

[53] 54 55

Sheng

Voice

Stone

Du

[56] 57 58

Sheng

Voice

Stone

Du

2011-9-1, rev. 2012-6-14 胡成芳
朱载堉：〈笙奏由庚〉
ZHU Zaiyu: 〈Shengzou You geng [Song You geng for sheng]〉

2011-9-1, rev. 2012-6-14 胡成菊
Fig. 7: 14a

朱載堉：〈南有嘉魚〉  
Zhu Zaiyu: 〈Nan you jiayu〉  
3 sets of songs alternatim: No. 2A

曲: 《樂語精義》: 外篇卷7 (《樂書》: 卷6: 25a-b); 詞: 《詩經》: 〈小雅: 南有嘉魚〉
Music: Luli jingyi; Outer Bk. 7 (Lushi: Fasc. 6: 25a-b).  Lyrics: Shi jing: 〈Minor odes: Nan you jiayu〉

Song 〈Nan you jiayu〉 in 4 stanzas of 4 lines each.
Fig. 7: 14b

Zhu Zaiyu: 〈Xiangge Nan you jiayu [Song Nan you jiayu with string accompaniment]〉

Music: Xiangyu shiyue pu: Bk. 1: 22b-24a, Bk. 3: 9a-10b, 12a-13b, 15a-16a; Lyric: Shijing: 〈Minor odes: Nan you jiayu〉

[Stanza 1] The Master of Music announces 〈Xiangge Na you jiayu〉.

22b

23a

28b

2011-9-1, rev. 2012-6-15 邱成範
朱載堉：〈弦歌南有嘉魚〉
ZHU Zaiyu: 〈Xiang Nan you jiayu [Song Nan you jiayu with string accompaniment]〉

[Stanza 2]

A: Xiagoua Bk. 3; leaf

20
21
22
23

2011-9-1, rev. 2012-6-15 胡成若
朱載堉：〈弦歌南有嘉魚〉
Zhu Zaiyu: 〈Xiange Nan you jiayu [Song Nan you jiayu with string accompaniment]〉
朱載堉：〈弦歌南有嘉魚〉
Zhu Zaiyu: 〈Xiangg Nan you jiayu [Song Nan you jiayu with string accompaniment]〉

[Stanza 3]

2011-9-1, rev. 2012-6-15 胡成芳
朱載堉：〈弦歌南有嘉魚〉
ZHU Zaiyu: 〈Xianghe Nan you jiayu  [Song Nan you jiayu with string accompaniment]〉
朱載堉: 〈弦歌南有嘉魚〉
ZHU Zaiyu: 〈Xiangge Nan you jiayu [Song Nan you jiayu with string accompaniment]〉

[Stanza 4]

A: Xiaoqiu Bk. 3 leaf

Voice

[4.] 翻 翻

Stone chimes

[...] 集

Ryu

[2]

Sc

2

2011-9-1, rev. 2012-6-15 胡成勇
朱载堉：〈弦歌南有嘉魚〉
ZHU Zaiyu: 〈Xiange Nan you jiayu [Song Nan you jiayu with string accompaniment]〉
朱載堉：〈崇丘〉

ZHU Zaiyu: 〈Chongqiu〉 3 sets of songs alternatim: No. 2B

曲、詞：《陸呂精義》：外篇卷7 (《陸書》：冊6: 25b-26a)

Music & lyrics: Lüli jingyi: Outer Bk. 7 (Liushu: Fasc. 6: 25b-26a)

Fig. 7: 15a

Song 〈Chongqiu〉 in 4 stanzas of 4 lines each. Newly composed.
Fig. 7: 15b

朱載堉: 〈笙奏崇丘〉
Zhu Zaiyu: 〈Shengzou Chongqi [Song Chongqi for sheng]〉

曲: 《樂歌詩樂清》: 卷1: 24a-25b, 卷3: 10b-12a, 13b-14b, 16b-17b; 詞: 《律呂精義》: 外篇卷7 (《樂書》: 册6: 26a)
Music: Xiangqi shiyue qu; Bk. 1: 24a-25b, Bk. 3: 10b-12a, 13b-14b, 16b-17b; Lyrics: Liulü jingyi: Outer Bk. 7 (Lishu: Fasc. 6: 26a)

[Stanza 1]

The Master of Music announces 〈Shengzou Chongqi〉.

2011-9-1, rev. 2012-6-15 胡成芳
朱載堉：〈笙奏崇丘〉

ZHU Zaiyu: 〈Shengzou Chongqiu [Song Chongqiu for sheng]〉

[Stanza 2]

2011-9-1, rev. 2012-6-15 胡成筑
朱載堉：〈笙奏崇丘〉
ZHU Zaiyu: 〈Shengzou Chongqiu [Song Chongqiu for sheng]〉

2011-9-1, rev. 2012-6-15 胡成筠
朱載堉：〈笙奏崇丘〉
ZHU Zaiyu: 〈Shengzou Chongqiu [Song Chongqiu for sheng]〉

[Stanza 3]
朱載堉：〈笙奏崇丘〉
ZHU Zaiyu: 〈Shengzou Chongqiu [Song Chongqiu for sheng]〉

[Stanza 4]

A. Xiangyu Bk. 3 leaf

2011-9-1, rev. 2012-6-15 胡成芳
Fig. 7: 16a

朱載堉：〈南山有臺〉間歌三終：第三之上
ZHU Zaiyu: 〈Namaishan you tai〉3 sets of songs alternatim: No. 3A

曲：《律吕精義》: 外篇卷7 (《律書》: 冊6: 26a-b); 詞：《詩經》: 〈小雅：南山有臺〉
Music: Lüli jingyi: Outer Bk. 7 (Lushi: Fasc. 6: 26a-b); Lyrics: Shi jing: 〈Minor odes: Nanshan you tai〉

Song 〈Namaishan you tai〉 in 5 stanzas of 6 lines each.

2012-6-28 胡成篇
朱載堉: 〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiangge Nanshan you tai [Song Nanshan you tai with string accompaniment]〉

Music: Xiangge shiyue ju: Bk. 1: 25b-27b, Bk. 3: 17b-19b, 21b-23b, 25b-27b, 29b-31b; Lyrics: Shijing: 〈Minor odes: Nanshan you tai〉

[Stanza 1]

A: Xiangge Bk. 1: leaf 29b 29b 29b 29b

The Master of Music announces 〈Xiangge Nanshan you tai〉.

2011-9-1, rev. 2012-6-16 胡成菊
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiange Nanshan you tai [Song Nanshan you tai with string accompaniment]〉
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiangge Nanshan you tai [Song Nanshan you tai with string accompaniment]〉

[Stanza 2]
A: Xiangge: Bk. 3: leaf 17b

2011-9-1, rev. 2012-6-16 胡威芳
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiangge Nanshan you tai [Song Nanshan you tai with string accompaniment]〉

[Stanzas 3-4]

2011-9-1, rev. 2012-6-16 胡成華
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiangge Nanshan you tai [Song Nanshan you tai with string accompaniment]〉
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiange Nanshan you t'ai [Song Nanshan you t'ai with string accompaniment]〉

[Stanza 5]

A: Xiangge: Bk. 3; leaf

29b  98  99  100  101  102  103  104  105

Voice

Stone

Rofi

Sc

2011-9-1, rev. 2012-6-16 周成芳
朱载堉：〈弦歌南山有臺〉

ZHU Zaiyu: 〈Xiange Nanshan you tai [Song Nanshan you tai with string accompaniment]〉
朱載堉：〈弦歌南山有臺〉
Zhu Zaiyu: 〈Xiangge Nanshan you tai [Song Nanshan you tai with string accompaniment]〉
Song. 〈You yi〉 in 4 stanzas of 6 lines each. Newly composed.
朱载堉：〈箏奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉

曲：《雕歌曲集》：卷1: 27b-29b, 卷3: 19b-21b, 23-25b, 27b-29b; 詞：《律呂精義》：卷7 (《律書》: 卷6: 27a)
Music: Xiangqin shiyue pu: Bk. 1: 27b-29b; Bk. 3: 19b-21b, 23-25b, 27b-29b, Lyrics: Lii li jingyi: Outer Bk. 7 (Lishu: Fasc. 6: 27a)

[Stanza 1]

The Master of Music announces 〈Shengzou You yi〉.

2011-9-1, rev. 2012-6-17 胡成芳
朱載堉：〈笙奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉

2011-9-1, rev. 2012-6-17 胡成謀
朱载堉：〈笙奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉

[Stanza 2]

A. Xiangyi: Bk. 3; leaf [26 19b]

Harmony

2011-9-1, rev. 2012-6-17 胡成芳
朱載堉：〈笙奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉
朱載堉：〈笙奏呂儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉

[Stanza 3]

2011-9-1, rev. 2012-6-17 胡成華
朱載堉：〈笙奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉
朱載堉：〈笙奏由儀〉
Zhu Zaiyu: 〈Shengzou You yi [Song You yi for sheng]〉
3 SETS OF SONGS WITH CONCERTED MUSIC

合樂三終
Fig. 7: 18a

Zhu Zaiyu: 〈Guam ju〉 3 sets of songs with concerted music: No. 1A

Music A: Xiangyin Shiyou ju Bk. 6: 1b-3a; Music B: Liulü jingyi: Outer Bk. 7 (Liushu: Fasc. 6: 27b-28a); Lyrics: Shiijing: 〈Airs of Southern Zhou: Guam ju〉

The melodies in Music A and Music B are identical.

Song 〈Guam ju〉 in 5 stanzas of 4 lines each.
Fig. 7: 18b

[Stanza 1] The Master of Music announces (Heyue Guan ju).

A: Xiangjin Bk. 1: 1st

Steng

Voice

Stone chimes

Chen Pu

Ta que

Small drums

Big drum

Se

31b

31b

32a

[Harmony]

[1.] 闁 闁 嘖 鸠[,]
朱載堉：〈合樂關雎〉
Zhu Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉

2011-9-3, rev. 2012-6-18 胡成芳
朱載堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉

2011-9-3, rev. 2012-6-18 胡成筠
Zhu Zaiyu: 《合樂關雎》
Song Guan ju with concerted music

[Stanzas 2-5]
A: Xianggu Bk: 4 leaf

1a

Stang

Voice

Stone chimes

Changfu

Bo Ye

Tao

Small drums

Big drum

1 each

2

1b

[Harmony]

Stang

Voice

Stone

Du

Bo Ye

Tao

Sun drum

Big drum

非禮勿視非禮勿聽非禮勿言非禮勿動 非禮勿視非禮勿聽非禮勿言非禮勿動 非禮勿視非禮勿聽非禮勿言非禮勿動 非禮勿視非禮勿聽非禮勿言非禮勿動

2011-9-3, rev. 2012-6-18 胡成葦
朱載堉：〈合樂關雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉

2011-9-3, rev. 2012-6-18 胡承著
朱載堉：〈合樂關雎〉
ZHU Zaizyu: 〈Heyue Guan ju [Song Guan ju with concereted music]〉
朱載堉：〈合樂關雎〉
Zhu Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：〈合樂關雎〉
Zhu Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：〈合樂關雎〉
Zhu Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉：〈合樂闈雎〉
ZHU Zaiyu: 〈Heyue Guan ju [Song Guan ju with concerted music]〉
朱載堉: 〈合樂闕睢〉
Zhu Zaiyu: 〈Heyue Guan ju [Song Guan ju with concorted music]〉
朱載堉：〈合樂闐睢〉
Zhù Zàiyù: 〈Heyue Guan ju [Song Guan ju with concerted music]〉

2011-9-3, rev. 2012-6-18 胡成瑞
Fig. 7: 19a

ZHU Zaizyu: ('Quechao') 3 sets of songs with concerted music: No. 1B

The melodies in Music A and Music B are identical.
Fig. 7: 19b

朱載堉：《合樂鶴巢》曲：《鄉飲詩樂譜》，卷1: 38a-40a, 卷4: 20a-24a

Music: Xiangyin shiyue pu: Bk. 1: 38a-40a, Bk. 4: 20a-24a; Lyrics: Shijing: 《ais of Southern Zhao Quechao》

[Stanza 1] The Master of Music announces 《Heyue Quechao》

<table>
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<tr>
<th>A: Xiangyin Bk. 1: iaof</th>
<th>30b</th>
<th>30a</th>
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<td>B: Xiangyin Bk. 2: iaof</td>
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<tr>
<th>Seng</th>
<th>Voice</th>
<th>Stone chimes</th>
<th>Gu</th>
<th>Bfx</th>
<th>Tai</th>
<th>Small drums</th>
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2011-9-3, rev. 2012-6-19 胡成芳
朱載堉：〈合樂鶴巢〉
ZHU Zaiyu: 〈Heyue Quechao [Song Quechao with concerted music]〉
朱載堉：〈合樂鶴巢〉
ZHU Zaiyu: 〈Heyue Quechao [Song Quechao with concerted music]〉

[Stanzas 2-3]
A: Xiangge Bk. 4: leaf 2.1, 3.2a 2.1, 3.2b

2.1, 3.2a

[2.1, 3.2b]

2011-9-3, rev. 2012-6-19 胡成芳
朱載堉：〈合樂鵲巢〉
Zhu Zaiyu: 〈Heyue Quechao [Song Quechao with concerted music]〉
Fig. 7: 20a

ZHU Zaiyu: <Ge tan> 3 sets of songs with concerted music: No. 2A

Music A: Xiangyu Shijue pu Bk. 6: 3a-4b; Music B: Lili jingyi Outer Bk. 7 (Liushu: Fasc. 6: 28b-29a); Lyrics: Shijing: (Airs of Southern Zhou: Ge tan)

The melodies in Music A and Music B are identical.

Song <Ge tan> in 3 stanzas of 6 lines each.
Fig. 7: 20b


Music: Xiangqin shiyue pu: Bk. 1: 33b-36a, Bk. 4: 8b-14a; Lyrics: Shijing: ‘Airs of Southern Zhou: Ge tan’

2011-9-3, rev. 2012-6-18 胡成芳
朱載堉：《合樂葛覃》
Zhu Zaiyu: 《Heyue Ge tan [Song Ge tan with concerted music]》
朱載堉：〈合樂葛覃〉
Zhu Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉
朱載堉：《合樂葛覃》
ZHU Zaiyu: 《Heyue Ge tan [Song Ge tan with concerted music]》
朱載堉：〈合樂葛覃〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉

[Stanzas 2-3]
A: Xiangyin: Bk. 4: leaf 8b 9a

[Harmony]

2011-9-3, rev. 2012-6-18 胡成芳
朱載堉：〈合樂葛覃〉
Zhu Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉

2011-9-3, rev. 2012-6-18 胡成芳
朱載堉：〈合樂葛覃〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉

2011-9-3, rev. 2012-6-18 胡成芳
朱載堉：〈合樂葛薺〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉
朱載堉：〈合樂葛覃〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉
朱戴凝：〈合樂葛韻〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉
朱载堉：〈合樂葛覃〉
Zhu Zaiyu: 〈Heyue Ge tan [Song Ge tan with concerted music]〉
朱載堉：〈合樂葛覃〉
ZHU Zaiyu: 〈Heyue Ge tan [Song Ge tan with concereted music]〉
Fig. 7: 21a

ZHU Zaiyu: 〈Cai fan〉 3 sets of songs with concerted music: No. 2B

曲本甲: 《鄉飲詩樂譜》 卷6: 16b-17b; 曲本乙: 《律呂精義》 外篇卷7 (《律書》 卷6: 29a); 詞: 《詩經》 〈召南: 采蘋〉

Music A: Xiangyin Shi Yue pu: Bk. 6: 16b-17b; Music B: Lili Jingyi: Outer Bk. 7 (Lishi: Fasc. 6: 29a); Lyrics: Shi Jing: 〈Airs of Southern Zhao: Cai fan〉

The melodies in Music A and Music B are identical.

Song 〈Cai fan〉 in 3 stanzas of 4 lines each.
Fig. 7: 21b

[Stanza 1] The Master of Music announces 《Heyue Cai fan》.

A: Xiangge Bk. 1: Leaf 40b

---

Steng 3

Voice

Stone chimes

Cuinao 1

Zhuo Bofu 1

Jiegao Yang 2

Jiale, Jinge Small drums

Big drum 1 each

---

Huangzhong

---

40b

40a

---

[Harmony]

1. 于 以 采 蔓 [?]
朱載堉：〈合樂采蘩〉
ZHU Zaiyu: 〈Heyue Cai fan [Song Cai fan with concorted music]〉

[Stanzas 2-3]
A: Xiaoyu Bk. 4, leaf

24a

24b

[Harmony]

2011-9-3, rev. 2012-6-19 胡成君
朱載堉：〈合樂采蘩〉
ZHU Zaiyu: 〈Heyue Cai fan [Song Cai fan with concerted music]〉
朱載堉：〈合樂采蘩〉
ZHU Zaiyu: 〈Heyue Cai fan [Song Cai fan with concerted music]〉
ZHU Zaiyu: ‘Heyue Cai fan [Song Cai fan with concerto music]’
朱載堉：〈台樂采繫〉
Zhu Zaiyu: ‘Heyue Cai fan [Song Cai fan with concerted music]’

2011-9-3, rev. 2012-6-19 胡成菊
朱載堉：〈合樂采蘩〉
ZHU Zaiyu: 〈Heyue Cai fan [Song Cai fan with concorted music]〉
Song ‘Jiuer’ in 4 stanzas of 4 lines each.

ZHU Zaiyu: ‘Jiuer’ 3 sets of songs with concerted music: No. 3A

The melodies in Music A and Music B are identical.
Fig. 7: 22b


A: Xiangjin. Bk. 1: 1a

36b

36a

Sheng

Voice

Stone

Du

Bofu

Zao Sun drum

Big drum

Se

Huangzheng

采

Huangzheng

采

Huangzheng

采

Huangzheng

卷耳[，]

非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读 非横勿读
朱载堉：〈合樂卷耳〉
ZHU Zaiyu: 〈Heyue juaner [Song juaner with concerted music]〉
朱載堉：〈合樂卷耳〉
ZHU Zaiyu: 〈Heyue juaner [Song juaner with concerted music]〉

2011-9-3, rev. 2012-6-18 吳成芳
朱載堉：〈合樂卷耳〉
ZHU Zaizhu: 〈Heyue juaner [Song juaner with concerted music]〉

[Stanzas 2-4]
A: Xiangge; Bk. 4; leaf [2.14a, 3.16a]

粟 Sheng
3

歌 Voice
四

豎 Stone chimes
1

鈴 Chime 1

瑟 Revo
四

鼓鼓 Taoyu

樂瑟, 聲樂 Small drum
1 each

瑟 Se
2

[2.14b]

[3.16b]

[Harmony]
朱載堉：〈合樂卷耳〉
Zhu Zaiyu: 〈Huyue juaner [Song juaner with concerto music]〉
朱載堉：〈合樂卷耳〉
ZHU Zaiyu: 〈Heyue juaner [Song juaner with concorted music]〉
朱載堉：〈合樂卷耳〉
Zhu Zaiyu: 〈Heyue juaner [Song juaner with concorted music]〉

2011-9-3, rev. 2012-6-18 胡成智
朱载堉：《合樂卷耳》
ZHU Zaiyu: 'Heyue Juaner [Song Juaner with concerted music]'
Fig. 7: 23a

ZHU Zaiyu: *Cai ping* 3 sets of songs with concerted music: No. 3B

曲本甲：《鄉飲詩樂譜》: 卷6: 19b-20b; 曲本乙: 《律吕精義》: 外篇卷7 (《律書》: 卷6: 30a); 詞: 《詩經》: 《召南: 采蘋》

Music A: *Xiāngyǐn Shīyuè pú*: Bk. 6: 19b-20b; Music B: *Lǜlǚ jīngyì*: Outer Bk. 7 (*Lǔshū*: Fasc. 6: 30a); Lyrics: *Shījīng*: *Airs of Southern Zhao*: *Cai ping*

The melodies in Music A and Music B are identical.

Song *Cai ping* in 3 stanzas of 4 lines each.
Fig. 7: 23b

[Stanza 1] The Master of Music announces 〈Heyue Cai ping〉.

A: Xiangqi Bk. 1: loa

```
[42b] 4 4 4 4 4
[42a] 4 4 4 4

Voices
- Huangzhong
- 2nd
- Yellow chimes
- 1st
- 2nd

Instruments
- Small drums
- 1 each
- Big drum

42b [harmony]
```

2011-9-5, rev. 2012-6-19 胡成慧
朱載堉: 〈合樂采蘋〉
ZHÚ Zài yù: 〈Heyue Cǎi píng [Song Cǎi píng with concerted music]〉

The musicians inform the Master of Music, "The regular songs are complete." This is said sitting down. Afterwards they do not rise. The Master of Music informs the guests, "The regular songs are complete." This is said standing up. After the announcement he descends [from the upper court].

2011-9-5, rev. 2012-6-19 胡成著
朱載堉：〈合樂采蘋〉
ZHU Zaiyu: 〈Heyue Cai ping [Song Cai ping with concerted music]〉

[Stanzas 2-3]

A: Xiangge, Bk. 4, Leaf

28a

[Harmony]

28b

2011-9-5, rev. 2012-6-19 胡成芳
朱載堉：〈合樂采蘋〉
ZHU Zaiyu: 〈Heyue Cai ping [Song Cai ping with concerted music]〉
朱載堉：〈合樂采蘋〉
ZHU Zaiyu: 〈Heyue Cai ping [Song Cai ping with concereted music]〉
ZHU Zaiyu: (Heyue Cai ping [Song Cai ping with concerted music])

2011-9-5, rev. 2012-6-19 胡成蔚
朱載堉：〈合樂采蘋〉
ZHU Zaiyu: 〈Heyue Cai ping [Song Cai ping with concerted music]〉

2011-9-5, rev. 2012-6-19 胡成 phạm
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A: WORKS BY ZHU ZAIYU 朱載堉 (1536–1611)

B: (Other) WORKS IN CHINESE

C: WORKS IN WESTERN LANGUAGES

Bibliography A: is a comprehensive list of all extant works by Zhu Zaiyu. A fragment A: Xiàntiántù, and an anthology A: Zhèngwàng which may be partially spurious (?), are included at the end of the list, but lost works or phantom titles are excluded. Editions, cited under each title, are included representatively, i.e. all editions which differ materially in content or format are included, but if one original item is published in several facsimile reprints, then only 1 or a few representatives are included. (For example, the Sìku quānshū《四庫全書》is published in 3 facsimile book editions and several facsimile electronic editions, but only 1 of these is listed here.) Bibliography B: and Bibliography C: are necessarily selective. A list of Chinese & Japanese publishers cited in the bibliography is appended.

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- Classical Chinese works (written < c. 1912) are listed by title; all other works are listed by author.
- In titles, Italic or 《Double angular brackets》 denote Complete books or Sets of books. 括号〈Single angular brackets〉 denote 〈Sub-books〉, 〈Chapters〉, 〈Essays〉, or 〈Journal articles〉, etc. Title translations provided with the original publications are enclosed in (parentheses); those made by myself are enclosed in [brackets].
- The sectional divisions of classical Chinese works are translated thus: juàn 卷 = Book (Bk.), piān 篇 = Chapter (Ch.), zhāng 章 = Paragraph (Para.), and cè 冊 = Fascicle (Fasc.). This gives a very rough guide to their respective sizes, Book 卷 ⇒ Chapter 篇 ⇒ Paragraph 章, but beware that this is only a general usage, with many exceptions. If written in lower case, the words ‘book’, ‘chapter’, ‘paragraph’, and ‘fascicle’ may be used less formally. ‘Volume (Vol.)’ is reserved for modern publications.
- The colon : indicates progressively finer subdivisions of a work. (For example, B: Sìku / F2008: Clasics division: Music (category) 經部: 樂類: Yuelù quānshú《樂律全書》: Bk. 25 Yùxué xīnhuò《樂學新說》: (leaf) 1a.) To avoid confusion, a subtitle or a break in a title is indicated by a slash /, instead of the more usual colon. (For example, B: DÀI Nianzu 戴念祖. 1986, rev. 2011. Zhu
Zaiyu / Mingdai de kexue he yishu juxing《朱载堉 / 明代的科学和艺术巨星》 [Zhu Zaiyu / Scientific and artistic superstar of the Ming dynasty].

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- Names of authors are given with dates of (birth–death or fl.) if they are classical (fl. < 1912); those without dates are modern. For ancient Chinese texts written before the end of the Han dynasty (220), much useful bibliographic information can be found in [C: LOEWE 1993]; for literature up to the end of the Sui dynasty (618), [C: KNECHTGES & CHANG 2010–] is similarly invaluable.

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Zhongyang Yinyue Xueyuan Chubanshe 中央音乐学院出版社 [Central Conservatory of Music Press]  
http://press.ccom.edu.cn/

Zhongyuan Daxue 中原大学 (Chung Yuan Christian University)  
https://www.cycu.edu.tw/

Zhongzhou Guji Chubanshe 中州古籍出版社 (Zhongzhou Ancient Texts Press)  
http://zhongzhouguji.com/
A: WORKS BY ZHU ZAIYU 朱載堉 (1536–1611)

Caoman

Caoman guyue pu《操縵古樂譜》  [Ancient music with zither figurations].  [1 Bk.]
In A: Yuelü quanshu (موسیقی) musical works).

(Princeton U Gest) TA141/2377 v.9–11
(Princeton U Gest) TA141/278 v.11
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.10

Signed Zaiyu ed. 載堉編述, and based on earlier work by Zaiyu’s father
ZHU HOUWAN 朱厚烷 (1519–1591); Preface without date.  Printed at the Zheng
principality in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.

(Rutgers U EAL) PL1025.K2 v.162


(U Pittsburgh EA CHI) QC3.C47 1995 v.2

_____ / F2013  F2013.  = A: Zhu / Li F2013: 1619–1758.  (WSK)

division: Music 經部: 樂類: 《隅律全書》 《隅律全書》: Bk. 27–28.  (WSK)

Eryi

Eryi zhuizhao tu《二佾綴兆圖》  [Diagrams of dance steps for 2 rows of dancers].
[1 Bk.]  In A: Yuelü quanshu (موسیقی) musical works).

(Princeton U Gest) TA141/278 v.16
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.15

Unsigned; Preface without date.  Printed at the Zheng principality in He-
nei, and presented to Ming Emperor Shenzong 明神宗 1606.

(Rutgers U EAL) PL1025.K2 v.163


(U Pittsburgh EA CHI) QC3.C47 1995 v.2


division: Music 經部: 樂類: 《隅律全書》 《隅律全書》: Bk. 40.  (WSK)

(C: Wu 2008)

Includes German trans. of A: Eryi, with explanatory commentary.

Gu Zhoubi

Gu Zhoubi suanjing / Yuanfang gougu tujie《古周髀算經 / 圓方句股圖解》 [The
ancient 《隅周髀算經》 / Diagrammatic explication of the circle, square, and right
triangle].  [1 Bk.]

Signed Zaiyu 載堉; author’s Preface and Postface without date; note
(leaf 17b) dated 1610.  Printed at Henei.
Jialiăng  Jialiăng suanjiang 《嘉量算經》  [Mathematical treatise of the measuring vessel]. Bk. 1–3, 〈Questions & answers 問答〉.

Signed Zaiyu 載堉; author’s Preface without date; note (at end of Bk. 1) dated 2 May 1610. Engraved 10 November 1610 and printed at Henei.


(Princeton U Gest) AC149.W45 v.69
Reprint; first published Shanghai [1935]. The original Wanwei biecang was compiled by RUAN Yuan in ms.

Lingxing  Lingxing xiaowu pu 《零星小舞譜》  [Choreography for the minor dances at the Lingxing Temple]. [1 Bk.]  In A: Yuelü quanshu († musical works).

(Princeton U Gest) TA141/278 v. 17–18
http://nrs.harvard.edu/urn-3:FHCL:3744719 v. 16–17
Signed Zaiyu 載堉; author’s Preface without date. Printed at the Zheng principality in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.

   (Rutgers U EAL) PL1025.K2 v.163


   (U Pittsburgh EA CHI) QC3.C47 1995 v.2


   (C: WU 2008) Includes German trans. of A: Lingxing, with explanatory commentary and music transcriptions.

Liudai Liudai xiaowu pu《六代小舞譜》 [Choreography for the minor dances of the 6 ancient dynasties]. [1 Bk.] In A: Yuelü quanshu (musical works).
   (Princeton U Gest) TA141/278 v. 15
   http://nrs.harvard.edu/urn-3:FHC/3744719 v.14

Signed Zaiyu 載堉; Preface without date. Printed at the Zheng principality in Henei, and presented to Ming Emperor Shenzong 明神宗 1595; printed later [at Henei].

   (Rutgers U EAL) PL1025.K2 v.163


   (U Pittsburgh EA CHI) QC3.C47 1995 v.2


   (C: WU 2008) Includes German trans. of A: Liudai, with explanatory commentary.

   (Princeton U Gest) TA141/278 v.20
   http://nrs.harvard.edu/urn-3:FHC/3744719 v.19

Signed Zaiyu 載堉; author’s Preface dated 4 February 1581. Presented in ms. to Ming Emperor Shenzong 明神宗 1595; printed later [at Henei].

   (Rutgers U EAL) PL1025.K2 v.164


   (U Pittsburgh EA CHI) QC3.C47 1995 v.2
Large sections from Lülü jingyi are excerpted into Gujin tushu jicheng, and scattered among the many subdivisions of the compendium. But most of the music scores are excluded, and the arrangement breaks up the organization and continuity of the treatise.


(C: Wu 2008)
Includes German trans. of A: Lülü jingyi: Outer Bk. 9–10, with explanatory commentary and music transcriptions.

Signed Zaiyu 載堉; author’s Preface without date; written 1610. Facsimiles F[1996–2003] and F2013 attach an extra autograph Preface (by Zaiyu) for Gujin lüli kao《古今律曆考》 by XING Yunlu 邢雲路 (? – c. 1623), dated 7 April 1610. The text appears to be holograph, engraved in facsimile in 1610 and printed at Henei.


(U California San Diego SSH East Asia) AC149.S732 1995 v.114


(Princeton U Gest) AC149.S6991 v.1 pt.183


Lülü zhiyi Lülü zhiyi bianhuo《律呂質疑辨惑》 [Replying to doubts and clarifying misconceptions about the musical pitches]. [1 Bk.]
Signed Gouqu Shanren Boqin (Fu) 句曲山人伯勤(甫); Preface by WANG Suoyong 王所用 (1571 – < 1641) & JIANG Chongde 蔣崇德 (? – ?), without date. Written [c. 1610] and printed [at Henei].


(U California San Diego SSH East Asia) AC149.S732 1995 v.114


(Princeton U Gest) TA141/278 v.1–2
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.1–2
Signed Zaiyu 載堉; author’s Preface dated 12 February 1584. Printed at the Zheng principality in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.


〈Rangguo〉 〈Rangguo zhenglun shu 讓國正倫疏 [Petition to relinquish the principality and rectify family relationships]〉 & 〈You shu 又疏 [Another (supplementary) petition]〉.

Presented to Ming Emperor Shenzong 明神宗 [1593].


Sepu 《瑟譜》 [Notes on the se]. Bk. 1–10.

Signed Shanyang Jiukuang Xianke 山陽酒狂仙客, Preface signed Kuang-sheng Zaiyu 狂生載堉 and dated 6 July 1560, author’s Postface dated 1560.


Both Jiguge F1989 and Jiguge F2013 are facsimiles of the Baichuan Shuwu Congshu 百川書屋叢書 edition published at Wujin 武進 in 1930, which was in turn a facsimile of a ms. copy by Jiguge 汲古閣 at Changshu 常熟 in [16xx].

Shengshou 《聖壽萬年曆》 [Imperial Longevity Perpetual calendar] / title in the center margins, with pagination, is Lishu diyice 《曆書第一冊》 [Treatise
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.18

Signed Zaiyu 載堉; no preface. Presented in ms. to Ming Emperor Shenzong 明神宗 1595; printed later [at Henei].

(U Pittsburgh EA CHI) QC3.C47 1995 v.2
_____ / F2013  = A: Zhu / Li F2013: 3847–3974. (WSK)
_____ / Gujin tushu F1934  

Suanxue
Suanxue xinshuo [A new discourse on computation]. [1 Bk.] In A: Yuelü quanshu (musical works). (Princeton U Gest) TA141/278 v.4
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.3

Signed Zaiyu 載堉; no preface. Engraved 7 September 1603 and printed at the Zheng principality in Henei; presented to Ming Emperor Shenzong 明神宗 1606.

(U Pittsburgh EA CHI) QC3.C47 1995 v.2
_____ / F2013  = A: Zhu / Li F2013: 4395–4496. (WSK)

Wannian
http://nrs.harvard.edu/urn-3:FHCL:3744719 v.18
Signed Zaiyu 載堉; no preface. Presented in ms. to Ming Emperor Shen-zong 明神宗 1595; Appendix added up to 1597; printed later [at Henei].


Signed Zaiyu 載堉; Preface without date. Printed at the Zheng principal-ity in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.


Xiaowu Xiaowu xiangyue pu 《小舞鄉樂譜》 [Music of the country to accompany the minor dances]. [1 Bk.] In A: Yuelū quanshu ( 音樂作品). (Princeton U Gest) TA141/278 v. 16 http://nrs.harvard.edu/urn-3:FHCL:3744719 v.15

Signed Zaiyu 載堉; Preface without date. Printed at the Zheng principal-ity in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.


Xuangong

《旋宮合樂譜》 [Concerted music / transposable through all 12 pitches]. [1 Bk.] In A: Yuelü quanshu (音樂作品).

Presented to Ming Emperor Shenzong 明神宗 1606.

Yuelü quanshu

《樂律全書》 [Comprehensive treatise on music and music theory]. 14 titles in 47 Books & 2 Appendices, and 2 Presentation petitions.

Incomplete  (Princeton U Gest) TA141/2377 v.1–14
Complete  (Princeton U Gest) TA141/278 v.1–20
Complete  http://nrs.harvard.edu/urn-3:FHCL:3744719 v.1–19

Constituent works written at various times between < 1581 – 1607. Presented to Ming Emperor Shenzong 明神宗 in 2 parts:
(1) 3 calendrical treatises in ms. in 1595 (𨰡 = *Shengshou*, *Wannian*, *Lüli*);
(2) 11 musical works in print in 1606 (🎶 = *Lüxue*, *Yuexue*, *Suanxue*, *Lüli jingyi*, *Caoman*, *Xuangong*, *Xiangyun*, *Liudai*, *Xiaowu*, *Eryi*, *Lingxing*).

All works eventually printed [at Henei].


(Rutgers U EAL) PL1025.K2 v.160–164

Reprint; originally published in the series Wanyou wenku 萬有文庫 [Universal library], Shanghai 1931. Facsimile of [Henei] print.


Facsimile of [Henei] print.


Yuexue

*Yuexue xinshuo* 《樂學新說} [A new discourse on music]. [1 Bk.] In A: *Yuelü quanshu* (🎶 musical works). (Princeton U Gest) TA141/278 v.3

http://nrs.harvard.edu/urn-3:FHCL:3744719 v.3

Signed Zaiyu 藏甫; no preface. Printed at the Zheng principality in Henei, and presented to Ming Emperor Shenzong 明神宗 1606.


F2013.  = A: Zhu / Li F2013: 137–258. (WSK)


Anthology of lyrics and poems (101 titles) attrib. ZHU Zaiyu.  The original edition, entitled Zhengwang ci《鄭王詞》 and bearing a Preface by WANG Maoxian 王茂先 (= WANG Linchun 王林春, fl. 1824) dated 1824, is lost; an undated ms. copy, re-titled Qingli ci《情理詞》, is in the Zhu Zaiyu Memorial Museum of Qinyang city 沁陽市朱載堉纪念馆; and the edition WANG F2013 is a facsimile of this copy.

WANG F2013.  = A: Zhu / Li F2013: 4979–5141. (WSK)

Anthology of lyrics and poems (147 titles) attrib. ZHU Zaiyu.  The original edition, entitled Zhengwang ci fenlei huibian《鄭王詞分類彙編》 [Classified anthology of lyrics of the Prince of Zheng], was published
by Yizhitang 益智堂 in 1935; a facsimile, re-titled *Xingshi ci* 《醒世詞》 *[Lyrics to alert the world]*, was published in Zhengzhou 1992; and the edition YAN F2013 is a conflated facsimile of these 2 prints.

**(B: LUG 1956)**

Pp. 73–79 include 21 lyrics attrib. ZHU Zaiyu, selected from [A: Zhengwang / HE 1821].

**(B: XieBY 2012)**

**B: WORKS IN CHINESE**

Baizhai 何塘 (literary name Baizhai 柏齋, 1474–1543). *Baizhai ji*《栢齋集》 [Collected works of Baizhai]. Bk. 1–11.  
Printed 1549 at Henei 河内 by Zhu Houwan 朱厚烷 (1519–1591).  

_____ / Siku _____  
[http://ctext.org/library.pl?if=gb&res=6731](http://ctext.org/library.pl?if=gb&res=6731)

(WSK)

Facsimile of author-editor’s ms.  
(WSK)

(Rutgers U EAL) B128.C54C53 1990

(Rutgers U electronic)

(WSK)

CHENWN 1982 CHEN Wan-Nai 陳萬鼐. 1982. 〈Zhongguo shanggu shiqi de yinyue zhidu (xiyuanqian 11 shiji zhi qian 221 nian) / Shishi Gu Yuejing de hanyi 中國上古時期的音樂制度(西元前 11 世紀至前 221 年) / 試釋「古樂經」的涵義 [The musical institutions of ancient China (~11th century to ~221) / The meaning of the Ancient classic of music]〉. *Dongwu wenshi xuebao*《東吳文史學報》 (Soochow journal of humanities) 4: 35–70.  
(UBC Library) AS455.A1 T88

_____ 1986 _____. 1986. 〈Yanjiu Zhu Zaiyu shengping shiji de diyi shou ziliao / Zheng Duanqing Shizi cizang shendaobei zhushi 研究朱載生平事跡的第一手資料 /
郑端清世子赐葬神道碑注释 [Data at first hand for research into the life of Zhu Zaiyu / Annotations and commentary on the《Memorial stele for the tomb of honour of Prince Heir Duanqing of Zheng》]. Yueidian 《樂典》(Archiv musical magazine) 11: 56–73.

(Chinese U Hong Kong) X 音期 980 874

1990

Zhu Zaiyu lüxue zhi yanjiu 朱載堉律學之研究 [Researches on Zhu Zaiyu’s music tuning]. Dongwu wenshi xuebao 《東吳文史學報》(Soo-chow journal of humanities) 8: 267–326.

(Chinese U Hong Kong) AS455.T84A3

1992


(WSK)

2010

Qingshigao 《清史稿》: Yuezhi yanjiu 《《清史稿•乐志》研究》 [Researches on《Draft history of the Qing dynasty》: 〈Treatise on music〉]. Guojia Qingshi Bianzuan Weiyeuankui yanjiu congkan 国家清史编纂委员会研究丛刊 [National Committee for the Compilation of a History of the Qing Dynasty research series]. Beijing: Renmin Chubanshe.

Rev. ed. (stated as 1st ed); 1st ed. titled Qingshi Yuezhi zhi yanjiu 《清史乐志之研究》, published Taibei 1978.

CHENYG 1982


(Princeton U Gest) MT6.C4174C5 1982

CHENYS 1985


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1002-9903.0.1985-01-004

1987

CHENYS 1987


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1002-9903.0.1987-02-003


(C: CHEN Yingshi T1988–1989)


1995

CHENYS 1995


(Rutgers U electronic) 【CNKI-DOI】 cnki:ISSN:11030042.0.1995-01-011

2004


R2004


Reprint; originally published Beijing 1997.


CHENYS et al 1989


2004


(U Pittsburgh EA CHI) MT85.C44 2004

CHEUNGSB 1975

Zhongguo yinyueshi lunshu gao《中國音樂史論述稿》 [Historical studies of Chinese music]. Hong Kong: Youlian Chubanshe. (WSK)

Chibei


Author’s Preface 1691.

/ JIN 1982


CHOGJ T2009


Chouren


Author’s Preface 1799.


With an abridged English trans.


Chunqiu Gongyangzhuan Anon.  *Chunqiu Gongyangzhuan* 《春秋公羊傳》  [Spring and Autumn annals / with commentary by GONGYANG].

Attrib. CONFUCIUS 孔子 (−551 – −479), GONGYANG Gao 公羊高 (? – ?) & GONGYANG Shou 公羊壽 (5th-generation descendant of Gao).


Chunqiu Guliangzhuan
Anon. Chunqiu Guliangzhuan《春秋穀梁傳》 [Spring and Autumn annals / with commentary by GULIANG].
Attrib. CONFUCIUS 孔子 (–551 – –479), & Master GULIANG穀梁子 (fl. c. –400 – –195).
http://ctext.org/guliang-zhuan/zh

Chunqiu Zuozhuan
Anon. Chunqiu Zuozhuan《春秋左傳》 [Spring and Autumn annals / with commentary by ZUO].
Attrib. CONFUCIUS 孔子 (–551 – –479) & ZUO Qiuming 左丘明 (c. –550? – c. –450?).
http://ctext.org/chun-qiu-zuo-zhuan/zh

Ch'ÜWL R1984
Ch'Ü Wan-li 屈萬里. 1984. Pulinsidun Daxue Geside Dongfang Tushuguan Zhongwen shanben shuzhi《普林斯頓大學葛思德東方圖書館中文善本書志》 (A catalogue of the Chinese rare books in the Gest collection of the Princeton University...
608


(U Pittsburgh CHS) PL2461.Z6K8 1982

Dadai Anon. Dadai liji《大戴禮記》 [Book of rites of Dai the Elder]. Ch. 39–81 (not all extant).

Compilation attrib. Dai De 戴德 (fl. ~73 – ~49).


(Rutgers U electronic) 【CNKI-DOI】CNKI:SUN:ZRKY.0.1987-03-001


(Rutgers U electronic)

Prefaces by Ming Emperor Xiaozong (reign Hongzhi 弘治 1488–1505) 1503, by Ming Emperor Wuzong (reign Zhengde 正德 1506–1521) 1510.


WSK

Daming huidian 1587


(Rutgers U EAL) DS753.T24 1963 v.1–5

Daming jili


Preface by Ming Emperor Shizong 明世宗 (reign Jiajing 嘉靖 1522–1566) dated 1530.  Based on an original edition of 1370.

______ / [Joseon R1692] ______.  [R1692.  Seoul.]

http://www.wul.waseda.ac.jp/kotenseki/html/wa04/wa04_06292/index.html

2nd Preface by King [Sukjong of Joseon 조선 숙종 (朝鮮肅宗, reign 1674–1720) dated 1692].  Reprint from an unspecified Chinese print or copy.


WSK

Datang


Preface by ZHOU Bida 周必大 (1126–1204) without date.  The Ceremonials were promulgated in 732.


http://ctext.org/wiki.pl?if=gb&res=257303

______ / Siku ______.  Siku quanshu 四庫全書 1782.  = B: Siku: History division: Documents on government 史部: 政書類: Datang Kaiyuan li《大唐開元禮》.

http://ctext.org/library.pl?if=gb&res=5589

DENGHL & DUXM 2004 DENG Hongli 邓宏礼 & DU Xinming 杜新明.  2004.  〈Zhu Zaiyu zai Qinyang de shiji 朱載堉在沁陽的史跡 [Historical traces of Zhu Zaiyu in Qinyang]〉.


Erya Anon. Erya 《爾雅》 [Dictionary / Approaching that which is correct]. Ch. 1–19. Compiled c. –300? – ~200?


Fudan 2007  Fudan Daxue Tushuguan Gujibu 復旦大學圖書館古籍部 (Fudan U Library: [Ancient documents department]). 2007. Siku xilie congshu mulu • suoyin 《四庫系列叢書目錄 • 索引》 [4 treasuries series / Catalog & index]. Shanghai: Shanghai Guji Chubanshe. (WSK)
**Siku xilie congshu zonghe suoyin** [四庫系列叢書綜合索引] (2012–). Shanghai: Fudan Daxue Tushuguan.

http://www.library.fudan.edu.cn:8088/guji/skxl2.htm

**Gexiang**

ZHAO Youqin 趙友欽 (fl. 1329). *Gexiang xinshu*《革象新書》 [New treatise on gexiang (? the heavenly bodies)].

Preface by SONG Lian 宋濂 (1310–1381) without date, printed with B: *Gexiang* / WANG Siku F2008.


Preface by Wang Wei without date, Postface by YUE Zheng 岳正 (1418–1472) without date.

**Gongy 2002**


(U Kansas) MT654.C5G65 2002

Text with 2 CD sound discs.

**Guanzi**

Anon. *Guanzi*《管子》 [Book of Master GUAN]. Ch. 1–86 (not all extant).


(C: Guanzi T2005) English trans. of B: Guanzi, with original Chinese text.

**Gujin lüli**


Bk. 1–23 (missing 5–6) http://gallica.bnf.fr/ark:/12148/btv1b90029357
Bk. 24–51 http://gallica.bnf.fr/ark:/12148/btv1b9002936n
Bk. 52–72 http://gallica.bnf.fr/ark:/12148/btv1b9002934t

This ed. printed 1608; 1st ed. printed by XU An 徐安 (fl. 1600) at Yan’an 延安 1600.
Gujin tushu

[CHEN Menglei 陳夢雷 (1651–1741)] & JIANG Tingxi 蔣廷錫 (1669–1732) et al, compilers & ed. (Qinding) gujin tushu jicheng 《(欽定)古今圖書集成》  [(Imperial) encyclopedic compendium of books ancient and modern].

10 040 Books. Originally printed and presented at Imperial court in Beijing 1726.


Incomplete  (Rutgers U EAL) AE4.K8 1934 v.1–808


(Rutgers U EAL) Z1029.K93 1996

Guo que


(WSK)

GUOSC 2010


(WSK)

GUOSQ 1985


(Rutgers U electronic) 【CNKI-DOI】 cnki:ISSN:0512-7939.0.1985-02-007

1993

GUOSQ 1993


(Rutgers U electronic) 【CNKI-DOI】 cnki:ISSN:0512-7939.0.1993-04-009

1994

1994. （Zhu Zaiyu de yinyue shijian dui “xinfa milü” de yingxiang’ 朱載堉的音樂实践对其“新法密率”的影響 (Zhu Zaiyu’s musical practice and...

(Rutgers U electronic)【CNKI-DOI】cnki:ISSN:11030042.0.1994-02-003

____ 1996


(Rutgers U electronic)【CNKI-DOI】cnki:ISSN:11030042.0.1996-01-013

____ 2008a


(Rutgers U electronic)【CNKI-DOI】cnki:SUN:MUSI.0.2008-01-005

Guoyu


Attrib. ZUO Qiuming 左丘明 (c. −550? – c. −450?).

____ / ctext 2006−


____ / WEI & BAO 2000


____ / YI & HOU 1995


(C: Guoyu T1985)

French trans. of B: Guoyu: Bk. 1–3.

Hanshu

BAN Gu 班固 (32–92) et al. Hanshu《漢書》 [History of the (Former) Han dynasty (~206 – +9 +23)]. Bk. 1–100.

____ / ctext 2006−


____ / WU & LIU 2013


____ / YAN 1962


____ (Lüli zhi) 〈律曆志〉: 〈Treatise on the musical system and calendar 律曆志〉. = B: Hanshu: Bk. 21.

In part compiled from earlier work by LIU Xin 劉歆 (~46 – +23).


Includes English trans. of B: *Hanshu*: Bk. 24, 91, with original Chinese text.

*Henan* 1660


With many Prefaces by many officials, presented at Imperial court in Beijing by JIA Hanfu in 1660, and reprinted with supplemental materials by XU Huacheng 徐化成 (fl. 1660–1670) in 1670.

____ / F2011


(Stanford U) C-DS793.H5Z466 2011 v.1–2

Facsimile of 1670 supplemented reprint. (The edition states, somewhat inaccurately, that it is a facsimile of the 1660 print.)

*Henan* 1735


Original Preface by TIAN Wenjing 1731, presented at Imperial court in Beijing by WANG Shijun 1735, reprinted with supplemental materials 1826, 1869, (1882?), 1892, 1902, 1914.

____ / F1969


(Rutgers U EAL) DS791.C5 v.113–115

Facsimile of 1882 reprint (as stated on non-facsimile title page).

____ / *Siku*

#####  Siku *quanshu* 《四庫全書》 1782. = B: *Siku*: History division: Geography 史部: 地理類: *Henan tongzhi*《河南通志》.

http://ctext.org/library.pl?if=gb&res=5260&by_title=河南通志

*Henei* 1693


Prefaces by LI Yun, XIAO Jiahui, SHI Lian, 1693.

*Henei* 1825


The 〈Annals〉 and 〈Biographies〉 are by Fan Ye, the 〈Treatises〉 are by Sima Biao.

http://ctext.org/hou-han-shu/zh


annotations and new translations]. Taibei: Sanmin Shuju.

(C: LIU T2010a) English trans. of B: Huainanzi.

(C: LIU T2010b) English trans. of B: Huainanzi, with original Chinese text.

Huaiqing 1660


Editor’s Preface 1660, and other Prefaces and Postfaces.


(U Pennsylvania Storage) DS737.T4 2009 v.28–29

Huaiqing 1789


Title page and Preface by TANG Shibi dated 1789, and Prefaces to earlier editions.


(Rutgers U EAL) DS791.H85 v.465–470

HUALK 2010


HUANGHX 1997


Huangji

SHAO Yong 邵雍 (1012–1077). Huangji jingshi shu 《皇極經世書》 [Book of the supreme kingly principle which runs like a warp through the fabric of the ages].


Full text without annotations.

____ / SHAO et al F1978

_____ . SHAO Bowen 邵伯溫 (1057–1134), CAI Yuanding 蔡元定 (1135–1198),
Huangming qinggong

Li Wencha 李文察 (c. 1493? – 1563?).  Huangming qinggong yuediao 《皇明青宮樂調》 [Music for the Imperial Ming crown prince].  Bk. 1–3.

Author's Preface 1545.

Huangming shiji

GUO Lianghan 郭良翰 (fl. 1614).  Huangming shiji huibian 《皇明諡紀彙編》 [Compendium of posthumous titles of the Imperial Ming dynasty].  Bk. 1–25.

Author's Preface 1614.

Huangming zhaoling


Postface by HUANG Chen 黄臣 (fl. 1539) 1539.  Rev. & augmented by the Zhejiang Buzhengsishi 浙江佈政司使 [Zhejiang Provincial Administration Commissioner] 1548.

Huangming zuxun

ZHU Yuanzhang 朱元璋 (Ming Emperor Taizu 明太祖, reign Hongwu 洪武 1368–1398).  Huangming zuxun 《皇明祖訓》 [Ancestral injunctions of the Imperial Ming dynasty].  [1 Bk.]

Final revision [1395].


Huangyl & Changcc 1993


(C: Huang & Chang T1996)

Hubei 1989  
Hubei Sheng Bowuguan 湖北省博物馆 (The Museum of Hubei Province).  
Zhongguo tianye kaogu baogao ji / Kaoguxue zhuanjian 中国田野考古报告集 / 考古学专刊 [Reports of archaeological field work in China / Monograph in archaeology]: Series D 丁种: No. 37.  
Beijing: Wenwu Chubanshe.(Dartmouth College Orient) DS719.T74 1989 v.1–2

______ 2007  
______ (Hubei Provincial Museum).  2007. Zenghouyi mu / Zhangguo zaoqi de li- 
yue wenming《曾侯乙墓 / 战国早期的礼乐文明》 (Tomb of Marquis Yi of Zeng / Ritual-and-music civilization in the early Warring States period).  
Beijing: Wenwu Chubanshe.  
(U Pennsylvania East Asia) DS797.48.S85Z46 2007  
With partial English trans.

Hubei et al 1994  
Zhongguo kaogu wenwu zhi mei [The beauty of archaealogical relics of China]: 5.  
[Beijing]: Wenwu Chubanshe; & [Taipei]: Guangfu Shuju.  
(Princeton U Gest) DS715.C4852q v.5

HU DT 1982  
Shanghai: Shanghai Wenyi Chubanshe.  
(WSK)

Hui’an  
ZHÚ Xi 朱熹 (courtesy name Yuanhui 元晦, posthumous honorific title Wengong 文公, 1130–1200). Hui’an ji《晦庵集》 [Anthology from Hui’s studio].  
Bk. 1–100, 〈Sequel 續集〉 Bk. 1–11, 〈Another 別集〉 Bk. 1–10.  
Compiled by disciples of Zhu Xi.

______ / LIU 2010  
______. LIU Yongxiang 劉永翔 et al, ed. 2010. Hui’an xiansheng Zhu Wengong wenji《晦庵先生朱文公文集》 [Collected essays of Mr Hui’an, Zhu Wengong].  
(WSK)

JiangF & AI 2001  
(Cornell U Asia) BL1833.R57J53 2001

Jin yan  
Bk. 1–4.  
Author’s Preface 1566.
Jiuzhang

Attrib. ZHANG Cang 張蒼 (<−252 – −152) & GENG Shouchang 耿壽昌 (fl. −73 – −49), received text ed. LIU Hui 劉徽 (fl. 263) & LI Chunfeng 李淳風 (602–670) et al.


Libu
LIN Yaoyu 林堯俞 (fl. 1589 – 1626?), YU Ruji 俞汝楫 (fl. 1620), et al, ed. *Libu zhi gao* 《禮部志稿》 [Draft notes of the Ministry of Rites]. Bk. 1–100.

Compiled and printed 1620.


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:0512-7939.0.1980-03-006

(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1003-0042.0.1985-01-004


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:0512-7939.0.1985-02-006


(WSK)


(WSK)

Lidai mingchen


Author’s Preface 1855, Preface by Wang Tingzhen 王廷楨 (1796 – ?) 1881. Published by Chenshi Shenchutang 陳氏慎初堂 at Haining 海寧 1926.


(WSK)

Liezi


Source material attrib. Lie Yugou 列禦寇 (c. –600 –500), received text ed. Zhang Zhan 張湛 (fl. 317–420).


(C: [Liezi] T1990)

English trans. of B: Liezi.
Liji

Anon.  *Liji* 《禮記》 [Book of rites].  Ch. 1–49.

Compilation attrib. DAI Sheng 戴聖 [Xiao DAI 小戴 [DAI the Younger], fl. -73 – -49).

http://ctext.org/liji/zh?en=on

_____ / JIANG & HUANG 2007


(C: [Liji] T1885) English trans. of B: Liji.

LiM 2007


(WSK)

LiSG 1994


(Rutgers U electronic) 【CNKI-DOI】 cnki:ISSN:10031499.0.1994-01-001

LIUDS 1992


(WSK)

LIUDS & YUANQY 2008


(WSK)

LIUDY 1982


(Princeton U Gest) ML336.2.L59 1982

LIUF 1933

LIU Fu 劉復.  1933.  〈Shier denglí de famingzhe Zhu Zaiyu 十二等律的發明者朱載堉 [The inventor of 12-tone equal tuning, Zhu Zaiyu]〉.  In *Qingzhu Cai Yuanpei xiansheng liushiwu sui lunwenji* 《慶祝蔡元培先生六十五歲論文集》

(U Pennsylvania Storage) 9159.L334 v.1


LIUY 1992


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1003-0042.0.1992-04-007

_____ 1997


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1002-9903.0.1997-03-008

_____ 2000


(Rutgers U electronic)

LIUY & ZHANGQ 1993


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1003-0042.0.1993-04-015

LiY 2005


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1001-5736.0.2005-04-004

LUG 1956


(Yale U) Fv5660.7 6611

Pp. 73–79 include 21 lyrics attrib. Zhu Zaiyu, selected from [A: Zhengwang / He 1821].
Lunyu


Sayings of CONFUCIUS, compiled by disciples of his school.


http://ctext.org/analects/xue-er/zh?en=on

_____ / He et al 2000 ．He Yan 何晏 (c. 190 − 249) & XING Bing 邢昺 (932–1010) et al, ed. 2000. Lunyu zhushu《論語注疏》 [Exegeses on 《Lunyu》]. Bk. 1–20. (WSK)


Lülü chanwei


_____〈Prefaces〉 ．〈Preface to Lülü chanwei《律呂闡微》序〉 & 〈Another Preface 又序 to an earlier treatise Lülü xinyi [A new explication of the musical pitches] 昔年《律呂新義》序〉. = A: Zhu / Li F2013: 5263−5275. (WSK)

〈Preface to Lülü chanwei〉 is dated 1757, and 〈Another Preface to Lülü xinyi〉 is dated 1746, the earlier treatise Lülü xinyi being discarded and replaced by Lülü chanwei. Neither Preface is included in B: Lülü chanwei / Siku.

Lülü xinshu


Preface by ZHU Xi 朱熹 (1130–1200) dated 1187.


http://daten.digitale-sammlungen.de/bsb00063278/image_187

Lülü zhengyi

AISIN GIORO Xuanye 愛新覺羅玄煥 (Qing Emperor Shengzu 清聖祖, reign Kangxi 康熙 1662–1722) et al. (Yuzhi) lülü zhengyi 《(御製)律呂正義》 [The (Imperially produced) correct meaning of music]. Pt. 1 上編: Bk. 1–2, Pt. 2 下編: Bk. 1–2, Pt. 3 續編: Bk. 1.
Written [1713–1714].


Preface by Qing Emperor Gaozong (reign Qianlong 1736–1795) 清高宗 乾隆 dated 1746, Bk. Preliminaries–120 presented to him in Beijing 1746, Bk. 121–128 presented 1786.


(Princeton U Gest) CJ3496.C482q v.3


(WSK)

Mayi

Anon.  *Mayi Daozhe Zheng Yi xinf FA* [《麻衣道者正易心法》] / [The heart of the primal Yijing by the Daoist in the Flaxen Cloak].  1 Bk.


Mengzi


Sayings of MENCIUS, compiled by his disciples.  


http://ctext.org/mengzi/zh?en=on


(WSK)

_____ / ZHUX  ZHU Xi 朱熹 (1130–1200), ed.  = B: Sishu: Mengzi jizhu《孟子集注》.  

(C: LEGGE TR1970: Vol. 2)

(C: [MENG] T1984)  English trans. of B: Mengzi, with original Chinese text.


(WSK)

**Mingshan**

He Qiaoyuan 何喬遠 (1558–1632).  *Mingshan cang* 《名山藏》  [To be stored in a famous mountain].  Bk. 1–[109].

http://nrs.harvard.edu/urn-3:FHCL:4516708

Prefaces by Li Jiantai 李建泰 (? – 1649 ? 1650) & Wang Shao 王邵 (? – ?), without date.

**Mingshi**


Presented at Imperial court in Beijing 1739.

**Mingshi jishi**

Gu Yingtai 谷應泰 (1620–1690).  *Mingshi jishi benmo* 《明史紀事本末》  [Events in Ming history / narrated from beginning to end].  Bk. 1–80.

Author’s Preface 1658.

**Ming shilu**

Multiple authors.  *Ming shilu* 《明實錄》  [Veritable records of the Ming dynasty].


Preface by Ming Emperor Xuanzong 明宣宗 1438.


Preface by Ming Emperor Xuanzong 明宣宗 1438.


Preface by Ming Emperor Yingzong 明英宗 1438.

Preface by Ming Emperor Xianzong 明憲宗 1467.


Preface by Ming Emperor Xiaozong 明孝宗 1491.


Preface by Ming Emperor Wuzong 明武宗 1509.


Preface by Ming Emperor Shizong 明世宗 1525.


Preface by Ming Emperor Shenzong 明神宗 1577.


Preface by Ming Emperor Shenzong 明神宗 1574.


Preface by Ming Emperor Sizong 明思宗 [1630].


http://ctext.org/wiki.pl?if=gb&res=279435

[3] _____: Renzong shilu 《仁宗實錄》

http://ctext.org/wiki.pl?if=gb&res=398252

[4] _____: Xuanzong shilu 《宣宗實錄》

http://ctext.org/wiki.pl?if=gb&res=880255

[5] _____: Yingzong shilu 《英宗實錄》

http://ctext.org/wiki.pl?if=gb&res=381419

[6] _____: Xianzong shilu 《憲宗實錄》

http://ctext.org/wiki.pl?if=gb&res=307706
[7] ______: Xiaozong shilu 《孝宗實錄》
http://ctext.org/wiki.pl?if=gb&res=146891

[8] ______: Wuzong shilu 《武宗實錄》
http://ctext.org/wiki.pl?if=gb&res=322108

[9] ______: Shizong shilu 《世宗實錄》
http://ctext.org/wiki.pl?if=gb&res=309093

[10] ______: Muzong shilu 《穆宗實錄》
http://ctext.org/wiki.pl?if=gb&res=838914

http://ctext.org/wiki.pl?if=gb&res=964038


Mingshi zong 朱彝尊 (1629–1709), ed. Mingshi zong 《明詩綜》 [Survey of Ming poetry]. Bk. 1–100.

(《Siku quanshu》: Collected literary works: General collections 集部: 總集類: Mingshi zong 《明詩綜》).
http://ctext.org/library.pl?if=gb&res=5765&by_title=明詩綜


Prefaces by HUANG Zuo 1544, WU Jie 1456, colophon by LI Mo 李默 (1494–1556) 1549.


Prefaces by WANG Long 王鑨 (? – ?, brother of Duo) 1653, etc.


Quanzhou


Queli


Bk. 40–Final  http://books.google.com/books?id=_1kpAAAAYAAJ
Author’s note (at end of Bk. 100) dated 1761, Preface and Presentation petition by KONG Zhaohuan 孔昭焕 (1743–1782) 1762.

RICCI & TRIGAULT / HE et al TR2001


Sancai


Prefaces by WANG Qi 1607, by ZHOU Kongjiao 周孔教 (1548? – 1613) 1609, etc.


_____ / HUANG ______. HUANG Cheng 黃晟 (fl. 1747–1755), ed. No date. Leishu Sancai tuhui 《類書三才圖會》 [Classified pictorial encyclopedia of the 3 realms (heaven, earth, & man)]. No place: Huaiyin Caotang.


Sepu


http://ctext.org/library.pl?if=gb&res=5373&by_title=瑟譜

Shanghai 2007


Shangshu

Anon. Shangshu 《尚書》 [Classic of ancient documents].

Transmitted in 2 versions: (1) Modern script text 今文本 composed c. −1300?–c. −400?, and transmitted c. −179 – c. −157 by FU Sheng 伏勝 = 伏生 (fl. −213 – c. −157), in 28 Ch; (2) Ancient script text 古文本 putatively transmitted and edited by KONG Anguo 孔安國 (? – c. −100), but (according to prevalent opinion) actually spuriously composed c. 320? by MEI Ze 梅賾 (fl. 320), in 58 Ch.


http://ctext.org/shang-shu/zh?en=on
Ancient script text.


Modern script text.


Ancient script text.

(C: LEGGE TR1970: Vol. 3) English trans. of B: Shangshu, with original Chinese ancient script text.

(C: [Shangshu] T1950) English trans. of B: Shangshu, with original Chinese modern script text.


The new ed. is a slightly revised ed. of the 1st ed.  The 1st ed, edited by SHAO Youcheng 邵友誠 and published in Beijing in 1959, was itself an augmented ed. (revised with supplements) of B: SHAOYC 1911.  (SHAO Youcheng was the son of Zhang, who was the grandson of Yichen.)


Shenqi  ZHU Quan 朱權 (literary name Quxian 曬仙, 1378–1448), compiler & ed.  Shenqi mipu《神奇秘譜》[Wondrous and secret tablature].  Bk. 1–3.

Author-editor’s Preface 1425.

The complete music of B: Shenqi (64 pieces), transcribed with original tablatures, with recordings of 17 selected pieces performed by the editor.

(C: [ZHU Quan] T1997) 6 pieces for solo qin selected from B: Shenqi, in recordings performed by YAO Bingyan 姚丙炎, with transcriptions and original tablatures in facsimile.

(C: [ZHU Quan] T[2000]) The complete music of B: Shenqi (64 pieces), transcribed with original tablatures. (Complete recordings of performances by the editor available separately from the editor’s website.)

Shiben


Shiben was probably composed c. −234 – c. −228. Neither it nor its edition by SONG Zhong has survived as an independent work; they are partially reconstructed by compilation of fragments of quotations from them, culled from the extant literature.

Zhonghua R2008


Reprint; originally published Shanghai 1957.

Shiji


With supplementary material by ZHU Shaosun 褚少孫 (c. −104 – c. −30).

ctext 2006–


HAN 2008


Pei et al 1982


《Lü shu》〈Treatise on military science 律書〉. = B: Shiji: Bk. 25.

Partly inauthentic.


SWANN TR1974 Includes English trans. of B: Shiji: Bk. 129, with original Chinese text.

Shijing

Anon. Shijing《詩經》 [Classic of poetry].

Composed and compiled c. −1000 – c. −600.
Shijing yuepu

[AISIN GIORO] Yongrong [愛新覺羅]永瑢 (1743–1790) & ZOU Yixiao 鄒奕孝 (1728–1793) et al. (Qinding) Shijing yuepu quanshu 《(欽定)詩經樂譜全書》 [The (Imperial) complete 《Shijing》 songs in score] (Bk. 1–30) & (Qinding) yuelü zhengsu 《(欽定)樂律正俗》 [The (Imperial) correct music vs. vulgar music] [1 Bk].

Composed on Imperial commission 1788.

_____ / Siku F2008


Shisanjing

Shisanjing zhushu 《十三經注疏》 [Exegeses on the 13 classics].

13 collected classical texts and their exegeses, written c. –1300 – c. 1033, compiled c. 1190 – c. 1194, and collated by RUAN Yuan 阮元 (1764–1849) in 1816.

_____ / 2000


Shishuo


_____ / LIUJ 2011


https://zh.wikisource.org/wiki/世說新語

_____ / LIUZH 2009

Shuowen

Xu Shen 許慎 (c. 58 – c. 147). Shuowen jiezi 《說文解字》 [Dictionary / Explaining and analyzing words]. Ch. 1–14, Bk. 15.

Presented at Imperial court in 121.


DUAN Yucai’s edition was first printed in 1815.

(C: SERRUYS 1984) Includes English trans. of all 540 headings [bushou 部首] of B: Shuowen.

Siku


Siku jianming

Ji Yun 紀昀 (1724–1805) et al. (Qinding) siku quanshu jianming mulu 《(欽定)四庫全書簡明目錄》 [(Imperial) simplified catalog of the 《Siku quanshu》]. Bk. 1–20.

Ms. presented at Imperial court in Beijing 1782; first printed at Hangzhou [1784].


Facsimile of ms.

Siku zongmu


Ms. presented at Imperial court in Beijing 1782; first printed in Beijing [1789].

- 〈Daxue zangju 大學章句 [The great learning / with exegesis by Paragraph and verse]〉.
- 〈Zhongyong zangju 中庸章句 [Doctrine of the mean / with exegesis by Paragraph and verse]〉.


Songshi

TUOTUO (TOKTOGHAN) 脫脫 (1314–1355) et al. *Songshi* 《宋史》 [History of the Song dynasty (960–1279)]. Bk. 1–496.

Presented at Imperial court in 1345.

SHEN Yue 沈約 (441–513). *Songshu* 《宋書》 [History of the Song dynasty (420–479)]. Bk. 1–100.


**Suanjing**

*Suanjing shishu* 《算經十書》 [10 mathematical classics].
Collection of 10 treatises by various authors, written from < c. −100 – > 629, compiled & ed. 656 by Li Chunfeng 李淳風 (602–670) et al, re-compiled & ed. 1777 by Dai Zhen 戴震 (1724–1777).


Suishu


Presented at Imperial court in 636 and 656.


SULY [1985]

SU Li-yu 蘇麗玉. [1985]. Taiwan jikong yinyue de yan'ge yanjiu 《台灣祭孔音樂的沿革研究》 [A study of music for the worship of Confucius and its development in Taiwan]. [Master thesis, Guoli Taiwan Shifan Daxue].

(Princeton U Gest) ML337.9.S92

SUNXL 1987


(Rutgers U electronic) 【CNKI-DOI】cnki:ISSN:1003-0042.0.1987-01-026

Wenxuan


http://zh.wikisource.org/wiki/昭明文選

Li Shan’s edition was presented at Imperial court in 658.


(WSK)

(C: [XIAO] T1958) German trans. of a large selection from B: Wenxuan.

Xingzhuang

XIAO Luan 蕭鸞 (literary name Xingzhuang Laoren 杏莊老人, 1488 – > 1561), (ed). Xingzhuang taiyin buyi《杏莊太音補遺》 [Xingzhuang’s supplement to the sounds of antiquity]. Bk. 1–3.

Author-editor’s Preface 1557, and other Prefaces and Postfaces dated 1557–1561.

____ / F2010


XINGZL 1998


Xuanhe


c. 1107 – 1125.

____ / Siku F2008


XUANXY 2014


XUF 1996


(Rutgers U electronic) 【CNKI-DOK】 cnki:ISSN:1000-0763.0.2001-02-013

_____ 2001


(Rutgers U electronic) 【CNKI-DOK】 cnki:ISSN:1000-0763.0.2001-02-013

Yanchuan


Initial anthology 初集 printed 1756, supplements 1762, 1767, sequel 续集 1775, supplement 1779.
YANGYL 2009a


(Rutgers U EAL) ML336.Y22 2009 v.1–13

YANGYL 2009b


Author’s Preface 15 June 1943, work published here for the first time.

YANGYL 2009c


Uncorrected reprint; originally published Shanghai 1952.

YANGYL 2009d


Uncorrected reprint; originally published Beijing 1981.

YANGYL 2009e

Yang Yinliu 杨荫浏. 2009e. 〈Pingjunlü suanjie 平均律算解 (An account of the efforts of Chinese scholars towards the solution of the problem of the equal tempered scale in Chinese music)〉. = B: YANGYL 2009a: Vol. 5: 1–52.

Reprint; originally published Beijing 1937.

YANGYL 2009f


Reprint; originally published Beijing 1982.

YANGYL 2009g


Reprint; originally published Wuxi 1924.

YANGYL 2009h


YANGYL & HOUZW R2009

Reprint; originally published Beijing 1956.

Yanshantang

http://nrs.harvard.edu/urn-3:FHCL:4653329

YASUI & NAKAMURA 1971–1992


(Not seen)

None of the apocrypha have survived as independent works. They are partially reconstructed by compilation of fragments of quotations from them, culled from the extant literature.

Yijing

Anon. *Yijing* 《易經》 [Classic of changes].

Also called Zhouyi《周易》 [The *Yijing* of the Zhou dynasty]. Composed and compiled c. –1000? – c. –200?

ctext 2005–

Internet: Chinese Text Project.


jinzhuxinyicongshu古籍今注新譯叢書[Series of ancient texts with modern annotations and new translations]. Taipeh: Sanmin Shuju. (WSK)


_____/ZHUX_____. ZHU Xi朱熹 (1130–1200), ed. = B: Zhouyi benyi《周易本義》.

(C: [Yijing] T1899) English trans. of B: Yijing.


**Yìlì**


Dates unknown; attrib. Duke of Zhou 周公 (fl. −1042 − −1036).


_____/Gu et al 2002_____.


**Yìlì tongjie**

ZHU Xi朱熹 (1130–1200) & HUANG Gan黃榦 (1152–1221). Yìlì jingzhuan tongjie《儀禮經傳通解》[Comprehensive exegeses on《儀禮》]. Bk. 1–37, Sequel續Bk. 1–29.

Bk. 1–37 written by ZHU Xi and originally printed in 1217, Sequel Bk. 1–29 written by HUANG Gan and originally printed in 1223, definitive edition ed. YANG Fu楊復 (fl. 11xx–1231) 1st printed in 1231.


**Yìlì tu**

YANG Fu楊復 (fl. 11xx–1231). Yìlì tu《儀禮圖》[Diagrams for《儀禮》]. Bk. 1–17, 〈Auxiliary diagrams for《儀禮》儀禮旁通圖〉.

Author’s Preface 1228, Preface by CHEN Pu 陳普 (1244–1315) without date.


**Yìlì tu**


Prefaced and printed by RUAN Yuan阮元 (1764–1849) 1805.
<table>
<thead>
<tr>
<th>Book</th>
<th>Author</th>
<th>Title</th>
<th>Edition/Printing Details</th>
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<tr>
<td>Yin Yang</td>
<td>He Tang 何瑭 (1474–1543)</td>
<td>Yinyang guanjian《陰陽管見》 [My humble opinions on the yin and yang]</td>
<td>1 Bk.</td>
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<td>Reprint of a facsimile originally published in Shanghai 1935. Facsimile of 1584 print, with WANG Wan’s 〈Preface to Bailing xue shan〉 dated 1568, but without He Tang’s 〈Preface to Yinyang guanjian〉.</td>
</tr>
<tr>
<td>Yin Shu</td>
<td>Liu Mu 劉牧 (1011–1064)</td>
<td>Yishu gouyin tu《易數鈎隱圖》 [Diagrams to tease out the hidden secrets of the 《Yijing》 numbers]</td>
<td>Bk. 1–3, Appendix.</td>
</tr>
<tr>
<td>Yin Tu</td>
<td>Hu Wei 胡渭 (1633–1714)</td>
<td>Yitu mingbian《易圖明辨》 [Elucidating the 《Yijing》 diagrams]</td>
<td>Bk. 1–10.</td>
</tr>
<tr>
<td></td>
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<td>Author’s Preface 1706.</td>
</tr>
<tr>
<td>Yixue qimeng</td>
<td>Zhu Xi 朱熹 (1130–1200)</td>
<td>Yixue qimeng《易學啓蒙》 [Introduction to the study of the 《Yijing》]</td>
<td>Bk. 1–4.</td>
</tr>
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<td>Author’s Preface 1186.</td>
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<td>Postfaces by LIU Jing 劉涇 (fl. 1289–1292) &amp; XIONG He 熊禾 (1247–1312) for 1st ed. of Yixue qimeng tongshi printed in 1292; Preface by NALAN Chengde for Tongzhitang ed. dated 1677.</td>
</tr>
</tbody>
</table>
Yuanluo


Yuan wenlei


Yuefu


Yueling zhangju

Yueshu
Presented at Imperial court in 1101.

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