University of Reading

Evolution of Chinese typeforms up to the early 20th century

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

Xunchang Cheng

Abstract

This thesis investigates the origin and development of the Chinese typeforms, from their origins in China and early experiments with making Chinese types in Europe to the localisation of Western typefounding and printing technology in China during the early twentieth century. Chinese characters present unique challenges for movable type compared to alphabetic and other writing systems due to their extent and complexity. This study elucidates how Chinese writing has been translated into typographic form over the centuries, influenced by conventions, innovations and cross-cultural exchanges.

This thesis begins by analysing the compositional logic of Chinese characters and describing the evolution of Chinese script styles and forms under woodblock printing, laying the foundation for the subsequent discussion of the evolution of Chinese typeforms. It then examines early experiments in movable type printing with Chinese characters in China and Europe, respectively, followed by Chinese founts produced by missionaries.

The thesis culminates in a discussion of the rapid growth of refined Chinese typeface styles in the early twentieth century, which combined essential features of Chinese calligraphy with Western mechanical techniques, leading to the establishment of Song Ti, Kai Ti, Fang-song Ti, and Hei Ti founts, and building a foundation for modern Chinese typography.

In assembling this historical account, the thesis demonstrates the unique trajectory through which the Chinese writing system acquired its typographic forms, mediated by technical challenges, aesthetic considerations, and cross-cultural influences. The findings of this study provide a new, enriched perspective on the emergence of a significant non-alphabetic typographic tradition and provide a robust historical basis to inform contemporary Chinese type design and future scholarship.

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Chinese transliteration scheme

HANYU PINYIN

To enhance the accessibility and readability of content containing Chinese characters, this thesis employs the Hanyu Pinyin scheme without tones. Although tones can accurately reproduce Mandarin, this often presents difficulties for those unfamiliar with the nuances of Chinese phonemes. In written text, however, the focus often shifts to semantic understanding and communication, which can be achieved effectively through the Hanyu Pinyin system without the added complexity of tonal indicators.

Hanyu Pinyin is a romanisation system that uses the Latin alphabet to transliterate the pronunciation of Standard Mandarin Chinese.[1] Hanyu Pinyin was developed in th 1950s and formally introduced during the Fifth Session of the First National People's Congress in 1958.[2] The International Organization for Standardization (ISO) adopted Hanyu Pinyin as ISO 7098 in 1982, followed by its adoption by the United Nations in 1986.[3]

In addressing the translation of Chinese names within this thesis, a strict adherence to Chinese conventions is maintained, wherein the surname precedes the given name. For example, the name of the author of this thesis is '程训昌', where the surname '程' precedes the given name '训昌'. This transliteration is subsequently rendered in English as 'Cheng Xunchang'.

1 GB/T 16159 — 2012 Basic rules of the Chinese phonetic alphabet orthography 汉语拼音正词法基本规则. <www.moe.gov.cn/ewebeditor/uploadfile/2015/01/13/20150113091717604.pdf>

2 Zhou Youguang, 1998, 《汉语拼音方案》的制订过程 [The development process of the Hanyu Pinyin Programme]. In: 语文建设 (Language Planning), 1998:4, pp. 11–14.

3 ISO 7098: 2015 *Information and documentation — Romanization of Chinese*. <https://www.iso.org/obp/ui/en/#iso:std:iso:7098:ed-3:v1:en>

Chapter 1. Introduction

1.1 Background, objectives and perspectives

Chinese writing has a long and rich history spanning more than 3,000 years, giving rise to a vast repertoire of tens of thousands of characters, each a recognisable unit. As a logographic writing system, Chinese presents unique challenges for movable type compared to alphabetic scripts. Each distinct character must be faithfully reproduced, requiring sophisticated sorting and organisation. Nevertheless, a coherent logic underlies their large number. Each Chinese character is made up of multiple components, which for a full character set total in the hundreds. In turn each component is made up of dozens of strokes. The visual representation or shape of Chinese characters within a typeface defines Chinese typeforms.[1] These typeforms convey the functional aspects of reading Chinese and encapsulate the artistic nuances of Chinese calligraphy. In contrast to Latin typefaces, the large Chinese character set and the intricate and diverse nature of its typeforms have consistently posed challenges to type makers, typeface designers, and typographers.

This thesis investigates the evolution of Chinese typeforms, spanning the invention of early Chinese movable type printing in the eleventh century to the localisation of Western mechanical metal types in China in the early twentieth century. The history of printing usually focuses on the technical aspects of printing, such as the development of printing presses and materials, this thesis differs from this approach. It aims to examine the evolution through the lens of typeface design. This typographic lens analyses the interplay of functionality, aesthetics, and cultural influences that shape how Chinese characters are visually represented and communicated through type.[2] A printing historian might analyse the challenges of casting movable metal type for thousands of Chinese characters, whereas this thesis explores how these challenges influenced the design choices made by typographers and type designers.

In the present day, there is an urgent demand for the development of new Chinese typefaces in response to rapid economic growth in China. The widespread use of computer technology has brought more possibilities for Chinese typefaces, it has also led to fundamental changes in typeface design methods and production processes. It is essential to have a sound, research-based approach to the creation of new typefaces. Therefore, a comprehensive and systematic study of the historical development of Chinese typeforms is crucial to meet the needs of both academia and businesses.

In response to the evolving needs of Chinese typeface design, this thesis establishes a framework that elucidates the evolution of Chinese characters themselves as typographic forms. By integrating Chinese and English literature and meticulously describing the development of printed Chinese characters, this research endeavours to provide guiding principles for future Chinese typeface designers, while simultaneously enriching the histor-

1 In this thesis, Chinese typeform refers to the visual form or shape of Chinese characters in a typeface, which reflects the function of reading Chinese and the aesthetics of Chinese calligraphy.

2 Individual character blocks made based on movable type printing are defined as types in this research.

ical and cultural understanding of Chinese type design.

Existing research on Chinese typography primarily focuses on the field of printing history. In Su Ching's thesis, *The Printing Presses of the London Missionary Society among the Chinese*,[3] investigates the transformation of Chinese printing technology from xylography to Western typography from the perspective of a printing historian, providing a historical background for the development of Chinese typography in the 19th century. Japanese scholar Hiroshi Komiyama, in his book *The story of Japanese movable type: the people and typefaces of the early days*,[4] explores the development of Japanese Kanji typefaces from the perspective of a typeface designer, offering valuable references for this research. Additionally, Chinese scholar Sun Mingyuan has published several key works in recent years, such as *A study on the historical development of graphic design and typography in China: 1805–1949*,[5] which examines the development of Chinese typography from the perspective of printing history.

This research distinguishes itself from existing studies in its focus on Chinese typeforms. Unlike previous studies focusing on printing history or technique, this research takes the Chinese typeform as its primary object of study. In addition, Chinese typeforms in this research are limited to the text typefaces, and do not include display typefaces. Notably, the evolution of Chinese typeforms up to the early twentieth century is yet to be examined from a type design perspective.

1.2 Thesis structure

Given the limited availability of English-language research on Chinese typeface design is limited, and, in most cases, mainly focuses on aspects of Chinese calligraphy and writing systems. As the approach of this thesis is from the perspective of typeface design, it offers new insights into Chinese characters. Drawing upon the extensive knowledge derived from the Science of Chinese characters, chapter two describes the nature of Chinese writing, and the classification, construction and structure of the characters, with the intent of providing English-speaking readers with a concise understanding. Chapter two traces the evolution of representative script styles of Chinese characters and explores the transformation of character shapes during the era of woodblock printing. With the invention of movable type printing, Chinese typeforms predominantly drew inspiration from these two key aspects of stylistic evolution. Thus, this chapter lays the foundation for the subsequent discussions on the Chinese typeforms.

Chapter three describes the origin and evolution of early Chinese movable type printing. At this stage, early Chinese type makers experimented with different materials for movable type, which included ceramics, wood, and various metals. This chapter examines the distinct characteristics of printed Chinese characters based on the specific materials used for movable type, providing a separate analysis for each material.

Chapter four explores the European attempts at creating Chinese mov-

3 Su Ching, 1997, *The Printing Presses of the London Missionary Society among the Chinese,* (Ph.D. Thesis, University of London).

4 Hiroshi Komiyama, 2009, 日本語活字ものがたり: 草創期の人と書体 [The story of Japanese movable type: the people and typefaces of the early days].

5 Sun Mingyuan, 2021, 中国近现代平面设计和文字设计发展历程研究—从一八〇五年至一九四九年 [A study on the historical development of graphic design and typography in China: 1805–1949].

able type printing. Faced with the challenges of printing Chinese characters, European sinologists and type makers ventured into various methods of producing Chinese founts. Their bold experimentation laid the foundation for the fusion of the Chinese writing system with Western mechanical movable type printing technology.

Chapter five traces the development of Chinese movable type printing in Asia, with a primary focus on the activities of notable figures such as missionaries Joshua Marshman, Robert Morrison, Samuel Dyer, and William Gamble, along with British businessman Ernest Major. These individuals played a pivotal role in the evolution of Chinese movable type printing, especially in advancing the technology of type production.

Chapter six, elucidates the development of Chinese movable type that occurred as private Chinese enterprises entered the printing and publishing industry in the 1880s. During this period, movable type printing technology gradually became localised and widely adopted in China. The Chinese foundries were able to produce founts independently, and gradually developed four main styles of Chinese typeface: Song Ti, Fang-song Ti, Hei Ti and Kai Ti. This chapter traces the formation of these four typeface styles and explores the origins of their typeforms using the information outlined in Chapter two.

1.3 Working with archives

This thesis utilises extensive archival resources, including original materials from various institutions, private collections, and online digital libraries. A complete list of these sources can be found in Appendix 7: Image notes and lists of provenance.

A multi-layered approach is employed to analyse the printed Chinese characters from archives. First, a close examination occurs at three distinct levels: the shape of strokes, the proportion of components and ultimately, the complete character. This allows for a detailed analysis of the Chinese characters' form. Beyond the characters, the research extends to the construction of the documents, considering aspects such as layout, material choices, and technique. A more comprehensive understanding of the historical context and evolution of Chinese characters can be achieved by looking at the individual characters and the documents that house them.

Moreover, the methodology for evaluating Chinese typeforms is guided by the approach taken by Fiona Ross, as stated in *The printed Bengali character and its evolution*:

> The evaluation of all type designs - Latin as well as non-Latin - is inevitably subjective, but criteria independent of personal taste and current fashion exist by which a typeface design can be assessed. These fall into two intimately-related categories: those applying to its aesthetic forms; and those relating to its functional aspect.[6]

The thesis likewise analyses influential Chinese typeforms from both aesthetic and functional aspects, taking into account the specific characteristics of Chinese characters. By examining Chinese typeforms from different historical periods, this research also strives to summarise the stylistic techniques and design principles of Chinese typefaces.

6 Ross, 1988, *The evolution of the printed Bengali character from 1778 to 1978*, p. 405.

Chapter 2. Introduction of Chinese writing and its evolution

The typeface, as the specific manifestation of a writing system, usually reflects the conventions of the particular script. Chinese writing is a unique writing system consisting of tens of thousands of characters, each of which is a recognisable unit. Despite this great number of characters, all characters are made up of hundreds of components, which in turn are made up of dozens of strokes. For example, the 11,834 standard Chinese characters included in the dictionary, *Cihai*, issued in 1979, contain only 648 components.[1] However, the traditional method of producing Chinese typefaces has always been to design them one entire character at a time.

If typeface designers utilise the construction of Chinese characters, they can effectively increase efficiency and control the quality of the production of Chinese typefaces. Therefore, the study of Chinese typeface design needs to be based on a certain understanding of the regulations and conventions of Chinese character composition. Research on Chinese characters mainly relies on the specific forms of the characters in different eras; therefore, there are many results of analyses on the construction and shape of Chinese characters, especially in the Science of Chinese Characters,[2] which are informative for studying Chinese typeforms.

This chapter provides a brief overview of the characteristics of the Chinese writing system, drawing upon the wealth of knowledge from the Science of Chinese Characters studies and distilling the relevant content concerning Chinese typeforms. Specifically, this chapter briefly describes the nature of Chinese writing, the classification, construction, structure and visual characteristics of Chinese characters from the perspective of a typeface designer. The purpose of this chapter is to summarise the constructional features and structural conventions of Chinese characters to assist in the subsequent exposition on the development of Chinese founts and the analysis of the distinctive styles of Chinese characters at each stage will provide a foundation for exploring Chinese typeforms in subsequent discussions.

1 The *Cihai* (辞海) is a large-scale comprehensive dictionary that functions as both a dictionary, a lexicon and an encyclopaedic dictionary, with characters leading to words. Fu Yonghe, 1993, 汉字七题 [Seven questions on Chinese characters]. p. 56.

2 The Science of Chinese Characters (中国文字学) is a branch of linguistics dedicated to the comprehensive examination of Chinese characters. Its scope includes the study of the origin, development, nature and system of writing, as well as the relationship between form, sound and meaning, orthography and the evolution of individual characters. Nowadays, some English texts also call this discipline Chinese Grammatology or Chinese philology, and this thesis follows Tang Lan's designation, the Science of Chinese Characters. Tang Lan, 2005, 中国文字学 [The science of Chinese characters], p. 6; Sha Zongyuan, 2008, 文字学术语规范研究 [A study of the norms of Chinese grammatology terminology], pp. 83–84; Zhong Yurou, 2019, *Chinese grammatology, script revolution and literary modernity, 1916–1958*.

2.1 Nature of Chinese writing

Discussing the formation of writing requires firstly a definition of writing. The most widely cited definition of writing is 'a system of human intercommunication by means of conventional visible marks', which was defined by I. J. Gelb in his book, *A Study of Writing*.[3] However, Gelb's definition of writing was broad and did not include the highly complex relationship between writing and language, which led him to sharpen his definition stating:

> I agree entirely with the linguists who believe that fully developed writing became a device for expressing linguistic elements by means of visible marks.[4]

Different from Gelb's broad definition of writing, Saussure proposed a more narrow definition:

> Language and writing are two distinct systems of signs; the second exists for the sole purpose of representing the first. The linguistic object is not both the written and the spoken forms of words; the spoken forms alone constitute the object.[5]

Florian Coulmas was critical of Saussure's narrow definition of writing:

> Recording information by graphical means is a basic function of writing that is never narrowed down entirely to the representation of sounds. Saussure's above-quoted observation that 'language and writing are two distinct systems of signs' must always be kept in mind, but the second part of his definition, that writing exists for the sole purpose of representing speech, must be rejected, for writing follows its own logic which is not that of speech.[6]

In traditional Chinese texts, the definition of writing follows Saussure's definition that writing is a technique for documenting language through the use of a designated set of symbols.[7] Within this framework, Chinese characters function as the unique symbols that embody the Chinese language. These characters are a form of logogram; that is, each character corresponds to a semanteme or morpheme — both of which represent a meaningful unit of language — and typically signifies a single syllable.

In contrast to languages like English and Latin, which modify or inflect a base word to express different meanings (for instance, 'do' can become 'does', 'doing', 'did' and 'done'), the Chinese language is unique. Its structure, known as an 'isolating' structure, ties one syllable to a single meaningful unit of language, a morpheme. Thus, each Chinese character, or morpheme, like the equivalent of 'do', stands alone (table 2.1).[8] Because the number of these unique morphemes in Chinese surpasses the total number of syllables, it requires a substantial number of individual characters in its

Chinese	English
做	do
	does
	did
	done

Table 2.1
Compare Chinese character '做' and its English translations (do, does, did, done).
Font in use: Noto Serif CJK SC, Medium; Brill, Roman.

3 Gelb, 1963, *A study of writing*, p. 12.

4 Ibid, p. 13.

5 Saussure, 1959, *Course in general linguistics*, (Wade, B., trans), p. 23.

6 Coulmas, 2003, *Writing systems: an introduction to their linguistic analysis*, p. 16.

7 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 1.

8 Encyclopædia Britannica, inc. (n.d.), Chinese writing, <www.britannica.com/topic/Chinese-writing>.

writing system, and there will be characters with complex structures.[9]

In *Chinese writing*, Qiu Xigui[10] was the first to make a clear distinction between two different levels of symbols:

> Writing symbolises language. But writing itself taken as a symbol of language and the symbols used by the writing systems are concepts belonging to two different levels. (...) In discussing the nature of Chinese writing, if a clear distinction is not made between the nature of writing as a symbol of language, and the nature of the symbols used by the writing system itself, a confusion in logic will result.[11]

Various scripts utilise graphic symbols that can be broadly categorised into three primary types: semantic symbols, phonetic symbols, and signs.[12] Semantic symbols maintain a semantic relationship with the words represented in the script, while phonetic symbols exhibit a phonetic link. Signs, on the other hand, lack both phonetic and semantic connections. In alphabetic writing systems, only phonetic symbols (letters) are used. In contrast, the Chinese writing system utilises all three types of symbols. Therefore, depending on the perspective, the Chinese script can be referred to as a morphemo-syllabic script or a semanto-phonetic script, or even a semanto-phonetic-sign script.[13]

Figure 2.1
Comparing the Chinese character '材', with the English word 'an'. The upper grey part shows the space or interspersed relationship (穿插关系) between two components, and the lower grey part shows the letter-fitting between the letters 'a' and 'n'. Font in use: Noto Serif CJK SC, Medium; Brill, Roman.

It is necessary to note that the above compares Chinese characters with English words based on Saussure's narrow definition of writing. However, in the field of typography, the unit of the Chinese writing is the individual Chinese character, whereas in Latin, the unit is the letter. In other words, each type corresponds to a Chinese character or a Latin letter.

Although it is not necessary to distinguish among the functions and meaning of the three symbols indicated above in the process of Chinese typeface design, the deviations in the correspondence between writing systems and typography can be a useful guide to designing relationships between different scripts to learn from and harmonise with each other. These deviations due to the nature of the writing are particularly evident in the letter-fitting in Chinese typeface design. When designing a Latin typeface, the type designers need to define the sidebearings on either side of each letter; between words is determined primarily by the width of the space. The letter fitting in designing Chinese typefaces reflects the interspersed relationship between the components constituting individual characters. (figure 2.1) In contrast, the spacing between characters corresponds to the definition of space width (figure 2.2).

Figure 2.2
Comparing the Chinese characters '字', '体', '设' and '计' with two English words 'type' and 'design'. The upper grey parts show the spacing between four characters, and the lower grey part shows the space width. Font in use: Noto Serif CJK SC, Medium; Brill, Roman.

Thus, the nature of Chinese writing determines the large number of characters and the complexity of Chinese typeforms by including the 'letter-fitting' in each character.

9 Su Peicheng, 2017, 汉字的性质 [The nature of Chinese characters]. In: 中国文字 (Journal of Chinese Writing Systems). 2017:2, p. 110.

10 Qiu Xigui, a distinguished contemporary Chinese palaeographer, is widely recognised for his work, *Chinese writing*, which is considered the 'single most influential study of Chinese palaeography'. Shaughnessy, 2013, Paleography. *obo* in Chinese Studies, doi: 10.1093/obo/9780199920082-0043.

11 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 14–15.

12 This view is derived from the 'Three writings' proposed by Qiu Xigui in *Chinese writing*.

13 Ibid, pp. 15–26.

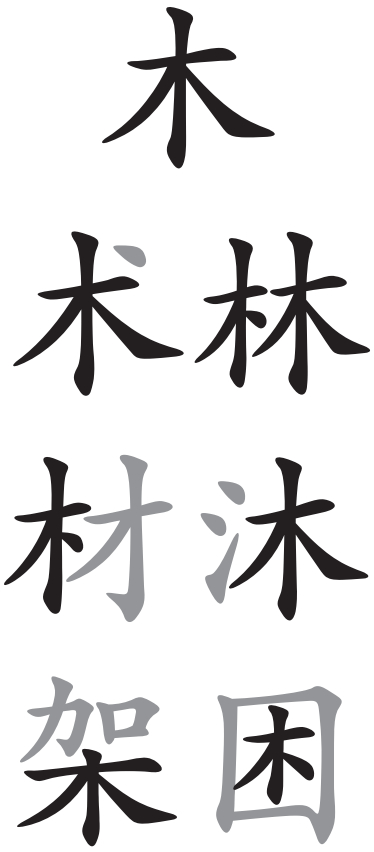


Figure 2.3
Chinese characters '木', '术', '林', '材', '沐', '架' and '困' in a Kai Ti font. The black parts are the character or component '木', and the grey parts are strokes or components used to combine with '木' to form the corresponding characters.
Font in use: Kaiti SC Bold, from SinoType.

2.2 Classification of Chinese characters

The Chinese writing system uses semantic symbols, phonetic symbols, and signs, which are character building components with the function of assembling characters. However, Chinese characters do not merely represent these three types of symbols simultaneously or separately, but a mixture or combination of them, while there may be variants in the combination. This is similar to how different English words are made up of different letters horizontally combined in different orders. The difference is that instead of a horizontal juxtaposition, the Chinese characters have complex structures that combine components in 'square frames'.

The Chinese characters containing the symbol '木' (Pinyin: mu) are used as examples (Diagram 1.3): character '木' has only one semantic symbol '木', meaning 'tree'; '术' (Pinyin: shu) is '木' plus the dot stroke '丶' in the upper right corner, '木' in this case lacks both phonetic and semantic connections, so it is used as a sign symbol; '林' (Pinyin: lin) consists of two semantic symbols '木', but the last stroke of the left-hand '木' has changed from the press stroke '乀' to the dot stroke '丶' to avoid repetition and for better combination; '材' (Pinyin: cai) consists of a semantic symbol '木' and a phonetic symbol '才'. Both '材'and '才' are pronounced as 'cai'; '沐' (Pinyin: mu) consists of the left-right combination of the components '氵' and '木', where '木' is the phonetic symbol, therefore '沐' is pronounced as 'mu' as in '木'; '架' (Pinyin: jia) consists of the components '加' and '木' top and bottom, with '加' as the phonetic symbol and '木' as the semantic symbol, therefore '架' means 'shelf' or 'frame' and is pronounced as 'jia' as in '加'; '困' (Pinyin: kun) consists of two semantic symbols, '口' and '木' inside and out, meaning 'trap, sleepy or difficult'. One of the best-selling Chinese dictionaries, *Xinhua Dictionary* (新华字典), contains a total of 1,020 Chinese characters with the symbol '木', some of which have been exemplified above.[14]

The above examples show that the complexity of the structure of Chinese characters, coupled with the large number of characters, makes their classification particularly essential for Chinese character-based research and practice, including Chinese typeface design.

There are two great classes of Chinese characters: undecomposable and composite characters. Undecomposable characters are those that cannot and should not be divided, such as the characters '木' and '术' in the previous example.[15] In contrast, composite characters are characters consisting of two or more components, such as the characters '林', '材', '沐', '架' and '困' indicated above (figure 2.3).

Compared to the English alphabet, undecomposable Chinese characters are similar to letters, such as 'A' or 'I', which can either be words or letters that make up other words. Other English words are similar to composite Chinese characters. Traditional Chinese linguists, such as Duan Yucai,[16] referred to undecomposable characters as '文', composite characters as '字', and two characters together as '文字' denotes 'writing' in Chinese. In the

14 *Xinhua Dictionary* is a Chinese dictionary published by the Commercial Press. Refer to the list on the website: <http://xh.5156edu.com/html/421.html> (accessed on 5 Sep 2023).

15 Shao Aiji, 2021, 《通用规范汉字表》独体字统计与思考 [The undecomposable characters in the General Standard Chinese Characters Table], 41:3, pp. 33–43.

16 Duan Yucai (段玉裁, 1735–1815) was a Chinese philologist of the Qing dynasty known for his annotated edition of *Shuowen Jiezi*.

present day, whether these specific characters are used individually or in combination, they all signify 'writing'.

'Six writings'

As early as the Han dynasty (202 BC–AD 220), traditional Chinese linguists would further categorise Chinese characters, grouping them by composition and usage of Chinese characters into six categories, known as the 'Six writings' (六书; Pinyin: liu shu):

Category 1. Zhi Shi (indicate things, 指事)

Category 2. Xiang Xing (resemble form or pictograms, 象形)

Category 3. Xing Sheng (form and sound, 形声)

Category 4. Hui Yi (conjoining meanings or ideograms, 会意)

Category 5. Zhuan Zhu (evolving and deriving, 转注)

Category 6. Jia Jie (loan-borrowing, 假借)[17]

Xu Shen[18] first explained its definition and recorded it in the postface of *Shuowen Jiezi* (说文解字) around AD 120 (figure 2.4).[19] Xu Shen developed the theory of the 'Six writings', defining them and putting them into practice by analysing each of the 9,353 characters included in *Shuowen Jiezi*. He also stated that the 'Six writings' were initially intended as a literary pedagogy, which he used to compile the *Shuowen Jiezi*.

> According to the *Zhouli*[20] at the age of eight [one] undertakes primary studies. The Baoshi instructed the scions of state by first teaching them the Six writings.[21]

However, Xu Shen's explanation of the 'Six writings' is relatively simple, and there is still no uniformity in the definitions of these six categories among later generations.

After the Han dynasty (202 BC–AD 220), traditional Chinese linguists continued to study the theory of the 'Six writings' and the construction of Chinese characters, for example, *Shuowen Jiezi Xizhuan* (说文解字系传) by Xu Kai (徐锴, 920–974) of the Song dynasty, *Liu Shu Lue* (六书略) by Zheng Qiao (郑樵, 1104–1162) of the Song dynasty. Until the Yuan (1271–1368) and Ming (1368–1644) dynasties, the 'Six writings' became the central issue in the study of Chinese characters. In the Yuan dynasty, there were *Shuo Wen Zi Yuan* (说文字原) and *Liu Shu Zheng E* (六书正讹) by Zhou Boqi (周伯琦, 1298–1369), *Liu Shu Tong* (六书统) by Yang Heng (杨桓, 1234–1299) and so on. In the Ming dynasty, there were *Liu Shu Ben Yi* (六书本义) by Zhao Huiqian (赵撝谦, 1351–1386), *Liu Shu Suo Yin* (六书索隐) by Yang Zhen (杨慎, 1488–1559) and so on.[22]

17 See Appendix 1 for further translations and analyses of the 'Six writings'.

18 Xu Shen (许慎, *c.* AD 58–*c.* 148) was a Confucian scholar and linguist of the Eastern Han Dynasty (AD 25–220) who pioneered the Science of Chinese characters.

19 Xu Shen, 1963, 说文解字 [Shuowen Jiezi].

20 *Zhouli* (周礼) is one of the three ancient ritual texts in the 'Thirteen Classics of Confucianism' written by Zhou Gongdan (周公旦) a politician of the Western Zhou dynasty (1046–771 BC).

21 Baoshi (保氏) is the ancient official who was responsible for correcting the king and educating the children of the nobility through propriety and righteousness. Original text in Chinese: '周礼八岁入小学，保氏教国子，先以六书'. Xu Shiyi, 2016, 汉语语文辞书发展史 [History of Chinese language dictionaries], pp. 222–224; Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 151–153.

22 Zhou Zumo, 2023, 六书说 (Six categories of Chinese characters). In: 中国大百科全书 第三版网络版 (Encyclopaedia of China, the third edition, online version). <www.zgbk.com/ecph/

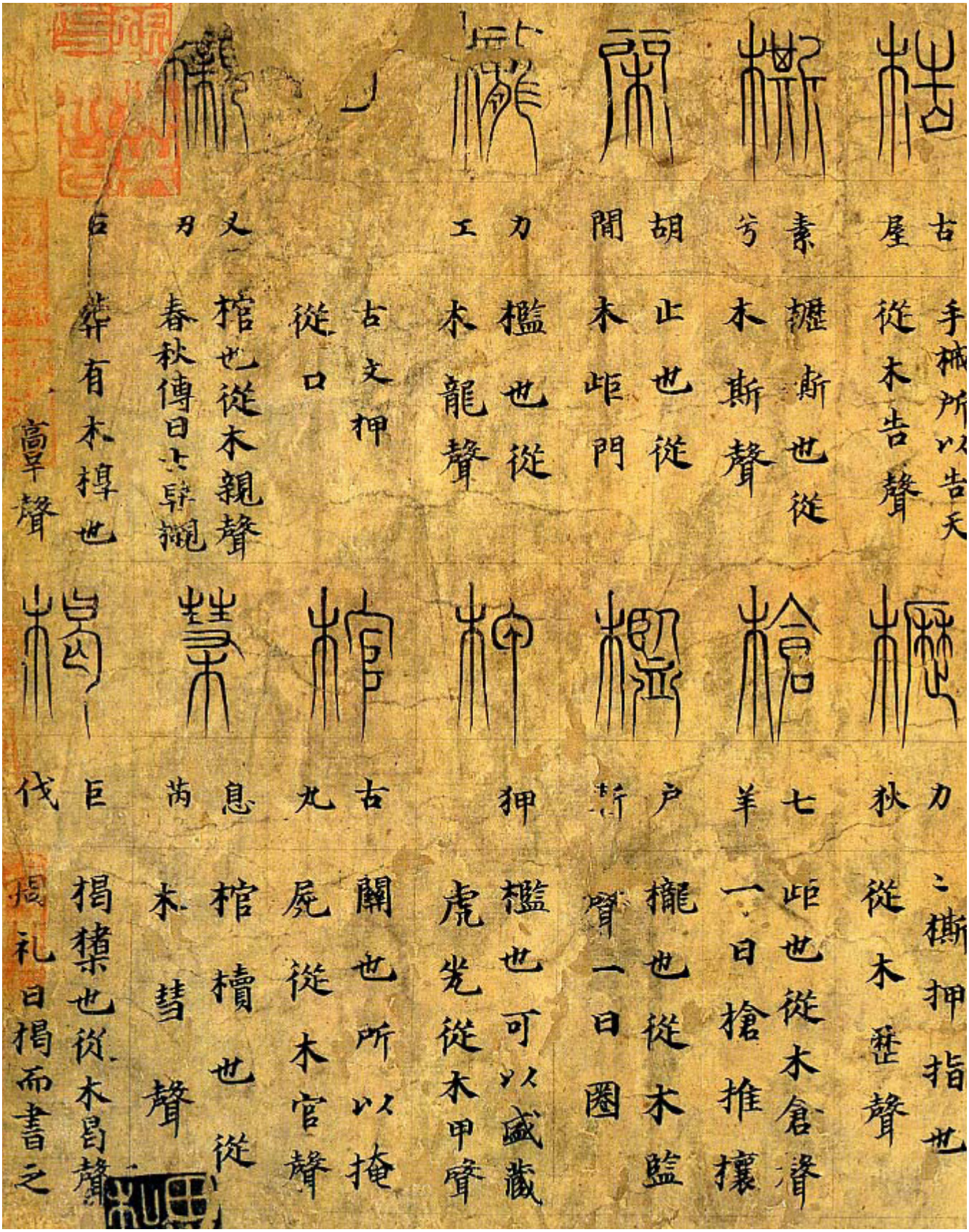


Figure 2.4
Fragment of the Tang Dynasty (AD 618–907) *Shuowen Jiezi*, presumably made in 820. It is the oldest extant manuscript of *Shuowen Jiezi*, although some believe it to be a forgery.
Source: <http://kuzunoha.kantate.info/rekishi_tsuiki.htm> (accessed on 10 Sep 2023).

After more than 1,400 years of research, the 'Six writings' theory in the Qing dynasty had more developments. The linguist Dai Zhen (戴震, 1724–1777) further divided the 'Six writings' into the 'Four Forms and Two Uses' (四体二用) in terms of the character structure, 'Four Forms' refers to the four methods of creating characters or four structures of Chinese characters, including Zhi Shi, Xiang Xing, Hui Yi and Xie Sheng; 'Two Uses' refers to the two methods of using characters including Zhuan Zhu and Jia Jie.[23]

'Three writings'

The 'Six writings', as the understanding of Chinese characters by traditional linguists in the Qin (221 BC–207 BC) and Han dynasties (202 BC–AD 220), conformed to the state of Chinese characters in small seal script at that time. However, due to the limitations of the times, there were also many imperfections, especially not applicable to the current classification of Chinese characters. In addition, although Xu Shen explained the 'Six writings' with examples, there were still different interpretations by later researchers. If categorised by the 'Six writings', each Chinese character often fails to determine which category it should belong to.[24]

In the 1930s, contemporary Chinese linguists, inspired by Western linguistics, established a modern theoretical system of the Science of Chinese Characters.[25] In his 1934 work titled *An introduction to palaeography*, Tang Lan (1901–1979) introduced a novel classification system. Instead of adhering to the conventional 'Six writings', he proposed a reclassification, 'Three writings', consisting of three categories: 'Xiang Xing characters' (pictographs, 象形文字), 'Xiang Yi characters' (ideographs, 象意文字), and 'Xing Sheng characters' (form and sound, 形声文字)', which marked a significant departure from traditional categorisation methods.[26] And he explained:

> Xiang Xing and Xiang Yi characters are the pictorial characters of the ancient period, and the Xing Sheng characters are the phonetic symbol characters of the ancient time nearest to the present, and these three categories can include all Chinese characters.

Tang Lan's Xiang Xing characters possess three essential criteria:

1. They must be undecomposable characters.
2. They must be names [nouns].
3. They must not convey any meanings beyond their original name.[27]

For instance, the character '人' (Pinyin: ren), meaning 'person', is derived from the side view of a human figure, and it clearly represents the concept of 'person' within the language (figure 2.5). Therefore, it is an Xiang Xing

words?SiteID=1&ID=138399&Type=bkzyb> (accessed on 8 Sep 2023)

23 Except for the Xie Sheng (谐声), which was based on Zheng Zhong (郑众, ?–AD 83) of the Eastern Han dynasty (AD 25–220), Dai Zhen's 'Six writings' have the same names as Xu Shen. Wang Jialing, 1995, 戴震文字学论述 [An exposition on Dai Zhen's philology]. In: 東吳中文研究集刊 (Soochow Journal of the Graduate School of Chinese). 1995:2, pp. 63–65.

24 Tang Lan, 2005, [The science of Chinese characters], p. 10.

25 Liu Yu, 2015, 唐兰先生的治学之路 [Mr Tang Lan's academic path]. In: 故宫博物院院刊 [Palace Museum Journal]. 2015:5, p. 141.

26 Tang Lan, 2005, [The science of Chinese characters], pp. 60–63; Tang Lan, 2015, 唐兰全集 [The complete collection of Tang Lan].

27 Tang Lan, 2005, [The science of Chinese characters], p. 61.

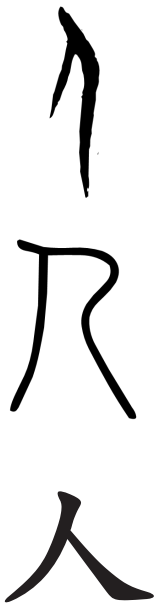


Figure 2.5
Chinese character '人' in three Chinese script styles, from top to bottom: the oracle bone script digitised from, No. 18,901, *Oracle bone script collection*; the small seal script from *Shuowen Jiezi Gulin Zhengbu Hebian*; the Kai script, using the font, Kaiti SC Bold, from SinoType.

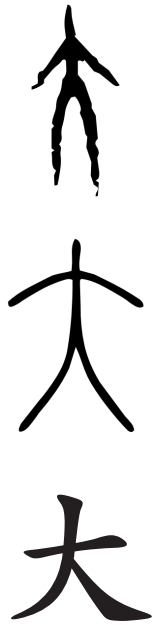


Figure 2.6
Chinese character '大' in three Chinese script styles, from top to bottom: the oracle bone script digitised from, No. 22,421, *Oracle bone script collection*; the small seal script from *Shuowen Jiezi Gulin Zhengbu Hebian*; the Kai script, using the font, Kaiti SC Bold, from SinoType.

character. In contrast, the character '大' (Pinyin: da), meaning 'big', while originating from a frontal human figure, is unrelated to the human figure in the language (figure 2.6). It is presumed that the ancient character '大' originally represented the idea of 'adult', but it later extended to mean 'big'. Consequently, this character already contains meanings beyond the human figure and is classified as an Xiang Yi character.[28]

Moreover, Tang Lan's Xiang Yi characters are sub-divided into single-body (单体) and compound-body (复体) characters. Although similar to Xiang Xing characters, single-body Xiang Yi characters emphasise only one feature of the figure represented by the character. For example, the character '身' (Pinyin: shen), meaning 'body', is derived from a human's abdomen, focusing on this aspect while disregarding others. Compound-body Xiang Yi characters are similar to Xing Sheng characters but prioritise the visual representation, where recognition of the character's original pictorial nature directly conveys its meaning, making it an Xiang Yi character. On the other hand, Xing Sheng characters incorporate phonetic components that Xiang Yi characters do not.[29]

Although the 'Three writings' of Tang Lan was an innovation derived from the traditional 'Six writings', it still has shortcomings. Notably, distinguishing between Xiang Xing and Xiang Yi characters can be challenging, and it does address the phenomenon of Jia Jie characters, thus fully reflecting the nature of Chinese characters.

In 1956, Chen Mengjia (1911–1966), in his work *Review of Yin Ruins oracle inscriptions*, pointed out the shortcomings of the 'Three writings' and proposed a new 'Three writings' comprising Xiang Xing (pictographs, 象形), Jia Jie (loan-borrowing, 假借) and Xing Sheng (form and sound, 形声).[30] He merged Tang Lan's Xiang Xing and Xiang Yi into his Xiang Xing and argued that Jia Jie should be listed as one of the basic types of Chinese characters. Chen Mengjia stated:

> Xiang Xing, Jia Jie and Xing Sheng are not three predetermined principles of character creation but rather three stages in the evolution of writing. Chinese characters began as Xiang Xing and, in the course of development and application, they transformed into phonetic components, which are called Jia Jie characters; in the process of further development, there were Xiang Xing and Jia Jie characters, which increased the number of form and sound components, which is called Xing Sheng characters. Xing Sheng characters are a natural outcome of the evolution of Chinese characters.[31]

Chen Mengjia's 'Three writings' is more comprehensive than Tang Lan's, aligning better with the development of Chinese characters. In 1988, Qiu Xigui, in Chinese writing, stated:

> While we believe that Mengjia's three-principles theory [Three writings] is basically sound, we feel his term 'pictograph' [Xiang Xing] should be emended to 'semantograph' (referring to characters

28 Tang Lan, 2015, [The complete collection of Tang Lan], p. 62.

29 Ibid.

30 *Review of Yin Ruins oracle inscriptions* (殷虚卜辞综述), written by Chen Mengjia, is one of the definitive works in the field of oracle bone research and is still frequently cited. Chen Mengjia, 1988, 殷虚卜辞综述 [Review of Yin Ruins oracle inscriptions].

31 Ibid.

created from semantic symbols). Only by doing so can a place for all semantographs be secured in the three-principles theory.[32]

Additionally, Qiu Xigui identified five categories of characters that the 'Three Writing' theory does not encompass: signs, semi-signs, graphs altered in shape to indicate sound, phonetic fusions and characters with two phonetics.[33] Moreover, he argued that:

> Viewed in a wider context, apart from those characters which had evolved into sign graphs and semi-sign graphs due to changes in graphic shape and so forth, the number of character, which cannot be covered by the three principles is rather small. If our only goal is to explain the original structure of the average Chinese graph, then the three principles are essentially suitable for this purpose.[34]

Scholarly discussions on the structure and classification of Chinese characters continue, and further research is necessary to achieve a unified understanding. This section provides a simplified overview of the principles of Chinese character classification and lays the foundation for the following discussions on the development of Chinese typeforms.

2.3 Construction of Chinese characters

The construction of Chinese characters is generally divided into three hierarchies: stroke, component and character. Strokes combine to form components or 'undecomposable characters', and components combine to form characters. These three hierarchies also correspond to the three main stages in the production of Chinese typefaces: shaping strokes, producing components, and integrating them into characters.

When analysing Chinese typeforms for individual characters, the common approach is to examine them from the details to the whole using these hierarchies. When looking at the strokes of characters, the main focus is on the detailed treatment of the typeface. When considering components, the main observation centres on the structural composition of the characters. When examining characters, a comprehensive analysis that encompasses the previous two aspects is conducted, which also takes into account the relationships between characters such as spacing.[35]

To facilitate subsequent discussions on the development of Chinese typeforms in the following chapters, this section introduces Chinese characters from three perspectives: strokes, components, and structure, and elucidates their respective influences on Chinese typeface design.

Strokes of Chinese characters

The strokes of Chinese characters typically refer to the various shapes of dots and lines that compose Chinese characters without interruption. The Ministry of Education of the People's Republic of China officially defines a stroke as the smallest writing unit that constitutes Chinese glyphs in the Kai script, as the Kai script serves as the writing standard for Chinese

32 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 167.

33 For more details, see Qiu Xigui's explaination in *Chinese writing*. Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 169–170.

34 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 171.

35 Chinese typeforms and the spacing between typeforms determine the type colour, which describes the density of the text appears on the page.

characters.[36] Furthermore, strokes were standardised during the Kai script era and subsequently became a unit of Chinese writing that could be sequenced and counted. The written representation of the strokes is called the stroke form or stroke feature, which defines the name of the stroke.[37]

When writing Chinese characters, in the process of starting and ending each stroke, regardless of whether the route taken by the tip of the brush on the paper is horizontal or vertical, long or short, straight or curved, it is collectively known as a stroke.[38] Therefore, a stroke is usually divided into three parts: the starting, running and ending (figure 2.7). Each stroke possesses a distinct direction and unique form, a line system, which is the result of the long practice of calligraphers of all generations, with precise distinguishing functions and unique aesthetic value.[39]

'EIGHT PRINCIPLES OF YONG' (永字八法)

Traditionally, Chinese characters consist of eight fundamental strokes originated from the principles of brushwork in Chinese calligraphy, known as the 'Eight Principles of Yong' (永字八法, figure 2.8 & table 2.2). These fundamental strokes are exemplified by the eight-stroke sequence found in the character '永' (Pinyin: yong), signifying 'forever' or 'permanence'.

As for the origins of the 'Eight Principles of Yong', various accounts exist, including those of Cui Ziyu,[40] Wang Xizhi,[41] Zhi Yong,[42] and Zhang Xu,[43] but none of them has a verifiable foundation.[44] One of the more widely circulated accounts is Liu Zongyuan's 'Praise to the Eight Principles of Yong' (永字八法颂), written during the Tang dynasty (618–907) and recorded in volume 583 of *Quan Tang Wen* (全唐文).[45] Although interpretations of the eight principles may vary, the names of each principle remain fundamentally consistent.

The traditional eight basic strokes are primarily employed in the written style of Chinese characters, such as the Kai script, and the stroke forms vary depending on the writing tool or the way in which they are presented. For instance, the vertical strokes in the Kai Ti style typeface inspired by brush-writing are subdivided into the 'hanging needle vertical stroke' (悬针竖) that end in a sharp point and the 'hanging dew vertical stroke' (垂露竖)

36 See chapter 2.4 for further details related to the Kai scripts. Fu Yonghe, Wang Min & He Rui, 2020, 通用规范汉字笔顺规范 (Stroke orders of the commonly used standard chinese characters). National Language Commission, Ministry of Education of the People's Republic of China, p. 1.

37 Wang Ning, 2016, 汉字构形学导论 [Introduction to Grapheme formation of Chinese characters], pp. 78–79; Fu Yonghe, Liu Lianyuan, Wang Cuiye & Wang Danhui, 2001, GB 13000.1 字符集汉字折笔规范 [Chinese character turning stroke standard of GB 13000.1 character set].

38 Fu Yonghe, 1993, [Seven questions on Chinese characters], p. 25.

39 Lu Yongfang, 2016, 汉字书写 [Writing of Chinese characters], pp. 60–61.

40 Cui Ziyu (崔子玉, 78–143) was a Chinese calligrapher during the Eastern Han dynasty (25–220).

41 Wang Xizhi (王羲之, *c.* 303–361) was an eminent Chinese calligrapher of the Eastern Jin dynasty (317–420) who was best known for his mastery of Chinese calligraphy.

42 Zhi Yong (智永) was a Chinese calligrapher of the Southern Dynasties from Chen (557–589) to the early Sui dynasty (581–618), and the seventh-generation grandson of Wang Xizhi.

43 Zhang Xu (张旭, *c.* 685–*c.* 759) was a Chinese calligrapher of the Tang dynasty who was well known for his cursive script.

44 'Eight Principles of Yong', Encyclopaedia of China, third edition, online version. Available at: <www.zgbk.com/ecph/words?SiteID=1&ID=41968&Type=bkzyb&SubID=169301> (accessed on 24 Sep 2023).

45 Liu Zongyuan (柳宗元, 773–819) was a Chinese philosopher, poet, and politician of the Tang dynasty who was a founder of the Classical Prose Movement. Dong Gao, Ruan Yuan & Xu Song (Eds.), 1819, 钦定全唐文 [Qin Ding Quan Tang Wen], <ctext.org/wiki.pl?if=gb&res=425915>.

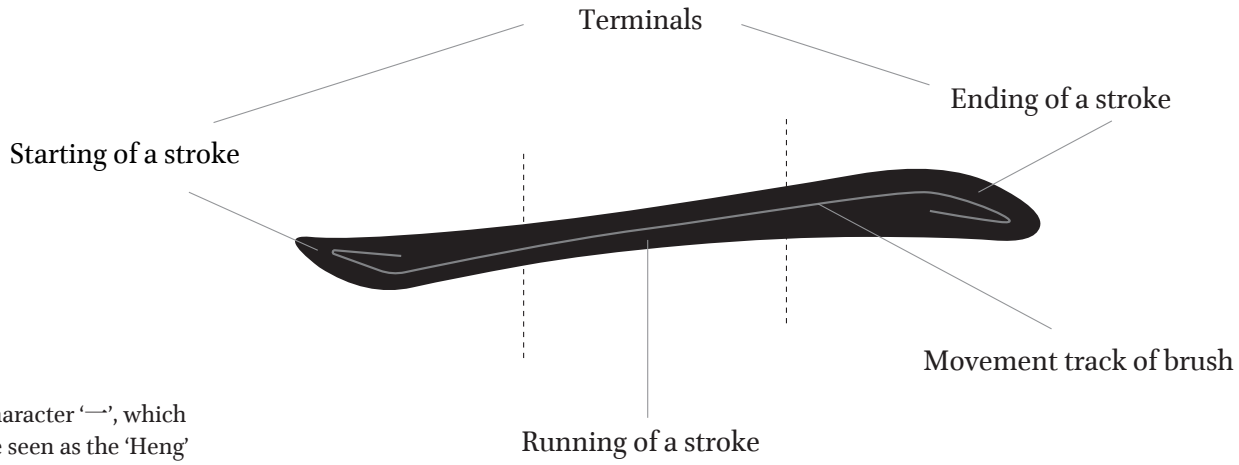


Figure 2.7
Chinese character '一', which can also be seen as the 'Heng' (horizontal) stroke, is divided into three parts.

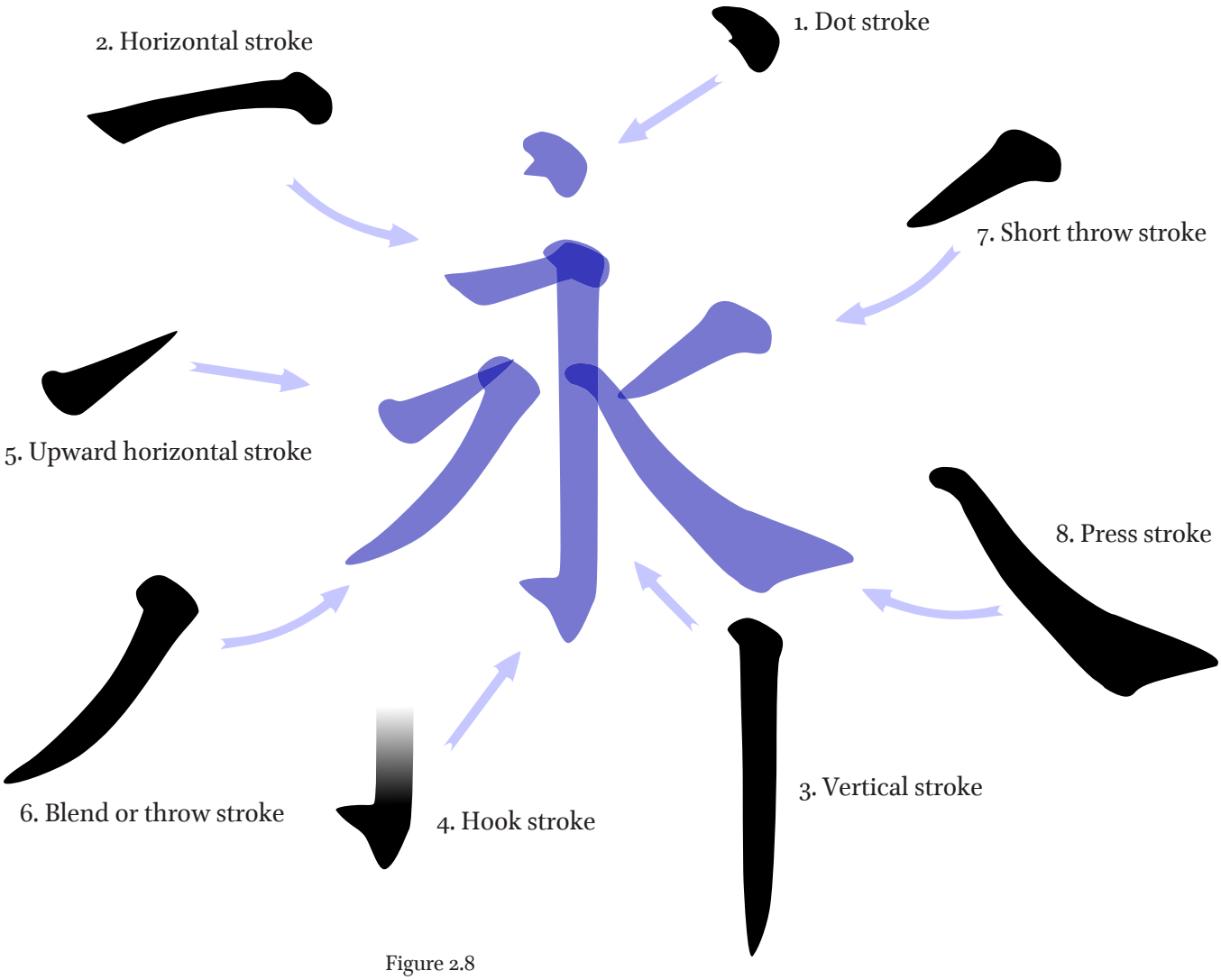


Figure 2.8
Diagram shows the Chinese character '永' used to illustrate the eight basic strokes of Chinese characters. The writing sequence of each stroke is given, but the character shown above actually has five strokes because the 'Horizontal', 'Vertical', and 'Hook' strokes combine to form a compound stroke, while the 'Upward Horizontal' and 'Blend' strokes combine to form another compound stroke.
Source: <zh.wikipedia.org/wiki/永字八法#/media/File:8_strokes_of_永-zh.svg> (accessed on 23 Sep 2023).

Strokes	Names	Moods of writing (笔势)	Li Puguang's descriptions	Supplementary notes
	Dot, 点, Pinyin: dian	[Sideway], 侧, Pinyin: ce	Strange stone, 怪石	'Ce' (侧) is the meaning of tilt, the 'Dian' (dot) stroke should be tilted, as a crookedly strange stone.
	Horizontal, 横, Pinyin: heng	[Bridle], 勒, Pinyin: le	Jade table, 玉案	'Le' (勒) means to strangle the reins of a horse, and the 'Heng' (horizontal) stroke should be angled upward to the right, as a rider tightening the reins.
	Vertical, 竖, Pinyin: shu	[Crossbow or Strive], 弩 or 努, Pinyin: nu	Iron pillar, 铁柱	'Nu' (弩 or 努) means to have strength, and the 'Shu' (vertical) stroke should be straight inside and curved outside, as a bow standing upright.
	Hook, 钩, Pinyin: gou	[Picking off], 趯, Pinyin: ti	Pincer of a crab, 蟹爪	'Ti or yue' (趯) means to jump; as a person wants to jump, they need to crouch down to build strength and then leap suddenly. When creating a 'Gou' (hook) stroke, crouch the brush tip to gather energy, then quickly lift the brush, twisting and turning the brush tip, smoothly bringing it out and concentrating force at the brush tip.
	Upward horizontal, 提, Pinyin: ti	[Horsewhip], 策, Pinyin: ce	Tiger's tooth, 虎牙	'Ce' (策) originally means a horsewhip, but here it is used metaphorically to support by coordinated action. The 'Ti' (upward horizontal) stroke is often used on the left side of a character, slanting upward to the right, complementing the dot stroke on the right side, forming a balanced and harmonious posture of mutal support and interaction.
	Blend or throw, 弯 or 撇, Pinyin: wan or pie	[Passing slightly], 掠, Pinyin: lue	Horn of rhinoceros, 犀角	'Lue' (掠) means to pass slightly, as if brushing over the surface of an object with a hand. While the speed of writing the 'Wan or Pie' (blend or throw) stroke gradually accelerates, the stroke should capture an appearance of grace and precision. However, it is crucial to direct the force to the end; otherwise, it may appear floating and lack strength.
	Short throw, 短撇, Pinyin: duan pie	[Pecking], 啄, Pinyin: zhuo	Bird pecking, 鸟啄	'Zhuo' (啄) means bird pecking at food. The 'Duan Pie' (short throw) stroke should be written fast to form a short tapering line thinning toward the lower left.
	Press, 捺, Pinyin: na	[Dismemberment], 磔, Pinyin: zhe	Golden knife, 金刀	'Zhe' (磔) originally means to dismember sacrificial offerings, containing the meaning of disintegration or dehiscence. The 'Na' (press) stroke in Kai script inherits its style from the clerical script, which, in turn, disperses the inward-curved forms of the small seal script and makes the character open outward. In addition, there is another meaning that the press stroke should be written with strength and vigour as if it carries the intention of cutting or chopping with a knife. When writing this stroke, there is also the notion of the brush top spreading open.

Table 2.2
Eight strokes of the 'Eight Principles of Yong'. The graphs of the strokes are extracted from figure 2.9; the mood of writing refers to the two versions of *Praise to the eight principles of Yong* by Liu Zongyuan and Yan Zhenqing (颜真卿, 709–785) written in the Tang dynasty (618–907) from the volume 583 and 338 of *Quan Tang Wen* (全唐文); Li Puguang's descriptions refers to the *Explanations to the eight principles of Yong* by Li Puguang (李溥光) from his work *Xue An Ba Fa* (雪庵八法) in the Yuan dynasty (1271–1368).
Source: Dong Gao, Ruan Yuan & Xu Song (Eds.), 1819, 钦定全唐文 [Qin Ding Quan Tang Wen], <ctext.org/wiki.pl?if=gb&res=425915> (accessed on 24 Sep 2023).

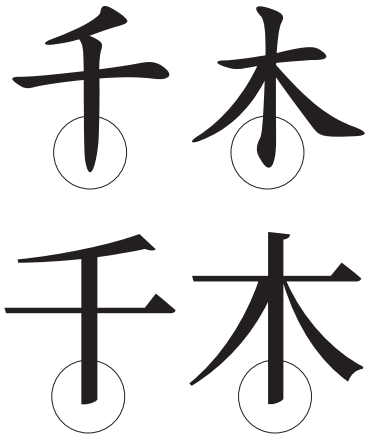


Figure 2.9
Chinese characters '千' and '木' in a Kai Ti typeface (above) and a Song Ti typeface (below).
Fonts in use: Kaiti SC, Bold (above); Noto Serif CJK SC, Medium (below).

have a rounded end, whereas the vertical strokes in Song Ti style typefaces inspired by the style of characters in xylography do not make such distinctions (figure 2.9).[46] Therefore, before the standardisation of the Chinese character typeforms in the 1960s,[47] the stroke forms differed considerably between different styles of Chinese scripts, especially between the most commonly used Song Ti style and the Kai Ti style, which was used as the standard. In order to make the Chinese glyphs as consistent as possible, in principle, the Song Ti style should be closer to the Kai Ti style.

'METHOD OF ZHA CHARACTER' (札字法),
The glyph list of commonly used Chinese characters for printing issued by the Ministry of Culture of the People's Republic of China and the Committee for Language Reform of China on 30 January 1965 and *List of commonly used characters in modern Chinese* issued by the State Language Commission and the General Administration of Press and Publication in March 1988, defined five categories of strokes:

1. Category of horizontal strokes (横, Pinyin: heng)
Including all forms of horizontal strokes and the upward horizontal stroke (提, Pinyin: ti).

2. Category of vertical strokes (竖, Pinyin: shu)
Including all forms of vertical strokes and the vertical hook stroke (竖勾, Pinyin: shu gou).

3. Category of throw strokes (撇, Pinyin: pie)
Including all forms of throw strokes.

4. Category of dot strokes (点, Pinyin: dian)
Including all forms of dot strokes and the press stroke (捺, Pinyin: na).

5. Category of turning strokes (折, Pinyin: zhe)
Including all forms of turning strokes.[48]

When combined, the main stroke forms of each of these five categories can form the character '札' (Pinyin: zha), which is why this classification is also known as the 'Method of Zha character', which encompasses all Chinese character strokes. Although the 'Method of Zha character' has been widely used, this classification system categorises the vertical hook as a vertical stroke while classifying the horizontal hook as a turning stroke. The fact that both the vertical hook and the horizontal hook stroke share a similar structural composition but were classified as different categories of strokes creates a logical inconsistency.[49] Nevertheless, the *Chinese character turning stroke standard of GB 13000.1 character set* issued on 19 December 2001 and the *Stroke orders of the commonly used standard Chinese characters* issued on 23 November 2020 still insisted on classifying the vertical hook as a vertical stroke.[50]

46 See chapter 6 for more details about the Kai Ti and Song Ti typefaces.

47 Refer to the glossary from the *The glyph list of commonly used Chinese characters for printing*, Chinese glyphs (typeforms) include the number of strokes, shape of the strokes, construction method and the stroke order.

48 印刷通用汉字字形表 [The glyph list of commonly used Chinese characters for printing], 1965.

49 Xu Lili, 2005, 现行汉字笔画规范札记 [Reading notes on standardization of the strokes of current Chinese characters], pp. 2–3.

50 Fu Yonghe, Liu Lianyuan, Wang Cuiye & Wang Danhui, 2001, [Chinese character turning stroke standard of GB 13000.1 character set]; Fu Yonghe, Wang Min & He Rui, 2020, 通用规范汉字笔顺规范 (Stroke orders of the commonly used standard chinese characters)..

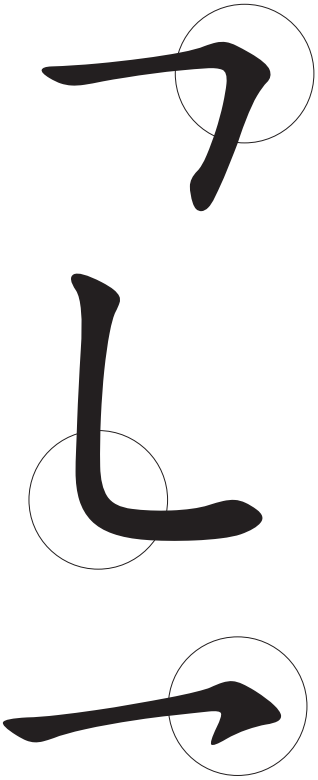


Figure 2.10
Three kinds of 'turning points', from top to bottom: Turn, Bend, and Hook.
Font in use: Kaiti TC, Bold.

In addition, strokes can be classified as 'plane stroke feature' and 'turning stroke feature' depending on whether the strokes' direction changes. Strokes that do not change direction from the starting to the ending are known as the 'plane stroke features' (basic stroke forms), which consist of six stroke forms: horizontal (Heng), upward horizontal (Ti), vertical (Shu), throw (Pie), dot (Dian) and press (Na). Strokes that change direction are called 'turning stroke features' (compound stroke forms). The twist in the running of the stroke that occurs when the direction of the stroke changes is called a 'turning point'. Before and after the 'turning point' are generally 'plane stroke features'; in other words, the 'turning stroke feature is generally a combination of 'plane stroke features'. Moreover, there are three kinds of 'turning points': Turn (折, Pinyin: zhe), Bend (弯, Pinyin: wan), and Hook (钩, Pinyin: gou, figure 2.10).[51]

According to the standard outlined in the *Chinese character turning stroke standard of GB 13000.1 character set*, there are a total of 32 stroke forms, including 6 'plane stroke features' and 26 'turning stroke features'. However, the classification in this standard is not comprehensive and does not include strokes such as '〇' (圈, Pinyin: quan).[52] In contrast, the current Unicode standard, 'CJK Strokes' (ranging from 31C0 to 31EF), includes a broader set of 36 stroke forms (table 2.3).[53] Nevertheless, there are still some controversial aspects within the Unicode standard, such as the categorisation of the stroke '㇄' (竖弯折, Pinyin: shu wan zhe), which is not generally considered a compound stroke. Therefore, the standardisation and classification of Chinese stroke forms remain subjects of ongoing research and discussion. At present, the production of Chinese typefaces predominantly relies on the two aforementioned standards to define stroke forms.

COMBINATION METHODS OF STROKES

Strokes, serving as the fundamental building blocks, combine to form Chinese characters or their components through three distinct methods: separation, connection, and intersection.[54] Separation involves strokes being distinctly apart, with no physical contact between them, as exemplified by character '八' (figure 2.11). The combined relationship of connection containing two scenarios: one involves the start or end of a stroke connecting with the running of another stroke, as seen in character '人' (figure 2.12a); the other is that the start or end of a stroke connects with the start or end of another stroke, as seen in character '了' (figure 2.12b). Lastly, intersections occur when strokes cross each other within their running parts, such as the character '十' (figure 2.14).

Most Chinese characters are constructed by combining the two or three methods as indicated earlier. For instance, the character '千' (Pinyin: qian) is formed by the connection of the press stroke with the vertical stroke and the intersection of the horizontal stroke with the vertical stroke (figure 2.14). In the case of the character '犬' (Pinyin: quan), it involves the intersection of the horizontal stroke with the press stroke, the separation of the

51 Fu Yonghe, Liu Lianyuan, Wang Cuiye & Wang Danhui, 2001, [Chinese character turning stroke standard of GB 13000.1 character set].

52 Ibid.

53 Refer to CJK strokes, the Unicode standard, version 15.1. Available at: <http://unicode.org/charts/PDF/U31C0.pdf> (accessed on 24 Sep 2023)

54 Fu Yonghe, 1993, [Seven questions on Chinese characters], pp. 30–31.

Table 2.3
The chart shows the 36 CJK strokes of the Song Ti style in Unicode order: The column of 'Stroke' uses a representative glyph for each CJK stroke character; the column of 'Acronym' is the abbreviation used in the Unicode character name for the CJK stroke character; the column of 'Pinyin' is the Hanyu Pinyin, romanisation of the stroke name; the column of 'Name' is the traditional name for each stroke.
Source: CJK strokes, the Unicode standard, version 15.1. Available at: <http://unicode.org/charts/PDF/U31C0.pdf> (accessed on 24 Sep 2023)

Unicode	Stroke	Acronym	Pinyin	Name
31C0		T	ti	提
31C1		WG	wan gou	弯钩
31C2		XG	xie gou	斜钩
31C3		BXG	bian xie gou	扁斜钩
31C4		SW	shu wan	竖弯
31C5		HZZ	heng zhe zhe	横折折
31C6		HZG	heng zhe gou	横折钩
31C7		HP	heng pie	横撇
31C8		HZWG	heng zhe wan gou	横折弯钩
31C9		SZWG	shu zhe wan gou	竖折弯钩
31CA		HZT	heng zhe ti	横折提
31CB		HZZP	heng zhe zhe pie	横折折撇
31CC		HPWG	heng pie wan gou	横撇弯钩
31CD		HZW	heng zhe wan	横折弯
31CE		HZZZ	heng zhe zhe zhe	横折折折
31CF		N	na	捺
31D0		H	heng	横
31D1		S	shu	竖
31D2		P	pie	撇
31D3		SP	shu pie	竖撇
31D4		D	dian	点
31D5		HZ	heng zhe	横折
31D6		HG	heng gou	横钩
31D7		SZ	shu zhe	竖折
31D8		SWZ	shu wan zhe	竖弯折
31D9		ST	shu ti	竖提
31DA		SG	shu gou	竖钩
31DB		PD	pie dian	撇点
31DC		PZ	pie zhe	撇折
31DD		TN	ti na	提捺
31DE		SZZ	shu zhe zhe	竖折折
31DF		SWG	shu wan zhe	竖弯折
31E0		HXWG	heng xie wan gou	横斜弯钩
31E1		HZZZG	heng zhe zhe zhe gou	横折折折钩
31E2		PG	pie gou	撇钩
31E3		Q	quan	圈

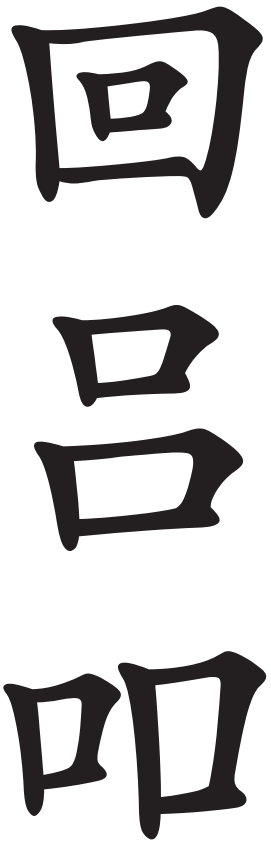


Figure 2.17
Chinese characters, '回', '吕' and '叩', in a Kai Ti font.
Font in use: Kaiti TC, Bold.

dot stroke from other strokes and the connection of the press stroke and the throw stroke (figure 2.15). It is important to note that when combined in different methods, the same strokes can also form different characters, as exemplified by '刀' (Pinyin: dao) and '力' (Pinyin: li, figure 2.16). Additionally, even if the strokes are the same and combined in the same way, if the positions are different, different characters could be formed, as illustrated by characters such as '回', (Pinyin: hui) '吕', (Pinyin: lv) and '叩' (Pinyin: xuan or song, figure 2.17).

ORDER OF STROKES

The stroke order is one of the fundamental conventions in Chinese character writing, involving the sequence and direction in which strokes are applied to form Chinese characters (figure 2.18).[55] Chinese characters consist of a series of strokes, as indicated before, and these strokes adhere to specific orders and directions to form characters accurately. Except for the characters '一' and '乙', consisting of only one stroke, all Chinese characters follow stroke writing sequences.[56] Regarding the direction of strokes, there are two well-established conventions:

1. When forming any stroke, the brush or pen should move from one end of the stroke to the other in a single uninterrupted motion, without retracing.

2. For horizontal strokes, they should be written from left to right, never from right to left. Vertical, left-falling, dot, and right-falling strokes should be executed from top to bottom, avoiding any upward strokes.[57]

Based on the direction of strokes, the general order of writing strokes follows conventional rules, including writing from top to bottom (as exemplified by the character '尖'), left to right ('河'), horizontal strokes before vertical strokes ('十'), outside before inside ('同'), and middle before side strokes ('小'), among others.[58] *Stroke orders of the commonly used standard Chinese characters* issued in 2020 specifies the stroke order for 8,105 standard Chinese characters listed in the *Table of general standard Chinese characters* (figure 2.19).[59] However, this stroke order standard is primarily intended for the needs of Chinese character retrieval, sorting, and writing.

Furthermore, the sequence in which strokes appear in Chinese characters is a summary of the experiences of previous generations who wrote Chinese characters with brushes. This practice involves a considerable degree of flexibility and personal habits, with no fixed rules.[60] Moreover, the stroke order for some Chinese characters may vary due to the complexity of their shapes or different writing styles. Therefore, in practical applications,

55 Fu Yonghe, Wang Min & He Rui, 2020, 通用规范汉字笔顺规范 (Stroke orders of the commonly used standard chinese characters).

56 Fu Yonghe, 1993, [Seven questions on Chinese characters], p. 39.

57 Ibid, p. 31.

58 Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 81.

59 Fu Yonghe, Wang Min & He Rui, 2020, 通用规范汉字笔顺规范 (Stroke orders of the commonly used standard chinese characters); *Table of general standard Chinese characters* is the current standard list of Chinese characters jointly developed by the Ministry of Education of the People's Republic of China and State Language Commission. The standard was officially promulgated on 5 June 2013, becombing the standard for the use of Chinese characters for the general application of the society.

60 Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 81.

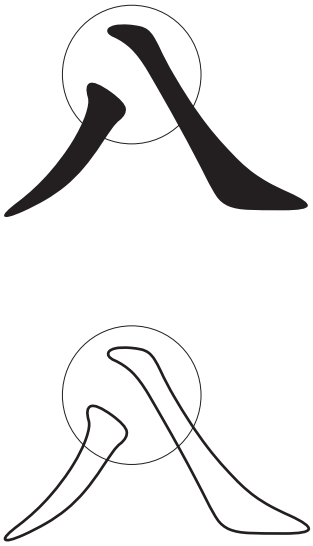


Figure 2.11
Chinese character '八' in a Kai Ti font and its outline. Circles indicate the separation of strokes.
Font in use: Kaiti TC, Bold.

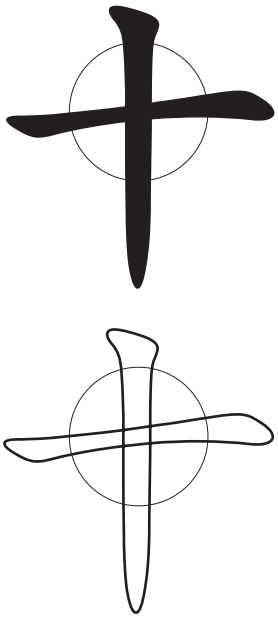


Figure 2.13
Chinese character '十' in a Kai Ti font and its outline. Circles indicate the intersection of strokes.
Font in use: Kaiti TC, Bold.

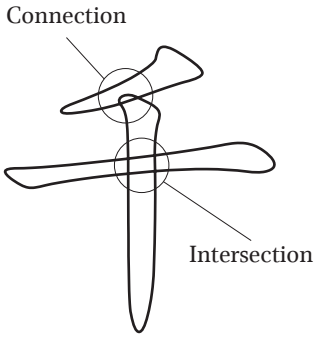


Figure 2.14
Outlined Chinese character '千' (Pinyin: qian) in a Kai Ti font.
Font in use: Kaiti TC, Bold.

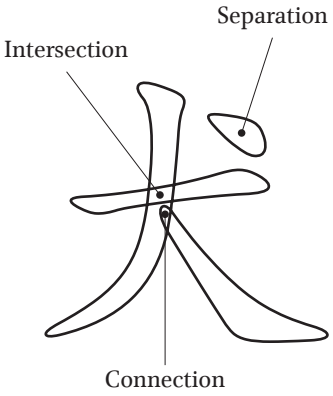


Figure 2.15
Outlined Chinese character '犬' (Pinyin: qian) in a Kai Ti font.
Font in use: Kaiti TC, Bold.

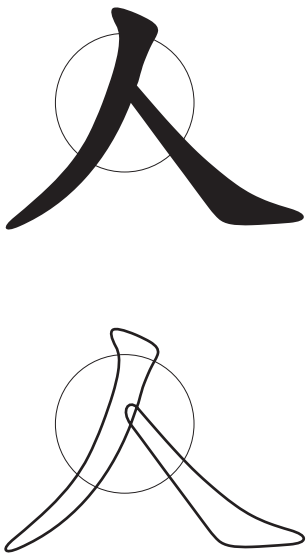


Figure 2.12a
Chinese character '人' in a Kai Ti font and its outline. Circles indicate the connection of strokes.
Font in use: Kaiti TC, Bold.

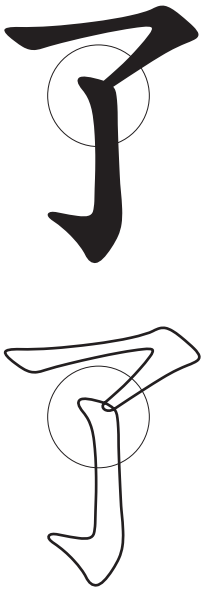


Figure 2.12b
Chinese character '了' in a Kai Ti font and its outline. Circles indicate the connection of strokes.
Font in use: Kaiti TC, Bold.

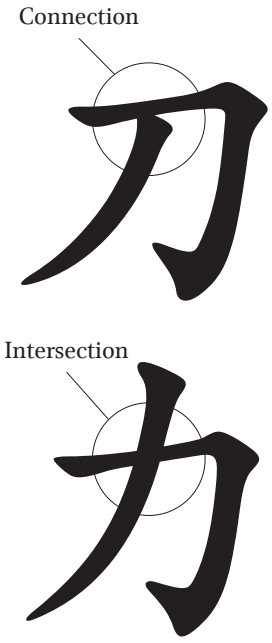
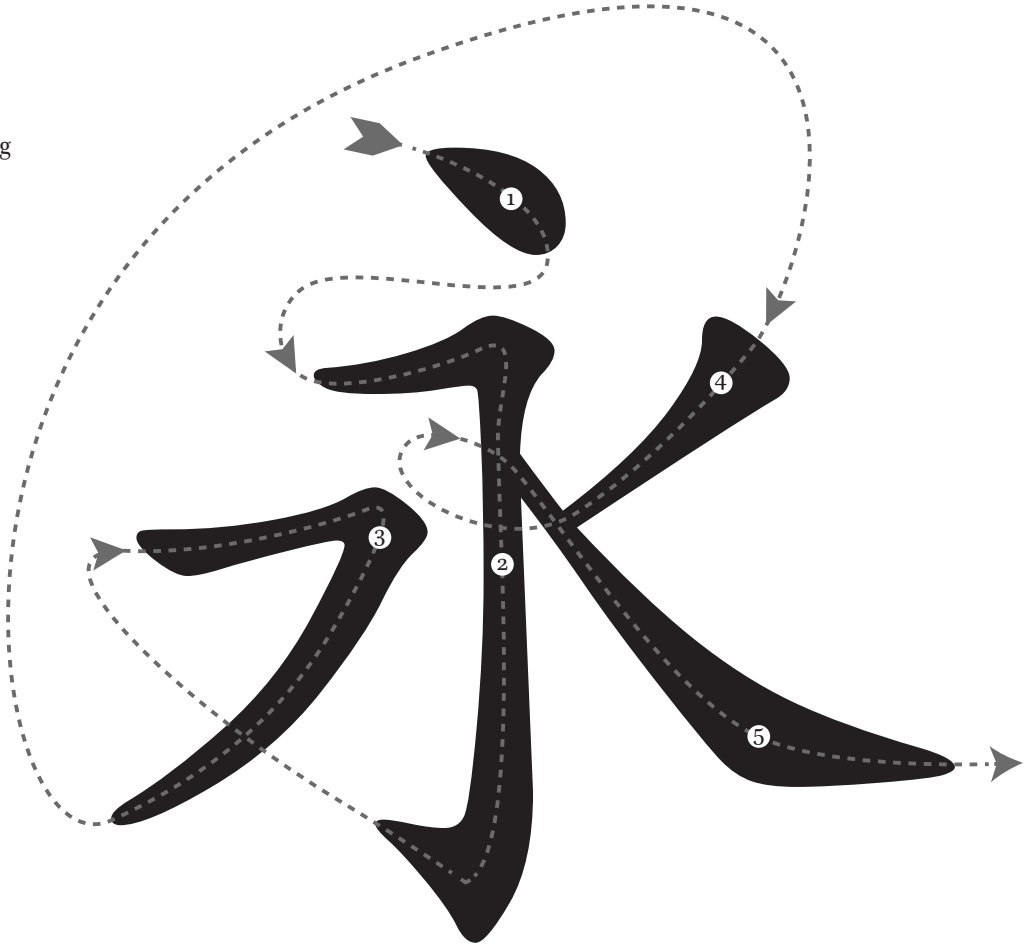


Figure 2.16
Chinese characters '刀' and '力', in a Kai Ti font.
Font in use: Kaiti TC, Bold.

Figure 2.18
Chinese character '永' in a Kai Ti font. The dotted lines with arrows indicate the trajectory of the 'writing instrument' and the serial numbers indicate the stroke order.
Font in use: Kaiti TC, Bold.



永
5 画

丶 亅 刁 永 永
4 5 5 3 4

Figure 2.19
Stroke order of the Chinese character '永' extracted from page 18 of the *Stroke orders of the commonly used standard Chinese characters* issued in 2020.

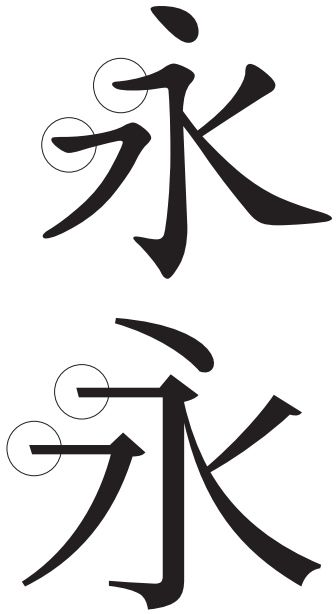


Figure 2.20
Chinese character '永' in a Kai Ti (upper) and a Song Ti font (lower). The circles indicate the different treatments of the two horizontal strokes of '永' in the Kai and Song styles fonts. In the Kai Ti font, the start of the first horizontal stroke is slightly thinner and more upturned than the second one to echo the previous dot strokes, as indicated in figure 2.19. In contrast, the two horizontal strokes are treated the same way in the Song Ti font. Fonts in use: Kaiti TC, Bold; Noto Serif CJK SC, Regular.

it is essential to combine general stroke order rules with specific characters for analysis rather than relying solely on rote memorisation of the stroke order for each character.

Although it is not necessary to follow the stroke order in typeface design, the order and direction of strokes influence their shapes. Especially when reviving the Kai Ti style or attempting to reflect the writing speed in the typeface, the strokes would change their shape to some extent to strengthen the continuity between the previous and the subsequent strokes. In contrast, the predominantly functional Song Ti typeface hardly reflects any stroke-order-induced stroke shape variations (Figure 2.20).[61]

Components

Strokes are the writing units of Chinese characters, while components are the structural units of Chinese characters. Each component of a Chinese character has a specific function or meaning, serving as a semantic symbol, phonetic symbol, or a sign that composes the Chinese character, as mentioned earlier. When components combine to form characters, the information (shape, pronunciation and meaning) conveyed by the character results from the combination of its components. In contrast, the strokes do not convey any information about the character they composed.

Using the character '木' as an example for analysis, it initially represents the meaning of 'tree' through its overall structure. When it serves as a component to construct the character '林', two components '木' combine to convey the meaning of 'a place where trees gather and grow', which is the original meaning of '林'. However, when the component '木' is subdivided into its horizontal, vertical, throw, and press strokes, each individual stroke does not reflect the intended meaning of the character they form. This illustrates the fundamental difference between components and strokes in Chinese characters.

'Pian Pang' (偏旁) and radicals (部首)

Chinese character components have different names in different hierarchical divisions and application scenarios. The commonly mentioned terms for components are 'Pian Pang' and radicals, which are often used in conjunction with each other, leading to the misconception that they are the same, but they are actually two distinct concepts.

Traditionally, in composite Chinese characters, the left component is referred to as 'Pian' (偏), and the right component is known as 'Pang' (旁). Nowadays, it's common to use the collective term 'Pian Pang' (偏旁) to encompass the left-right, top-bottom, and outer-inner divisions of composite characters.[62] Unlike compound components, 'Pian Pang' only results from a single division of a Chinese character. 'Pian Pang' mainly consists of 'Xing Pang' (semantic components, 形旁) and 'Sheng Pang' (phonetic components, 声旁). For example, in the character '枝' (Pinyin: zhi), which means branch, the left component '木' (which means 'trees') is a semantic component, indicating the character's association with trees, while the right component '支' (Pinyin: zhi) functions as a phonetic component, representing the pronunciation of the character.

61 See chapter 6 for more details about the Kai Ti and Song Ti typefaces.

62 Fu Yonghe, 1993, [Seven questions on Chinese characters], pp. 50–56.

On the other hand, radical is a concept used in Chinese character indexing. When characters with the same components are grouped, the common components are extracted and used as the basis for character searching, referred to as radicals. Moreover, the selection of radicals is often subjective, and their number can vary. In the *Shuowen Jiezi*, there are 540 radicals, while Mei Yingzuo from the Ming dynasty defined 214 radicals, in the *Zi Hui*,[63] and the *Xiandai Hanyu Cidian* published in 1979 selected 188 radicals.[64] Therefore, when using Chinese character components in the research of Chinese typeforms, it is essential not to rely solely on radicals as an analysis tool because radicals only cover a portion of Chinese character components, which cannot reflect the complete Chinese character set.

CLASSIFICATIONS OF COMPONENTS

Components can be classified into different categories based on their various usages. Firstly, they can be categorised into 'character formation components' and 'character non-formation components', depending on whether they can function independently as characters.

Character-forming components, such as the component '口' (Pinyin: kou), which is shared by the characters '另' (Pinyin: ling), '吉' (Pinyin: ji), and '唱' (Pinyin: chang), can also serve as an independent Chinese character meaning 'mouth'. Therefore, the component '口' is considered a character formation component. Conversely, non-character-forming components, like the component '疒' (Pinyin: chuang or ne) shared by the characters '疾' (Pinyin: ji) and '病' (Pinyin: bing), cannot function independently as characters. Thus, the component '疒' is classified as a character non-formation component.[65]

Secondly, based on the degree of divisibility within Chinese characters, components can be divided into 'basic components' and 'compound components'. 'Basic components' are the smallest units that cannot be further divided and are situated at the lowest level of the Chinese character structure, also referred to as 'terminal-level components'. For example, in the character '男' (Pinyin: nan), both '田' (Pinyin: tian) and '力' (Pinyin: li) are considered 'basic components' because they cannot be further divided.

'Compound components', on the other hand, are formed by combining two or more basic components. For instance, the component '相' (Pinyin: xiang), shared by the characters '想' (Pinyin: xiang) and '箱' (Pinyin: xiang), is a compound component since it can be further divided into the basic components '木' (Pinyin: mu) and '目' (Pinyin: mu).

Additionally, there is a special type of component known as a 'one-stroke component', consisting of a single stroke. For example, the component '一' (Pinyin: yi) serves as both a horizontal stroke and a component and can also function as an independent character.[66]

63 *Zi Hui* (字汇) is a Chinese dictionary edited by Mei Yingzuo (梅膺祚) during the Ming dynasty (1368–1644).

64 *Xiandai Hanyu Cidian* (现代汉语词典) is a contemporary Chinese dictionary notable as the first dictionary in the People's Republic of China to be organised according to Hanyu Pinyin, the phonetic standard for Standard Mandarin Chinese, and accompanied by explanatory notes in simplified Chinese. Fu Yonghe, 1993, [Seven questions on Chinese characters], p. 52.

65 National Language Commission & Ministry of Education of the People's Republic of China, 2003, 基础教学用现代汉语常用字部件规范 [Modern Chinese common character component standard of elementary teaching].

66 Ibid.

COMBINATION METHODS OF COMPONENTS

In the *Introduction to grapheme formation of Chinese characters*, Wang Ning proposed that characters are composed of components through two different combination methods: planar and hierarchical patterns.[67] In addition to using these two methods separately, there are also characters formed by using both combination methods, known as composite pattern. The following describes each of these three methods of combining components:

1. Planar pattern: In the planar pattern, components are combined all at once to form a character. For example, the character '器' (Pinyin: qi) is composed of four components '口' (Pinyin: kou), which represent the mouths of various objects, and one component '犬' (Pinyin: quan), which represents guarding. Therefore, the original meaning of '器' was utensil, and it now also refers to general implements, a specific physiological function within a living organism, or emphasis.
Structural formula: 口 + 口 + 犬 + 口 + 口 = 器[68]
Because the character '器' can be immediately divided into its components, it belongs to the planar pattern.

2. Hierarchical pattern: In the hierarchical pattern, components are built up in several stages, starting from basic components and gradually adding layers. For example, the character '诺' (Pinyin: nuo) can be analysed as follows:
Formula: 讠 + [(𠂇 + 口) + 艹] = 诺
First, the character '诺' is divided into a basic component '讠' (Pinyin: yan) and a compound component '若' (Pinyin: ruo). The compound component '若' can further be divided into a basic component '艹' (Pinyin: cao) and a compound component '右' (Pinyin: you), and '右' can be further divided into basic components '𠂇' (Pinyin: you) and '口'. This character exhibits a hierarchical pattern with three layers of components.

3. Composite pattern: The composite pattern refers to characters that incorporate both planar and hierarchical structural patterns in their construction. For example, the characters '疆' (Pinyin: jiang) can be analysed as follows:
Formula: 土 + [弓 + (一 + 田 + 一 + 田)] = 疆
The compound component '畺' (Pinyin: jiang) belongs to the planar structure, consisting of two one-stroke components '一' and two basic components '田', and when combined with the basic component '弓' (Pinyin: gong gōng), followed by '土' (Pinyin: tu), it forms '疆'. Therefore, '疆' belongs to the composite structure.[69]

Additionally, it is essential to note that the generation of the structure of Chinese characters does not necessarily align with the order in which they are written. During writing, characters are formed according to the stroke order, as previously explained, rather than completing one component before proceeding to the next. The complete arrangement of all components becomes visible only after the entire character is written. For instance, the

67 Fu Yonghe also mentioned the planar and hierarchical structures in the *Seven questions on Chinese characters*. Fu Yonghe, 1993, [Seven questions on Chinese characters], p. 141; Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters].

68 The use of structural formulas to describe the component combination process was proposed by Wang Ning. Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 261.

69 Ibid, pp. 97–105.

Figure 2.21
Stroke order of the Chinese character '夾'.
Font in use: Kaiti TC, Bold.

character '夾' (Pinyin: jia), which consists of a component '大' (Pinyin: da) and two components '人' (Pinyin: ren), is not written with one component followed by another (figure 2.21). Therefore, when analysing Chinese typeforms, Chinese characters should be considered as a whole rather than studied only at the level of components.

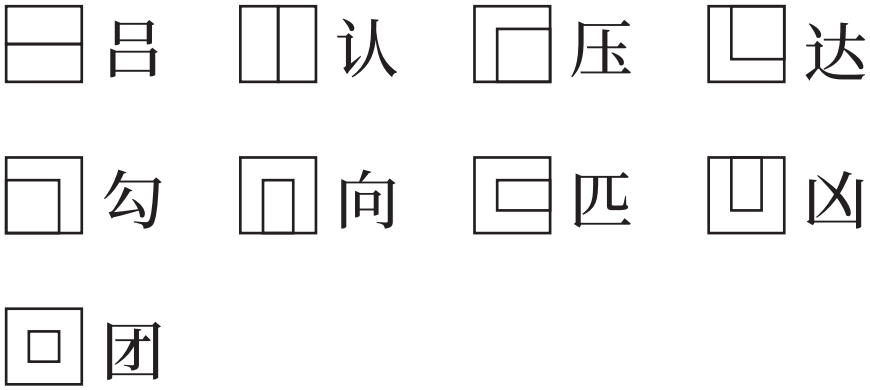
Structure of Chinese characters

Based on the two combination methods indicated above, the structure of Chinese characters can be classified according to the position of the components. Fu Yonghe conducted a structural analysis of composite characters using both planar and hierarchical approaches. He stated that composite characters are constructed from components, while undecomposable characters are formed by strokes.[70] However, in this thesis, undecomposable characters are classified as having a single-component structure.

In Yonghe's planar analysis, all characters adhering to a planar pattern are divided into basic components that cannot be further subdivided. They are grouped based on the number of basic components in each character. The following section analyses the structure of the 8,105 Chinese characters listed in the *Table of general standard Chinese characters,* drawing from Yonghe's analysis. The left side are diagrams of different structures, and the right side are Chinese characters used as demonstration examples.

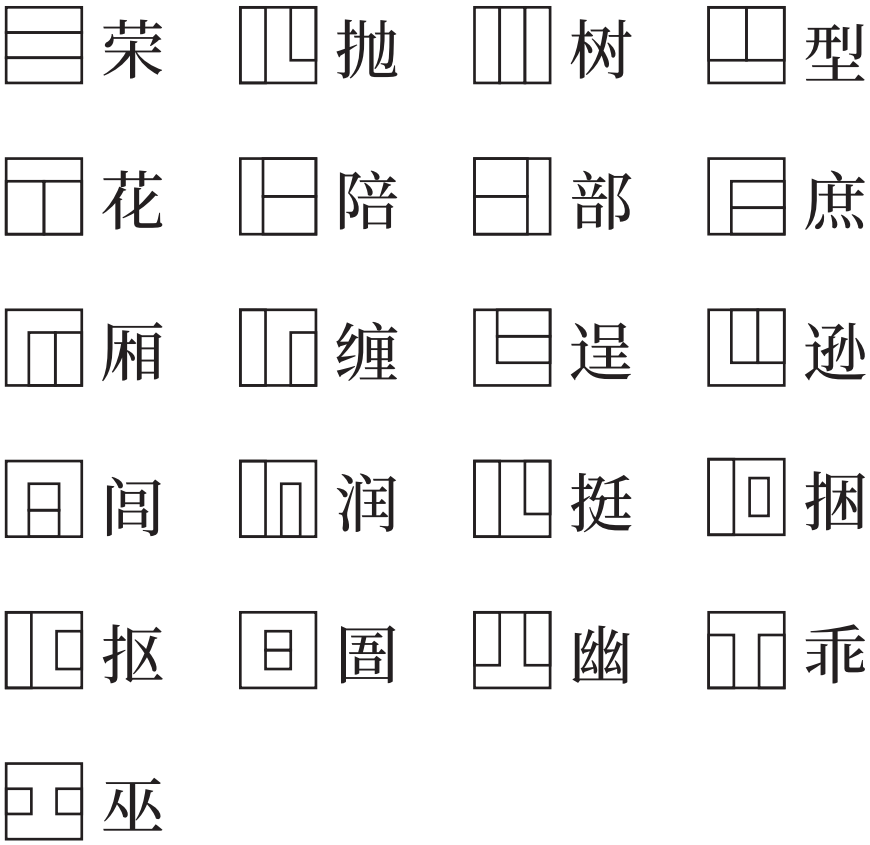
1. Characters consisting of 1 component in 1 structural category.

2. Characters consisting of 2 components in 9 structural categories.

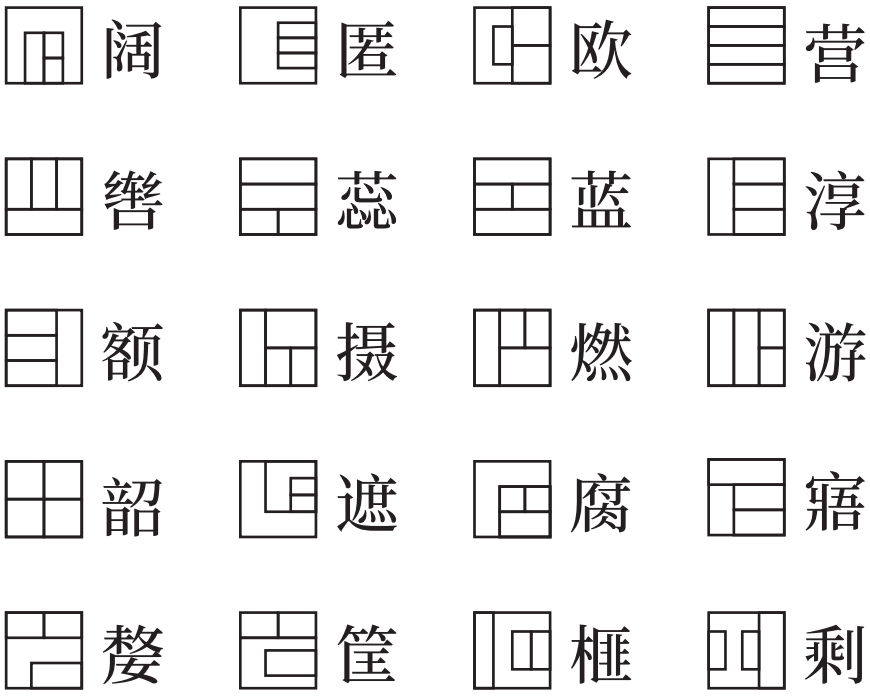


70 Fu Yonghe, 1993, [Seven questions on Chinese characters], pp. 140–146.

3. Characters consisting of 3 components in 21 structural categories.

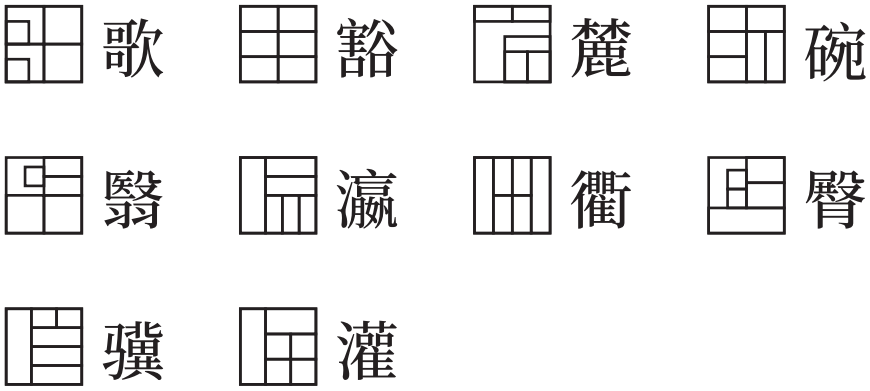


4. Characters consisting of 4 components in 20 structural categories.



5. Characters consisting of 5 components in 20 structural categories.

6. Characters consisting of 6 components in 10 structural categories.



7. Characters consisting of 7 components in 3 structural categories.

8. Character consisting of 8 components in 1 structural category.

9. Character consisting of 9 components in 1 structural category.

No.	Diagrams	Examples	Description
1		人	Single-component
2		好	Left to right
3		全	Above to below
4		班	Left to middle and right
5		复	Above to middle and below
6		回	Full surround
7		冈	Surround from above
8		凶	Surround from below
9		区	Surround from left
10		厘	Surround from upper left
11		可	Surround from upper right
12		起	Surround from lower left
13		坐	Overlaid
14		叉	Surround from right
15		永	Surround from lower right
16		乐	Horizontal reflection
17		囚	Rotation

Table 2.4
Structures of Chinese characters. Fonts in use: Noto serif CJK SC, Medium; Pingfang SC, Regular.

The Chinese character structures listed above using the planar analysis method are detailed but overly complex, totalling 86 different structures for 8,105 Chinese characters. If the Chinese character set is increased to 87,887 in the *GB 18030-2022* standard, there will be a larger number and more complex structures.[71]

Another way is to use hierarchical analysis, which takes individual characters that are divided once to summarise the basic Chinese character structure categories. The updated 'Ideographic Description Characters' version 15.1 of the Unicode standard describes 16 different structures for ideographic characters (Chinese characters). However, the Unicode standard does not include the single-component structure, but it should be treated as a type of structure (table 2.4).[72]

The structures of Chinese characters obtained from the hierarchical analysis are more summarised than planar analysis. During the process of component composition, they do not directly undergo collocation as in the Latin letters but instead change proportions or produce variants according to their complexity and those that need to be paired. It is important to note that the variations in Chinese character strokes do not align with the ligature phenomenon found in Latin letters. Instead, these variations involve fixed changes in components across different Chinese characters, and they cannot be mutually interchanged with their original shapes for better integration with other components.

The main reasons behind the generation of component variants primarily stem from the nature of Chinese character writing. When writing Chinese characters, individual characters are perceived as a whole entity written following the stroke order, rather than being written in the order of assembling its components. The primary reasons for generating component variants stem from the nature of Chinese character writing. When writing Chinese characters, each character is treated as a whole entity, and it is written following the stroke order rather than in the order of assembling its components. Below are the four kinds of component variants summarised by Wang Ning.

1. Stroke reduction variants.
For example, in the character '枭', the upper component '鸟' has its horizontal stroke removed (figure 2.22).
2. Placement direction variants.
For example, in the character '益', its upper component is derived by rotating the component '水' 90 degrees to place it horizontally (figure 2.23).
3. Stroke shape variants.
For example, In the character '骏', the upper-right component '允' has its lower part altered to two dot strokes (figure 2.24).
4. Overlap variants.
For example, the character '里' is combined by the components '田' and '土', with their middle vertical strokes changed to a vertical stroke through the middle (figure 2.25).[73]

71 The full name of the *GB 18030-2022* standard is *GB 18030-2022 Information Technology — Chinese coded character set*, the updated Chinese government standard defining the required language and character support necessary for software in China.

72 Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 148.

73 Ibid, pp. 84–87.

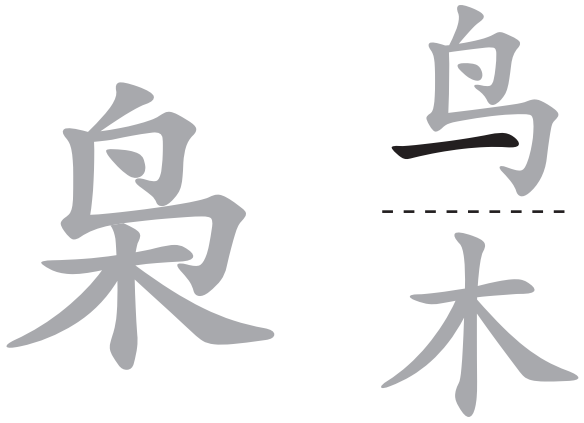


Figure 2.22
Chinese character '枭' (left) and its two components (right).
Source: Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 85. Fonts in use: Font in use: Kaiti TC, Bold.

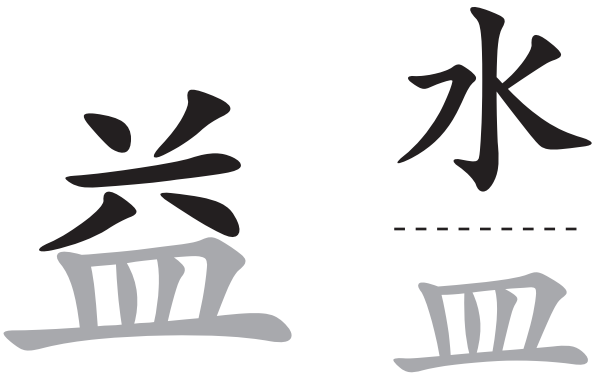


Figure 2.23
Chinese character '益' (left) and its two components (right).
Source: Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 85.

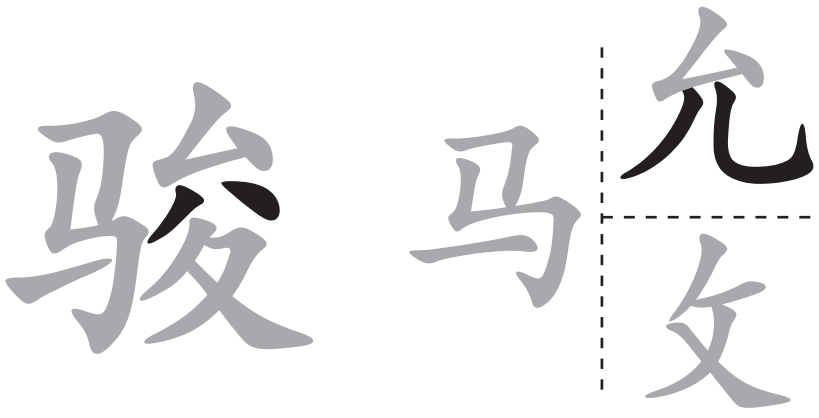


Figure 2.24
Chinese character '骏' (left) and its two components (right).
Source: Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 86.

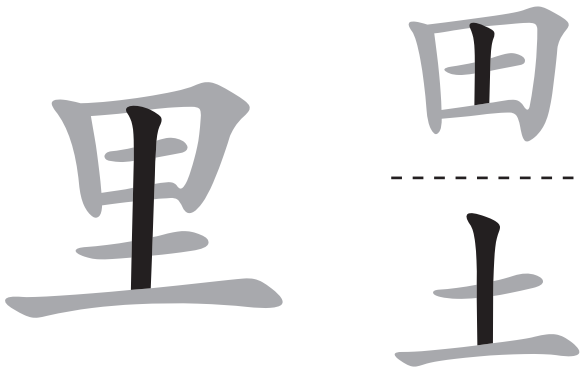


Figure 2.25
Chinese character '里' (left) and its two components (right).
Source: Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], p. 86.

Figure 2.26
Chinese character '马' (horse) in six representative forms for each of the six Chinese script styles, in chronological order, from top to bottom: the oracle bone script digitised from rubbing No. 584, *Oracle bone script collection*, originally from the Shang dynasty (*c.* 1600–*c.* 1046 BC); the bronze script digitised from 'Shi Kui Fu Ding' (師奎父鼎) around the middle of the Western Zhou dynasty (1046–771 BC); the small seal script digitised from *Shuowen Jiezi* (*with character check*) published in 1998, originally engraved by Chen Changzhi (陈昌治) in the Qing dynasty (1644–1911), the script style was used in the Qin dynasty (221–207 BC); the clerical script digitised from the 'Tablet to Cao Quan' (曹全碑) engraved in the AD 185; the Kai script (traditional Chinese character) digitised from the rubbing of 'Yan Qin Li Bei' (颜勤礼碑) engraved in 779, originally written by Yan Zhenqing (颜真卿, 709–785). Source: <xiaoxue.iis.sinica.edu.tw/jiaguwen?kaiOrder=136> (accessed on 1 Oct 2023).

2.4 Formation of Chinese writing and its evolution

Chinese writing is a 'self-originated writing system' (自源文字), a script created independently of others,[74] which has undertaken a process of continuous evolution and growth into the modern era. Chinese characters have a history spanning over three thousand years, dating back to the oracle bone script of the Shang dynasty (*c.* 1600 BC–*c.* 1046 BC). Throughout this extensive period, the nature of Chinese characters has remained unchanged; however, their form and structure have undergone significant transformations.

The evolution of Chinese characters is a highly complex process, with significant changes to the characters' form and meaning, the proliferation and extinction of characters, and the division and merging of their functions.[75] In *Chinese writing*, Qiu Xigui divided the evolution of Chinese characters into two main aspects:

> [Chinese characters have predominantly undergone a transformation from complexity to simplicity, manifesting in both script style and character shape. The change in character shape refers to the reconfiguration of individual character's composition and outline. In contrast, the change in script style refers to the overall changes in the character's features and writing style, which should be apparent. However, these two aspects of transformation are often intertwined, making it difficult to distinguish.][76]

The evolution of the Chinese script style has gone through the ancient script stage and the modern script stage.[77] The ancient script stage includes oracle bone script, bronze script and small seal script, originating during the Shang dynasty and ending in the Qin dynasty (221–207 BC).[78] The modern script stage includes the clerical script and Kai script, which began in the Han dynasty (202 BC–AD 9, AD 25–220)[79] and has lasted to the present day (figure 2.26). The names of these script styles represent the appearance of Chinese characters that were used as body text during key historical periods. Each Chinese script style exudes a unique artistic charm and is a source of inspiration for today's Chinese typeface design.

The invention of woodblock printing in the Tang dynasty (AD 618–907), also changed the shape of chinese characters due to the constraints of the tool. As woodblock printing technology advanced, the engraving styles of Chinese characters became progressively more diverse and sophisticated.

74 The opposite of the 'self-originated writing system' is the 'borrowed-origin writing system', which is created by borrowing, referring to or relying on other scripts. Wang Ning, 2016, [Introduction to Grapheme formation of Chinese characters], pp. 34–37.

75 Ibid, pp. 55–76.

76 In the English version of the original text, Gilbert L. Mattos and Jerry Norman translated 'character form' as 'graphic form' and 'script style' as 'graphic shape'. Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 44.

77 Chen Mengjia, 1988, 殷虚卜辞综述 [Review of Yin Ruins oracle inscriptions], pp. 3–4; Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 45; Liu Zhao, 2007, 汉字印刷字体发展, 设计与应用研究 [The development, design, and application of Chinese characters] (Ph.D. Thesis, Central Academy of Fine Arts), p. 6.

78 See Appendix 2 for the table of *A brief Chinese historical timeline*.

79 Briefly interrupted by the Xin dynasty (新朝, 9–23 AD) established through the actions of usurping regent Wang Mang (王莽, 45 BC–AD 23), the Han dynasty is consequently divided into two periods: the Western Han (202 BC – 9 AD) and the Eastern Han (25–220 AD).

In order to restore the calligraphic styles, famous calligraphers collaborated with highly skilled engravers, resulting in the creation of the highly aesthetic Fang-song Ti style, which exhibits a strong sense of engraving while still adhering to the calligraphic style.[80] Due to the high demand for printing and improved economic efficiency, a specific engraving style for Chinese characters emerged, known as the Song Ti style.[81] Similarly, the rich engraving styles of Chinese characters at different historical stages also became the stylistic source of Chinese typeforms.

This subchapter primarily focuses on highlighting changes in the visual characteristics of Chinese characters during their evolution, thereby elucidating the origins of typeforms during the era of movable type printing. The subchapter is structured into three sections: ancient Chinese scripts, modern Chinese scripts and the evolution of Chinese characters through woodblock printing. Analysis of the distinctive styles of Chinese characters at each stage will provide a foundation for exploring Chinese typeforms in subsequent discussions.

Ancient Chinese scripts

Chinese characters represent one of the world's oldest and most continuously used writing systems, with an unbroken lineage from ancient to present. In the ancient script stage, Chinese characters were gradually abstracted from a pictographic approach. In the process, for the convenience of writing, ancient Chinese people gradually simplified the visual images of concrete objects into linear representations, a phenomenon called 'linearisation'.[82] During this refinement, the distinctive characteristics of individual characters were progressively simplified, while the shared elements between characters became more pronounced. This evolutionary journey ultimately gave rise to the complex system of Chinese characters as we know them today.

The material of the writing surface denominated the script styles of the late Shang dynasty; for example, oracle bone script was engraved on animal bones or tortoise plastrons, and bronze script was cast on bronze vessels. Among the various records and inscriptions discovered from the late Shang dynasty, oracle bone script is the most numerous, followed by bronze script. Additionally, inscriptions have also been found on pottery, stones, and jade objects, although these are relatively scarce in comparison.[83]

80 See chapter 6.3 for more details on Fang-song Ti typefaces.

81 See chapter 6.2 for more details on Song Ti typefaces.

82 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 45.

83 Ibid, p. 46.

Figure 2.28
Inscribed plastron fragment with a character '鸟' (bird) in oracle bone script from the late Shang dynasty. Source: <museum.sinica.edu.tw/en/collection/32/item/766/> (accessed on 1 Oct 2023).

Figure 2.31
Chinese character '日' (sun) depicted in two representative forms from two Chinese script styles, from left to right: the oracle bone script scanned from no. 17,299, *Oracle bone script collection*, originally from the Shang dynasty (*c.* 1600–*c.* 1046 BC); the bronze script digitised from 'Xiao Chen Yu Xi Zun' (小臣艅犀尊), also originating from the Shang dynasty. Source: <xiaoxue.iis.sinica.edu.tw/jiaguwen?kaiOrder=136> (accessed on 1 Oct 2023).

ORACLE BONE SCRIPT

The oracle bone script is the earliest known form of Chinese writing. It forms the textual record for the late Shang dynasty (*c.* 1314 BC–*c.* 1046 BC),[84] with approximately 150,000 pieces of oracle bone inscriptions discovered, and the number of characters exceeding 4,000 (figure 2.27).[85] Only between 1,500 and 2,000 of these characters have been deciphered, and the decipherment of many is still controversial.[86]

Some characters in the oracle bone script still retain the pictographic features of proto-writing (figure 2.28). However, when compared to the traditional classification of Chinese character, 'Six Writings', established in the *Shuowen Jiezi*, it becomes evident that the oracle bone script had already encompassed various categories of Chinese characters, including 'Xiang Xing', 'Hui Yi' and 'Xing Sheng' (table 2.5).[87] Among these three categories, the most numerous are Xiang Xing characters representing tangible objects, such as the human body and animals. Xiang Xing (resembling form or pictographic) characters are not simple drawings; instead, they are conventional symbols that use simple lines to depict the characteristics of various objects. Hui Yi (conjoining meanings or ideograms) characters use symbols to represent concepts; they usually indicate an action or orientation or combine characters to convey specific meanings. The least common characters are Xing Sheng (form and sound), characters with phonetic symbols.[88]

The proportions and structures of characters in oracle bone script are not consistent (figure 2.29), and most of characters might exhibit various structural variations (figure 2.30).[89] This could be due to the fact that oracle bone script characters are primarily carved using sharp tools, which results in a greater prevalence of straight lines compared to curves. In bronze inscriptions, however, curves are more common than straight lines. This is illustrated in the character '日' (sun, Pinyin: ri): in oracle bone script, its shape tends to be more square for the sake of easier carving, while in bronze inscriptions, it appears rounder (figure 2.31). This is also shown in the stroke terminals of oracle bone script characters, which tend to be sharp and forceful, possibly for the purpose of quick carving.

84 The Late Shang period began when King Pan Geng (盘庚) relocated the capital to Yin (殷) around 1300 BC and lasted until the fall of the Shang dynasty around 1046 BC.

85 According to the latest progress report on the archaeological and oracle bone script research of the Ruins of Yin (殷墟), issued by the National Cultural Heritage Administration on November 10, 2022. (The Ruins of Yin is the site of one of ancient China's major historical capitals and the source of the archaeological discovery of oracle bone script.)

86 Tsien Tsuen-hsuin, 2003, 书于竹帛 中国古代的文字记录 (Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions), p. 22.

87 See chapter 2.2 for more details about the 'Six Writings'.

88 Tsien Tsuen-hsuin, 2003, (Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions), p. 24.

89 Ibid, pp. 25–27.

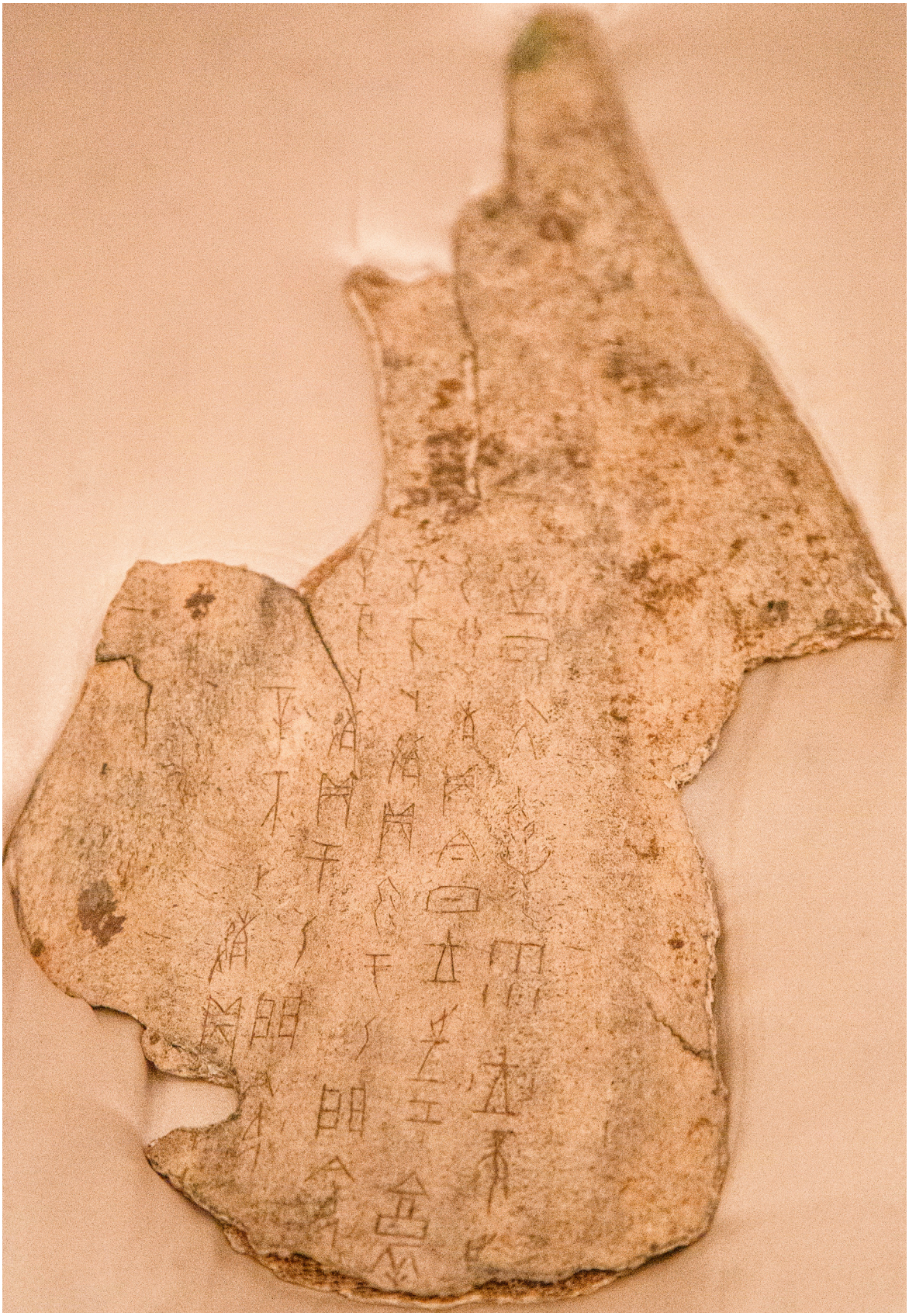


Figure 2.27
An oracle bone inscription on an animal bone from the Wuding period of the Shang dynasty (1250 BC–1192 BC). The content is on the subject of meteorology and architecture.
Source: National Library of China, photo by the author.

Table 2.5
Construction principles of the oracle bone script.
Source: Tsien Tsuen-hsuin, 2003, (Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions), p. 23.

原则		举例								释意
象形	a	人	女	子	口	鼻	目	大(手)	止(足)	人体全部或一部
	b	马	虎	犬	象	鹿	羊	蚕	龟	动物正像或旁像
	c	日	月	雨	(电)申	山	水	禾	木	自然物体符号
	d	壶	鬲	弓	矢	丝	册	卜	兆	人工器物符号
会意	e	斗		耤		(兽)狩		乳		象形字组合表动作
	f	暮		明		聿		史		象形字组合表意义
	g	上		下						指示位置
形声	h	骊		祀		妊		洹		象形加音符表示新意
	i	来		(风)凤						同音字表另意
		1	2	3	4	5	6	7	8	

0 1 cm

犬 豕 鹿 马 羊
Dog Pig Deer Horse Goat

Figure 2.30
Each column presents several different structural variants of the same character in oracle bone script.
Source: Luo Zhenyu, 1910, 殷商貞卜文字考 [Textual research on divination characters of Yin Shang], p. 3.

Figure 2.29
Extracted from an oracle bone inscription titled 'Shang ritual inscription on hunting and sacrificing, painted in cinnabar on an ox bone' (商祭祀狩猎涂朱牛骨刻辞), which was carved on an ox blade from the time of King Wu of Shang dynasty.
Source: Collected by the National Library of China; image sourced from <www.jianshu.com/p/df46fe52c3b6> (accessed on 6 Oct 2023).

0 0.5 cm

Figure 2.32
Chinese characters '瞿' and '父' on the bronze ritual vessel, 'Qu Fu Ding (瞿父鼎)', dating back to the Shang dynasty. The figure is extracted from page 8 of the [Inscriptions and rubbings of inscriptions on bells, cauldrons, ritual vessels, and seals from various dynasties] published in 1935.
Source: Xue Shanggong, 1935, 历代钟鼎彝器款识法帖 [Inscriptions and rubbings of inscriptions on bells, cauldrons, ritual vessels, and seals from various dynasties]. <old.shuge.org/ebook/zhong-ding-kuan-shi/> (accessed on 6 Oct 2023).

BRONZE SCRIPT

Due to the prevalence of bronze artefacts during the Shang and Zhou periods, with 'Ding (鼎)' representing bronze ritual vessels and 'Zhong (钟)' symbolising musical instruments, these inscriptions etched on bronze vessels and large bells came to be known as 'bronze script', and hence acquired the name 'Zhong Ding characters (钟鼎文)', meaning 'bell and cauldron script'.

The development of bronze script can be roughly divided into four periods, the mid-Shang dynasty (*c.* 1300–*c.* 1046 BC), the Western Zhou (1046–771 BC), the Eastern Zhou– Spring and Autumn period–Warring States period (770–221 BC), and the Qin–Han (221 BC–220 AD) dynasties. The bronze script continued to evolve in each of these periods, with distinctive characteristics in their structural forms.

Bronze script originated during the mid-Shang dynasty (*c.* 1300 BC). In contrast to the simple and abstract oracle bone script, the early bronze scripts are generally more decorative and closer to pictorial representations (figure 2.32), so they are sometimes considered more primitive than the oracle bone script.

During the Western Zhou period, bronze script reached its pinnacle with many inscriptions on bronze vessels exceeding one hundred characters in length. The script featured a balanced layout and precise shapes (figure. 2.33a & b). The bronze script of the Western Zhou dynasty initially closely followed the late Shang dynasty bronze script. Subsequently, the character forms gradually became more orderly and square in shape.

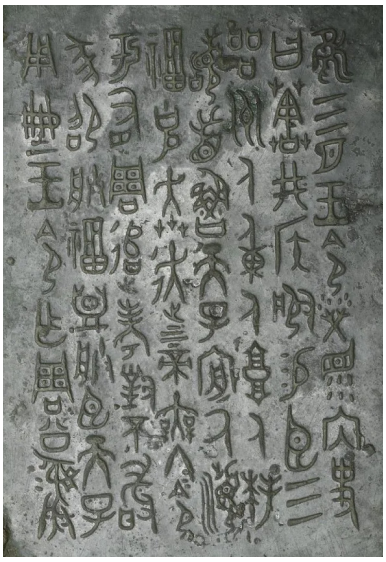
During the Spring and Autumn period (770–476 BC), various states initially adopted the late Western Zhou bronze script style. However, as time passed, each region developed its distinctive features. By the Warring States period (475–221 BC), these regional distinctions in Chinese characters became even more pronounced with a growing prevalence of variant forms.[90] After the unification of China by Qin Shi Huang,[91] he decreed that writing should be uniform throughout the empire and had stone tablets erected in various regions. The script used on these tablets was the small seal script. Inscriptions on bronze vessels and bells ceased, contributing to the decline of bronze script. By the time of the Han dynasty (202 BC–AD 220), inscriptions on iron objects became common, and the use of bronze vessels declined. As a result, bronze script gradually disappeared from historical records.

Chinese characters did not have a strict and standardised form during the oracle bone and bronze scripts era. Individual characters might have numerous variations in its structure and style. However, Chinese characters gradually evolved towards a more standardised direction, with the early uneven lines becoming increasingly uniform. Additionally, the character structure became more systematic, moving away from their pictorial origins, laying the foundation for the later development of the small seal script (figure 2.34).

90 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 51–53.

91 Qin Shi Huang (秦始皇, 259–210 BC) founded the Qin dynasty (221–207 BC) and became China's first emperor, uniting the country.

Figure 2.33a
Rubbing of the ‘Zhou Gong Yi (周公彝)’ inscribed by Luo Zhenyu (罗振玉, 1866–1940) on the ‘Xing Hou Gui (邢侯簋)’. ‘Xing Hou Gui’ is a bronze grain receptacle called a ‘Gui’, associated with Marquis Xing and dating back to the 11th century BC.
Source: <images.69ys.com/paimai/2017/5/23/1595/paipin/20170523012858332189546l.jpg> (accessed on 6 Oct 2023).



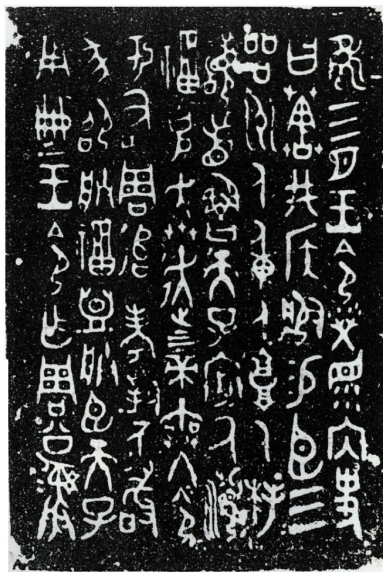


Figure 2.33b
Photo of ‘Zhou Gong Yi’ on the ‘Xing Hou Gui’ (above) and rubbing of ‘Zhou Gong Yi’ (below).
Source: <www.bronzeschinois.wordpress.com> (above); <www.mardephk.blogspot.com/2018/04/blog-post.html> (below) (accessed on 6 Oct 2023).

Figure 2.34
Linearisation of the Chinese character '天' (sky; Pinyin: tian) in bronze script from different bronze artefacts in chronological order, from top to bottom right to left.
Source: Rong Gong, 1925, 金文编, [Compilation of Chinese bronze inscriptions], pp. 1–3.

SMALL SEAL SCRIPT

After the unification of six states by Qin Shi Huang, he implemented a policy of 'Shu Tong Wen (书同文)', which standardised the Chinese script and promoted the use of small seal script. The implementation of this policy marked the first systematic attempt in China to standardise script styles.

During the Qin Dynasty, using a standardised seal script successfully unified the written characters throughout the nation. This significantly reduced regional character variations and brought about a considerable change in the abundance of variant forms of ancient characters. However, it is essential to note that variant characters did not entirely vanish; they continued to exist in the small seal script and later scripts.[92]

The strokes of the small seal script are uniform in width and monolinear style. However, while this line style is suitable for inscribing formal documents and stone tablets, writing with a brush can be quite challenging. Moreover, the structure of the small seal script is stable, with strokes evenly distributed within a condensed rectangular frame. In terms of layout, the small seal script is designed and planned in a grid format, with regular and neat character spacing and line spacing (figure 2.35).

Although the small seal script was the official standard script style in the Qin dynasty, there is limited evidence of its use in surviving manuscripts. Instead, a significant number of written documents on bamboo and wooden slips are found in clerical script. This evidence indicates that small seal script was an official standard style for Chinese characters rather than a handwriting style. The small seal script was primarily used for commemorative inscriptions on stone tablets, educational texts such as the *Cang Jie Pian*, imperial edicts, and official measurements (figure 2.36). The clerical script, derived from cursive small seal script, was widely used for official documents that required writing at speed.[93]

With the rise of clerical script, small seal script gradually was replaced, marking the end of ancient Chinese scripts. While its practical application in writing decreased, small seal script has continued to hold a significant place in China's cultural heritage as an ancient script style. Nowadays, Chinese typeface designers have also redesigned ancient Chinese scripts into display types used in various cultural applications.

92 Ibid, p. 73.

93 Jiang Boyi, 2022, 文字的前世今生(上): 漢字在楷書以前的發展歷程 [The past and present life of Chinese characters: the development of Chinese characters before Kai script].

Figure 2.35
Rubbing of the Yinshan inscribed stone tablet possibly originally written by Li Si. The original was destoryed, and the one that survives today was re-engraved by Zheng Wenbao (郑文宝, 953–1013) of the Northern Song dynasty in 993 from a copy by Xu Xuan (徐铉, 916–991) of the Southern Tang dynasty.
Source: <zh.wikipedia.org/wiki/%E5%B0%8F%E7%AF%86#/media/File:Yishankeshi.jpg> (accessed on 6 Oct 2023).

Figure 2.36
'Shang Yang Fang Sheng (商鞅方升)' is a standard measuring device that Shang Yang (商鞅, 390–338 BC) used to supervise the standardisation of weights and measures during the Reforms of Shang Yang (356 BC & 350 BC).
Source: Shanghai Museum, <www.shanghaimuseum.net/mu/asset2/20180904140700387/> (accessed on 6 Oct 2023)..

Modern Chinese scripts

The transformation from ancient to modern Chinese script, which is the evolution from small seal script to clerical script, is known as 'Li Bian' (隶变). This transformation was based on the standardisation of the ancient script by the small seal script,[94] which made the Chinese characters facilitated the writing of Chinese characters. As a result, there were significant changes in the way Chinese characters were written, with the majority of characters losing their pictorial nature and instead being composed of strokes. This process can be referred to as the 'segmentation of lines into strokes'.[95]

The modern script stage of Chinese writing began during the Han dynasty and continued to the present day, primarily going through two major styles: clerical script and Kai script. When Chinese characters reached the Kai script stage, their writing style became standardised, and no script style emerged afterwards. It is important to note that during the clerical script and Kai script stages, Chinese characters evolved in the direction of their respective cursive styles, such as Zhang cursive script (章草) based on clerical script, and semi-cursive (行书) and modern cursive script (今草) based on Kai script. However, this section aims to provide an overview of the stylistic origins of Chinese typeforms, focusing on practical script styles,[96] and does not include cursive scripts, which have been developed more towards the interests of artistic expression.

CLERICAL SCRIPT

According to discovered historical materials, the clerical script emerged during the late Warring States period (476–221 BC) and evolved into its mature form during the Han dynasty (202 BC–AD 220); and then it continued to be widely used through the Wei-Jin period (AD 220–420).[97]

Compared to the script styles of other states during the Warring States period, the script style of the Qin state (秦国, 897 BC–AD 207) appeared relatively conservative (figures 2.37 & 2.38). However, in their daily use of writing, the people of the Qin state continually modified and adapted standard Chinese characters for the sake of convenience. The popular script styles used in the Qin state formed the basis of clerical script.

From the Shuihudi Qin bamboo texts excavated in 1975 from Tomb 11, which was buried in about 217 BC at Shuihudi (睡虎地) in Yunmeng county, Hubei province, China, it can be found that the Chinese characters written on the bamboo slips were not the formal seal script.[98] According to Qiu,

94 Jiang Shan'guo, 1987, 汉字学 [Chinese character studies], p. 196.

95 In the English version of *Chinese writing*, Gilbert and Jerry translated this term into 'segmentation of graphs into strokes'. However, 'lines' are used here because the small seal script is mainly composed of lines. Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 45.

96 Practical scripts, usually more conducive to reading, are standard scripts used as references for Chinese typeforms.

97 Wei Jin period (魏晋时期) refers to the time between 220 220 AD and 420 AD, which followed the collapse of the Eastern Han dynasty and spanned from the Three Kingdoms era to the Jin dynasty. This period constitutes the first half of the broader historical era known as the Wei Jin Northern and Southern dynasties (魏晋南北朝), which extends from 220 AD to 589 AD. See Appendix 2 for more information about Chinese dynasties. Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 103–142.

98 Seal script refers to several types of seal scripts including the large seal script and the small seal script. Zou Dahai, 2007, Shuihudi's bamboo strips of Qin dynasty and mathematics in Pre-Qin period. In: *Chinese Archaeology*, *7*(1), pp. 132–136.

> Judging from the calligraphy on them, the rounded and curved strokes of the formal seal script had already been broken down or changed into square, angular, level and straight strokes.[99]

The clerical script, founded on the bamboo slips from the Qin state, is commonly known as Qin clerical script (秦隶) or ancient clerical script (古隶) and represents the early form of clerical script. Subsequently, clerical script gradually eroded the dominance of small seal script, and eventually, during the Western Han period (202 BC–AD 9), it became the primary writing style of that era.

Figure 2.39
Chinese character '三' extracted from the Rubbing of the Eastern Han Cao Quan Stele during the early Ming dynasty (明初拓东汉曹全碑). The last horizontal stroke in water-wave shape is a form of Bo Zhe.
Source: The Palace Museum, <www.dpm.org.cn/collection/impres/228534.html> (accessed on 15 Oct 2023).

Because clerical script matured during the Han Dynasty, it is also referred to as Han clerical script (汉隶) or modern clerical script (今隶). In its early stages, the clerical script was simplified seal script, lacking calligraphic rules. However, by the late Western Han period, it gradually became more systematic and developed specific rules for the shape of strokes, Bo Zhe (波磔) (figure 2.39).[100] From the clerical script of the Cao Quan Stele (曹全碑) dating back to the Eastern Han period (AD 25–220), it is evident that clerical script had completely moved away from the structural and stroke constraints of small seal script, forming its independent form (figure 2.40).[101]

As clerical script continued to evolve, it gradually transitioned into Kai script. Even after Kai script officially replaced clerical script as the standard, it did not become extinct; instead, it persisted in a calligraphic style. The clerical script has become a display or calligraphic typeface in the digital age. The historical styles of clerical script have served as a source of inspiration for typeface designers.

99 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 105.

100 Tang Lan, 2005, [The science of Chinese characters], p. 134.

101 Chen Nan, 2021, 中国汉字设计史 (History of Chinese character design), p. 76.

Figure 2.37
Five bamboo slips of Baoshan Chujian (包山楚简), *c.* 328 BC.
Source: Hubei Provincial Museum, <www.9610.com/xianqin/baoshan> htm (accessed on 10 Oct 2023)..

Figure 2.38
Two bamboo slips of Shuihudi Qin bamboo texts (睡虎地秦简), *c.* 217 BC.
Source: Hubei Provincial Museum; https://www.sgss8.net/tpdq/24149741/ (accessed on 10 Oct 2023).

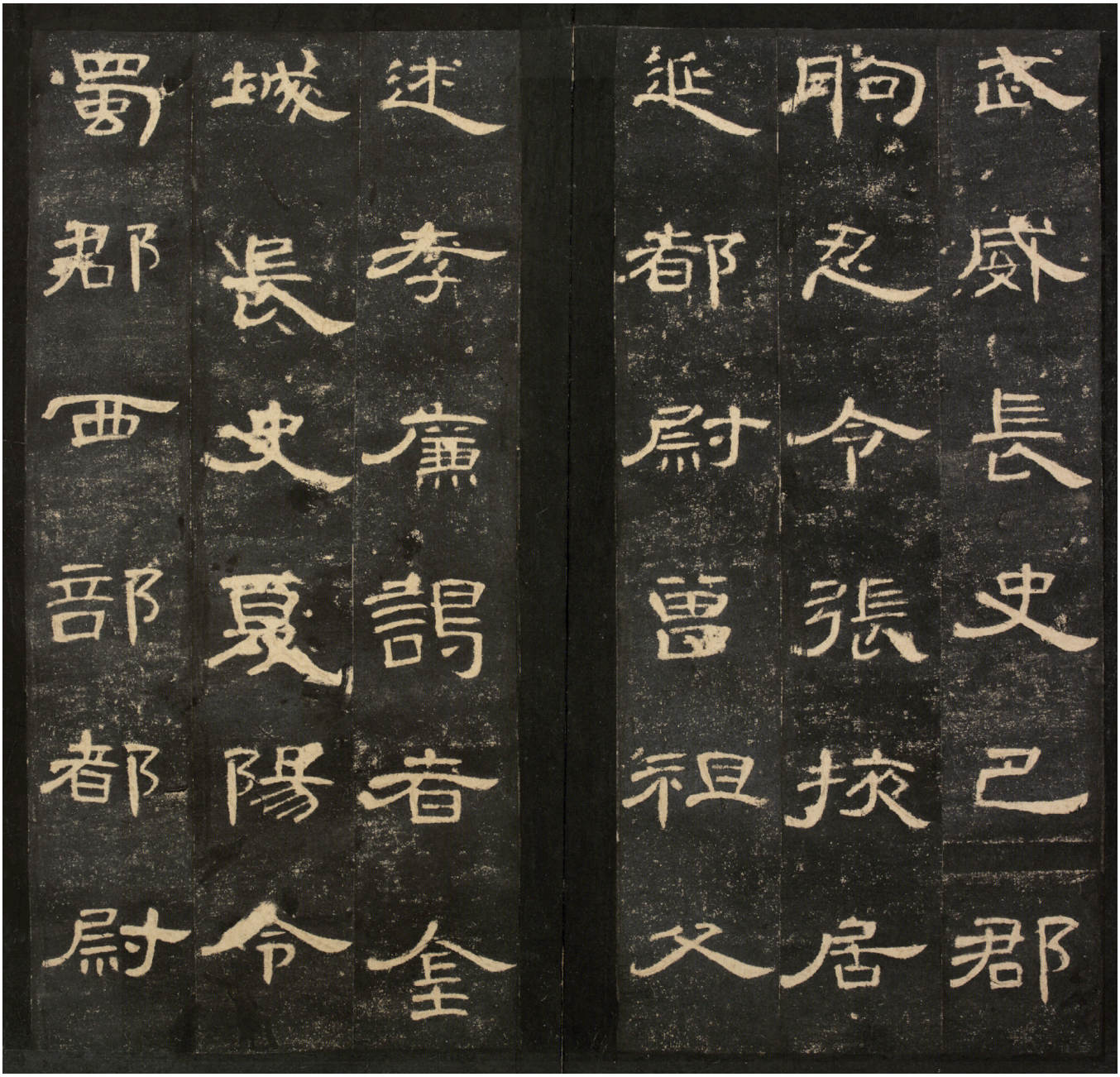


Figure 2.40
Rubbing of the Eastern Han Cao Quan Stele during the early Ming dynasty (明初拓东汉曹全碑).
Source: The Palace Museum, <www.dpm.org.cn/collection/impres/228534.html> (accessed on 15 Oct 2023).

KAI SCRIPT

Following the clerical script, Kai script evolved to become the primary standard script for Chinese characters. The history of the Kai script can be traced back to the Han dynasty and developed based on the clerical script. When categorised by historical periods, Kai script can be divided into Wei stele script (魏碑) and Tang Kai script (唐楷).

Wei stele script encompasses the script styles used during the Wei Jin Northern and Southern dynasties (220–589) and serves as a transitional script, bridging the gap between the clerical script and the Kai script (figure 2.41).[102] Compared to the clerical script, Kai script is more fluid and adheres to standardised character forms, making it the preferred choice for formal documents, letters, and official papers. The regularity and readability of Kai script have made it the main writing style for most calligraphers. Over several centuries of development during the Wei Jin Northern and Southern dynasties, the transformation from clerical script to Kai script was completed. Subsequently, the Kai script became the most popular standard script.[103]

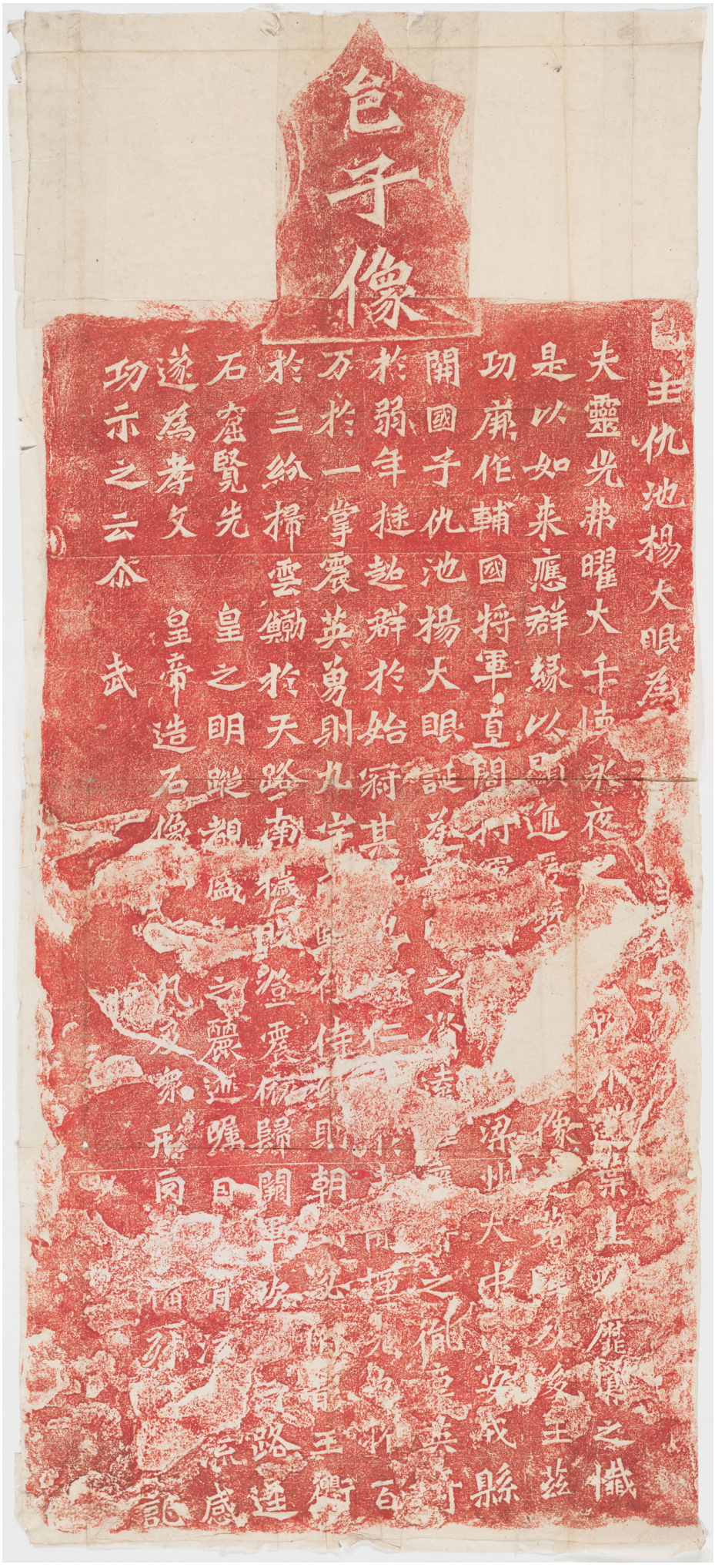
During the Sui and Tang dynasties (581–907), the Kai script reached its zenith in the history of calligraphy, akin to the flourishing period of the dynasties at that period. Many calligraphy masters emerged, such as Yu Shinan (虞世南, 558–638), Ouyang Xun (欧阳询, 558–638), Chu Suiliang (褚遂良, 558–638) in the early Tang Dynasty, Yan Zhenqing (颜真卿, 558–638) in the middle Tang Dynasty, and Liu Gongquan (柳公权, 558–638) in the late Tang Dynasty (figure 2.42). Their works in the Kai script are highly regarded by later generations, serving as models for Chinese character practice.

Kai script represents the last developed standard script style in the history of Chinese calligraphy. In contemporary Chinese typeface design, Kai script has been developed into one of the main text typeface styles.

102 Luo Shubao, 2003, 印刷字体史话 (3) [History of printed founts, 3]. In: 印刷杂志 (Printing Field). 2003:221, p. 71.

103 Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 99.

Figure 2.41
Rubbing of the Twenty masterpieces of Longmen (龙门二十品), originally from the Northern Wei period (386–534).
Source: <shuge.org> (accessed on 15 Oct 2023).



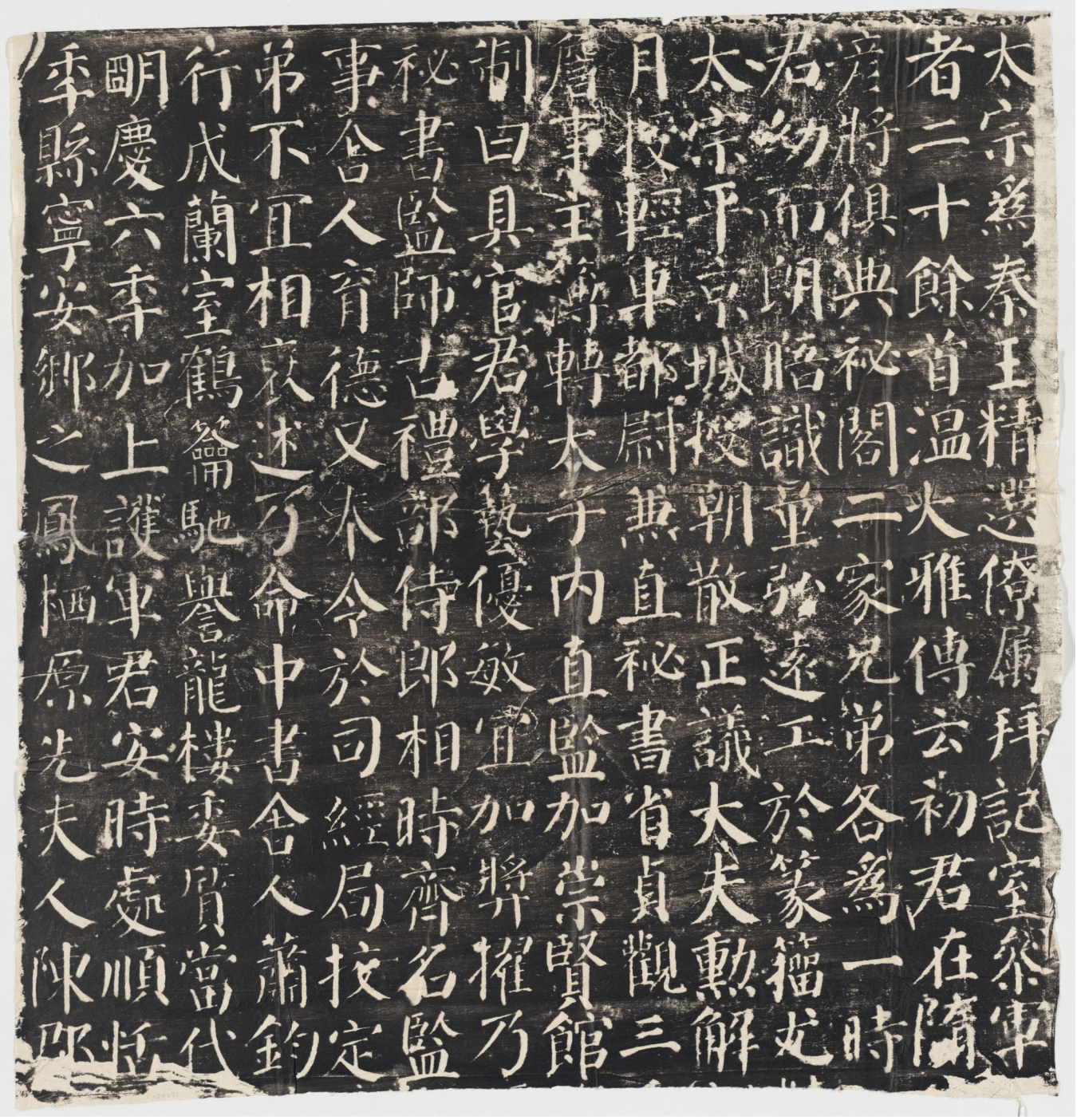


Figure 2.42
Rubbing of Yan Qin Li Stele (颜勤礼碑). The stele, written and inscribed by Yan Zhenqing for his great-grandfather Yan Qinli (颜勤礼), serving as a representative work of Yan Zhenqing's late-life Kai script. It was erected in 779.
Source: <shuge.org> (accessed on 15 Oct 2023).

2.5 Evolution of Chinese characters through woodblock printing

The woodblock printing technique for reproducing writing was invented in China during the Sui and early Tang dynasties, around the 7th century. At this time, Kai script had already become the standard script style for Chinese characters and had reached a high level of development.[104] Subsequently, Chinese characters, as conveyed through woodblock printing, underwent a long evolution spanning over a thousand years. During the development of woodblock printing, the shape of Chinese characters gradually exhibited a trend towards simplification due to the improvement in engraving techniques and the increase in production efficiency.

The world's earliest dated printed book,[105] the *Diamond Sutra*, was printed in Chinese on 11 May 868, during the Tang dynasty (618–907) (figure 2.43a). The style of Chinese characters in this book is in the Kai script style, but there are clear traces of engraving on the outlines of the printed characters (figure 2.43b). This is probably due to the fact that there were no clear divisions of labour between writing and engraving in the production of wood blocks during the Tang Dynasty. It can be observed that the producer attempted to imitate the shape of written characters, preserving the connections between strokes, but due to limited engraving skills, this led to the sharpening of stroke shapes.

When woodblock printing technology advanced to the period of the Five Dynasties and Ten Kingdoms (907–960), the processes of writing and engraving began to separate, giving rise to professional engravers.[106] In the Song dynasty, with the rapid development of the woodblock printing industry, engraving became a specialised craft:

> [Engraving books is called 'long knife', and it is distinct from engraving smaller or fragmented pieces. Those who study 'long knife' engraving spend three years mastering the craft, and when they enter or leave the mentorship, it is customary to present alcohol. Those who wish to become apprentices are best suited at around sixteen or seventeen years of age. In the early stages of their apprenticeship, their skills may not necessarily be mature. The most outstanding practitioners are typically between the ages of twenty and forty. As they reach their later years, their vision weakens, and they are no longer suitable for this work.][107]

The emergence of professional engravers significantly enhanced the progress and efficiency of woodblock printing technology. As engravers became more skilled in their craft, they developed specific techniques. When applied to the various script styles, these engraving techniques resulted

104 Luo Shubao, 2003, 印刷字体史话 (5) [History of printed founts, 5]. In: 印刷杂志 (Printing Field). 2003:213, p. 70.

105 Referring to the British Library's statement, see https://www.bl.uk/collection-items/diamond-sutra (accessed on October 15, 2023).

106 Wang Quan, 2013, 历代印刷汉字及相关规范问题 (Study on the Printed Chinese Characters of Successive Dynasties and Related Standardization). (Ph.D. Thesis, East China Normal University), pp. 149–150.

107 Original Chinese text: 刻书谓之长刀，与刻零碎者不同，学长刀者习艺三年，进出师必备酒，从师者以十六七岁为宜，学艺初成，技未必老。二十至四十之间，最为出色。及至暮年，目力已衰，亦无足取. Lu Jiye, 2006, 书林别话 [Some talks on the sector of books]. In: 卢前笔记杂钞 [Various writing of Luqian].

in a consistent pattern in the engraved characters. This initial separation between printed and written Chinese characters gave rise to different styles in printed characters.

In addition to having skilled engravers, people in the Song Dynasty printed books to disseminate cultural knowledge and reading and as works of art to be appreciated. Much effort was put into the style of characters to cater to the literati's tastes and ensure the popularity of the books they printed. Those proficient in calligraphy were entrusted with creating the written characters, expert engravers were hired for the engraving, and a strong emphasis was placed on the quality of paper and ink. Moreover, they aimed to capture the essence of renowned calligraphic artistry in their script style. These are the fundamental reasons why collectors have always treasured the Song editions in China (figure 2.44).[108]

By the Ming dynasty, printing technology had reached its zenith. The variety and quantity of printed materials far exceeded those of earlier periods. Due to the substantial workload in the Ming Dynasty, to enhance the efficiency of engraving, engravers adopted a method of carving vertical strokes before horizontal strokes. In the eyes of engravers, this transformed Chinese characters from a collection of individual characters into compositions of various lines and shapes. While this engraving technique inevitably sacrificed some of the aesthetics of Chinese characters, it eventually gave rise to the Song Ti style (figure 2.45). However, traditional literati held a low opinion of the Song Ti style, referring to it as 'Skin outline (肤廓)' characters and this assessment was later passed down to subsequent Song Ti style typefaces.

During the Qing dynasty, the Song Ti style typeface became slightly condensed to facilitate the composition of the page (figure 2.46). Woodblock printing was gradually replaced at the end of the Qing dynasty with the introduction of Western movable type printing technology by Christian missionaries. The Song Ti style of Chinese characters in woodblock printing was carried over into founts and has become the dominant Chinese typeform until now.

108 Luo Shubao, 2004, 印刷字体史话 (6) [History of printed founts, 6]. In: 印刷杂志 (Printing Field). 2004:213, p. 88.

Figure 2.43a
Part of *The Diamond Sutra* (金刚经) printed in 868 AD, a Sanskrit text translated into Chinese.
Source: <shuge.org> (accessed on 15 Oct 2023).

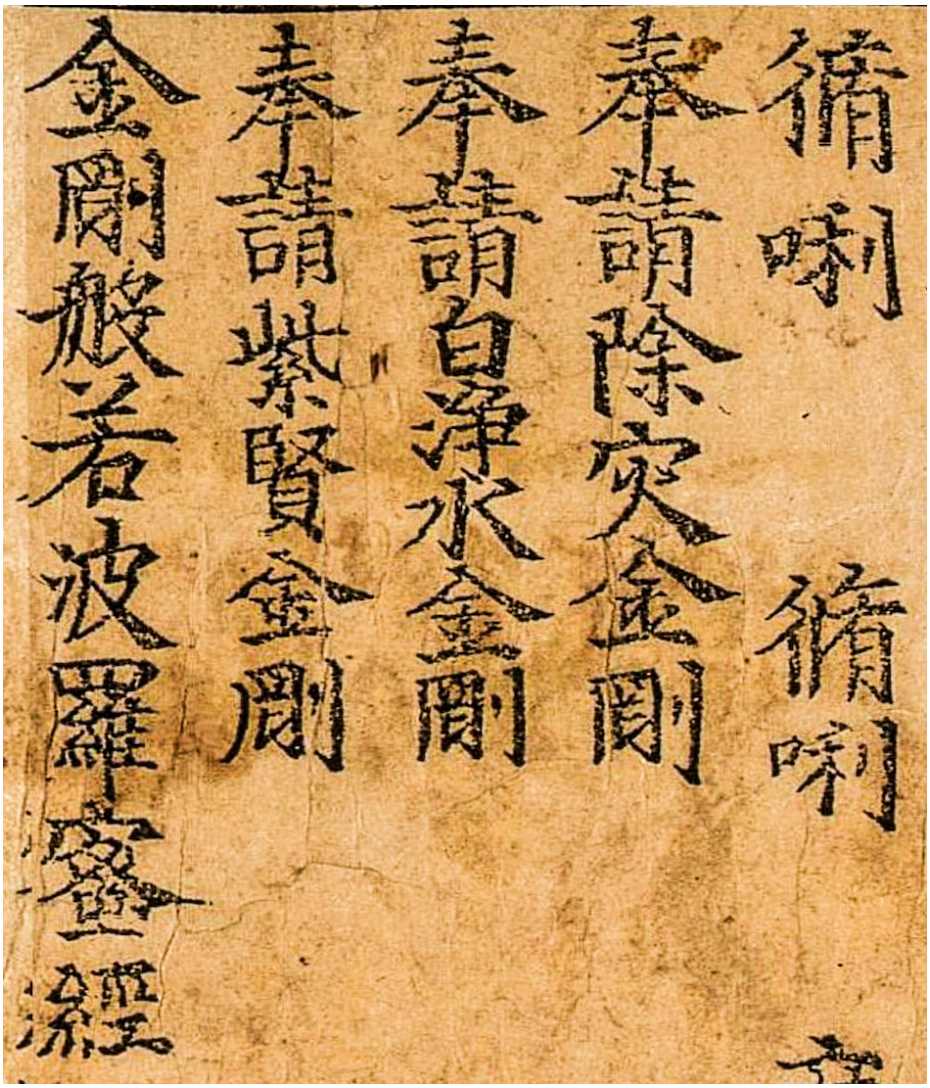
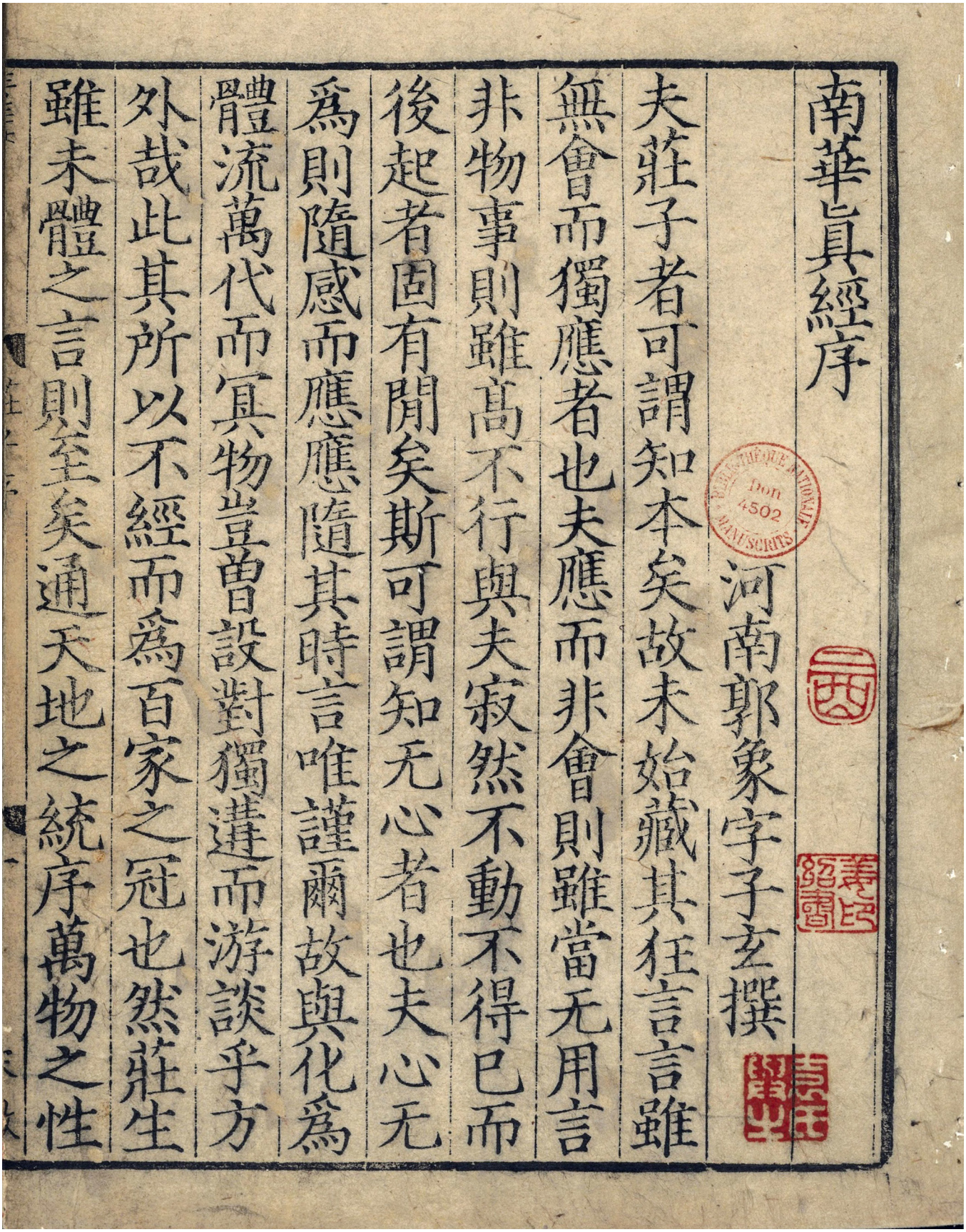


Figure 2.43b
Extracted from figure 3.18.
Source: <shuge.org> (accessed on 15 Oct 2023).


南華眞經序

河南郭象字子玄撰

夫莊子者可謂知本矣故未始藏其狂言言雖無會而獨應者也夫應而非會則雖當无用言非物事則雖高不行與夫寂然不動不得已而後起者固有閒矣斯可謂知无心者也夫心无爲則隨感而應應隨其時言唯謹爾故與化爲體流萬代而冥物豈曾設對獨遣而游談乎方外哉此其所以不經而爲百家之冠也然莊生雖未體之言則至矣通天地之統序萬物之性

Figure 2.44
A page of *Nan Hua Zhen Jing* (南华真经) from the Southern Song dynasty (1127-1279)
Source: <shuge.org> (accessed on 30 Oct 2023).

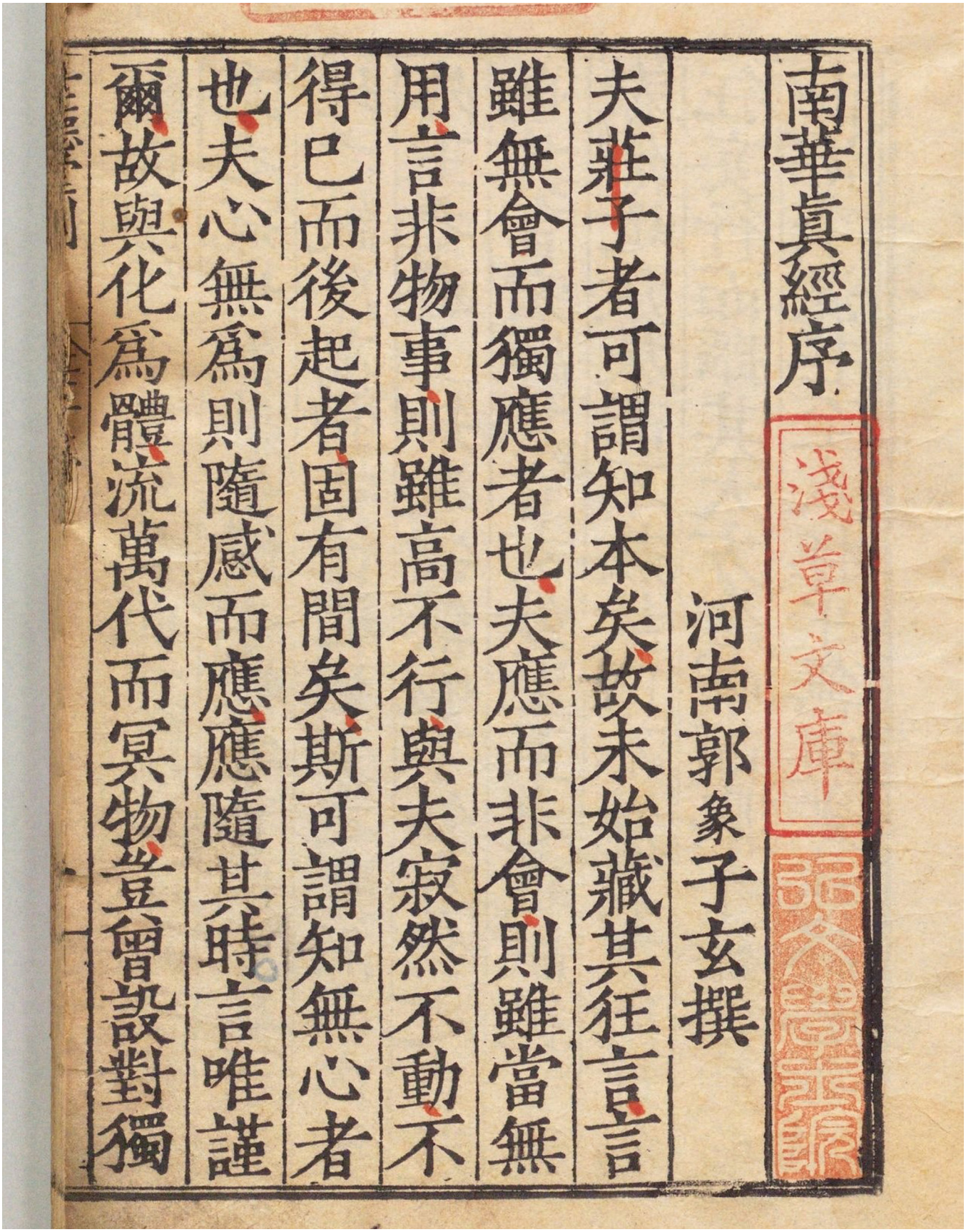

南華眞經序
河南郭象子玄撰
夫莊子者可謂知本矣故未始藏其狂言雖無會而獨應者也夫應而非會則雖當無用言非物事則雖高不行與夫寂然不動不得已而後起者固有間矣斯可謂知無心者也夫心無爲則隨感而應應隨其時言唯謹爾故與化爲體流萬代而冥物豈會設對獨

Figure 2.45
A page of *Nan Hua Zhen Jing* (南华真经) from the from the Ming dynasty (1368–1644).
Source: <shuge.org> (accessed on 30 Oct 2023).

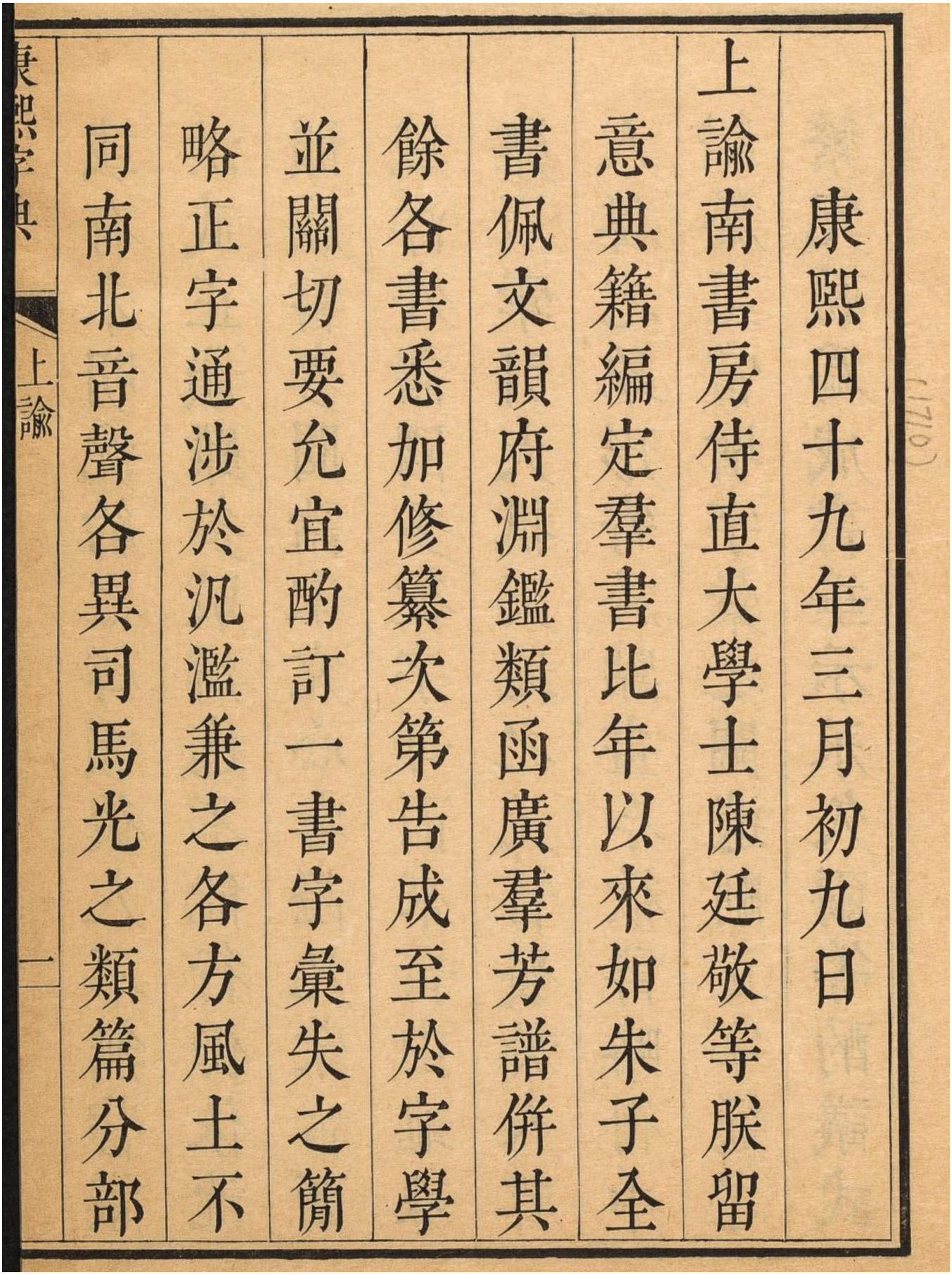

康熙四十九年三月初九日
上諭南書房侍直大學士陳廷敬等朕留
意典籍編定羣書比年以來如朱子全
書佩文韻府淵鑑類函廣羣芳譜併其
餘各書悉加修纂次第告成至於字學
並關切要允宜酌訂一書字彙失之簡
略正字通涉於汎濫兼之各方風土不
同南北音聲各異司馬光之類篇分部
康熙字典
上諭
一
(1710)

Figure 2.46
A page of *Kangxi Dictionary,* completed in 1716, which was the standard Chinese dictionary during the 18th and 19th century.
Source: Source: <shuge.org> (accessed on 30 Oct 2023).

Conclusion

Despite the vast number of Chinese characters, each possessing its own distinct identity, they are all grounded in hundreds of components, which, in turn, are constructed from dozens of strokes. A comprehensive and precise understanding of the Chinese writing system, based on the principles and regulations governing their construction, is essential for thoroughly studying their typeforms.

This chapter delves into the complexities of Chinese characters as a unique writing system by exploring two aspects: firstly, by exploring their nature and intricacies, and secondly, by tracing the historical development of their visual characteristics. The first aspect presents an overview of the nature of Chinese writing and the classification, construction, and structure of Chinese characters from the perspective of typeface designers; and also to a lesser degree from the perspective of font technology, given the information about the Unicode and sorting.

The second aspect follows the chronological development of the visual characteristics of Chinese characters as they evolved, both in terms of script styles and the shape of the characters in woodblock printing. These specific styles of Chinese characters provided a rich source for subsequent Chinese typeforms and their stylistic origins. In particular, the Kai script and Song Ti styles have been continued to the present day and eventually became the main Chinese text typeface styles.

Through a profound comprehension of the structural features and visual characteristics of Chinese characters, this chapter presents the theoretical foundation and provides rich stylistic references for subsequent discussions on the development of Chinese typefaces.

Chapter 3. Origins and development of early movable type

The invention of printing with movable type is recognised by scholars to have originated in East Asia, centuries before Gutenberg's activities in Europe. Evidence attributes the invention of movable ceramic type to 11th-century China.[1] According to the account of *Shen Kuo* (沈括, 1031–1095) in his book, *the Dream Pool Essays*, movable type was invented by *Bi Sheng* (毕昇, *c.* 970–1051) in the period of *Qingli* (庆历, 1041–1048), the Northern Song Dynasty (北宋, 960–1127)[2] more than 400 years before the use of movable type by Johannes Gutenberg.[3] This invention was an alternative to the process of xylography for reasons of economy and efficiency.[4] However, due to the rise and fall of dynasties, the complexity of Chinese characters, technical limitations and other factors, the development of movable type in China was slow. It was not until after the introduction of Western movable type technology to China in the early 1850s that printing from movable type gradually replaced woodblock printing to become the mainstream printing technology.[5]

Despite only sporadic development of movable type between the 11th and 19th centuries, the Chinese nevertheless experimented and used movable type printing in notable ways. An example of this was the attempt to employ various materials for the production of types. These materials included ceramic, wood and other non-metallic materials and various metals such as tin and copper.[6] As the production processes and printing effects of movable type made of various materials vary, this section focuses on three influential kinds of materials: ceramic, wood, and metal; and discusses the origins and development of early Chinese movable type printing for each material.

1 Shen Kuo, 1305, 古迂陈氏家藏梦溪笔谈: 二十六卷, [The dream pool essays or Jottings at the Dream Brook Studio, in the family collection of Chen Guyu, in 26 Juan]. [Pdf] Retrieved from the Library of Congress, <https://www.loc.gov/item/2021666451/>; See Appendix 3 for the full text.

2 Qingli is the era name of the fourth emperor of the Song dynasty in China, Emperor Renzong of Song, personal name Zhao Zhen (赵桢). Also, the Northern Song and Southern Song(南宋, 1127–1279) are two distinct periods of the Song dynasty(宋朝, 960–1279).

3 Shen Kuo, 1305, [The dream pool essays or Jottings at the Dream Brook Studio, in the family collection of Chen Guyu, in 26 Juan]; Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 201.

4 Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 201.

5 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 10.

6 'Ceramic' used as a general term in this thesis.

3.1 Ceramic type

The earliest movable type was not wood nor metal, but, unexpectedly, ceramic. How was movable ceramic type created and developed, and what influence did it bring to Chinese typeface design? The following section is divided into three parts in chronological order: the invention of movable ceramic type in the Northern Song dynasty; the use of movable ceramic type in the Southern Song and Yuan Dynasties; and the revival of movable ceramic type in the Qing Dynasty.

Invention of ceramic type in the Northern Song dynasty

Xylography had been in use since the Tang Dynasty (唐朝, 618–907), and it developed further during the Song Dynasty.[7] According to Shen Kuo's description, 'Under the Tang Dynasty, woodblock printing, though carried on, was not fully developed. In the time of Feng Yingwang, first the Five Classics and then, in general, all the ancient canonical works were printed.'[8] Woodblock printing was more economical with regard to human resources and time compared with the copying of manuscripts as books could be made at greater speed and lower cost. However, woodblock printing, although more convenient than manuscripts in terms of production, still had disadvantages: while printing a small number of pages was feasible, it would take many years to carve the necessary woodblocks to print an extensive text. Moreover, if people wished to reuse old blocks for a different edition, they would need to re-engrave them. The engraved woodblocks also required ample and suitable space for storage. Therefore, woodblock printing could still be uneconomical in terms of labour, materials, time and space.[9] After realising the shortcomings of woodblock printing, people in the Northern Song dynasty began to consider new printing methods.

Although it is generally accepted that movable ceramic type printing was invented by Bi Sheng, some scholars believe that the movable stone types of the Khitan large script, made perhaps a century and a half earlier, are the origin of movable type printing (figure 3.1). Despite the discovery of the Khitan large script movable type, its precise date has not been confirmed.

Regarding the birth and birthplace of Bi Sheng, his tombstone was discovered in 1990 in Hubei province, China (figure 3.2). Although the proof of his existence has been confirmed, his ceramic type technology had not been passed on to later generations, and there are no traces of the books he printed. Moreover, his invention did not attract the attention and advocacy of the ruling class in the Song Dynasty.[10] Fortunately, *Dream Pool Essays*, written by his contemporary, Shen Kuo, records valuable information

7 See Appendix 2 for the table of Chinese dynasties.

8 Feng Yingwang whose real name is Feng Dao (冯道, 882–954) was an important Chinese government official during the Five Dynasties and Ten Kingdoms period (五代十国, 907–909). 版印书籍，唐人尚未盛为之，自冯瀛王始印五经，已后典籍，皆为版本。 Refers to the translation by Thomas Francis Carter in 1925, from his book, *The invention of printing in China and its spread westward*. Unless otherwise noted, all translations are approximate translations by the author. Shen Kuo, 1305, 古迂陈氏家藏梦溪笔谈: 二十六卷, [The dream pool essays or Jottings at the Dream Brook Studio, in the family collection of Chen Guyu, in 26 Juan].

9 Zhang Xiumin, 1989, 中国印刷史 [Chinese Printing History], p. 663.

10 Zhang Xiumin, 1989, 中国活字印刷简史 [A brief history of Chinese movable type printing]. In: 活字印刷源流 [The origin and development of Chinese movable type printing], p. 13.

Figure 3.1
Movable stone type printing of the Khitan large script archived by Pei Yuanbo (裴元博).
Source: Pei Yuanbo (private collection).

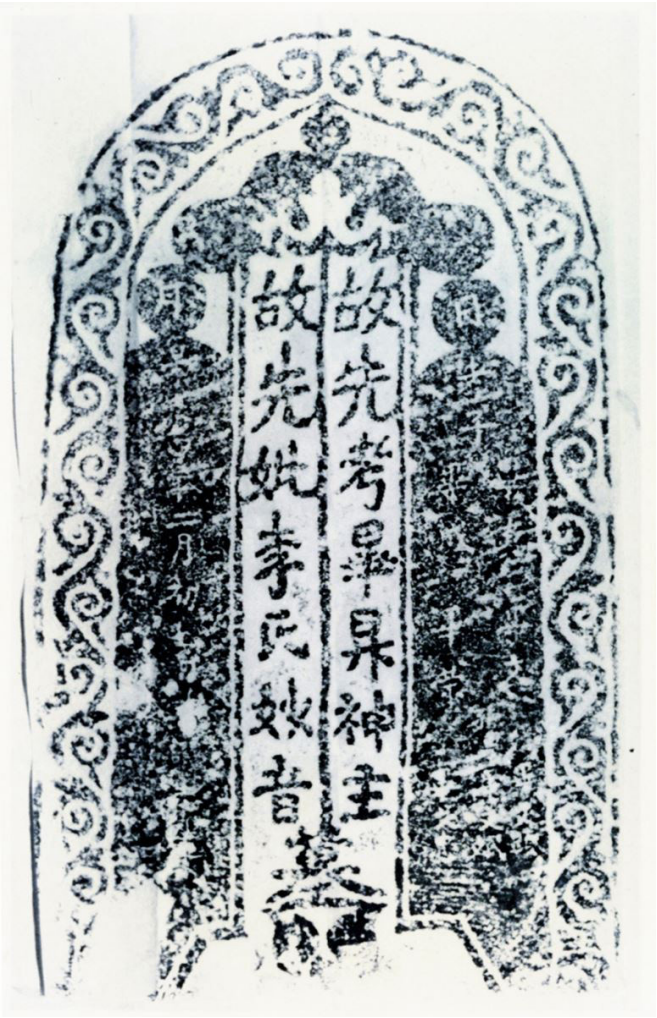
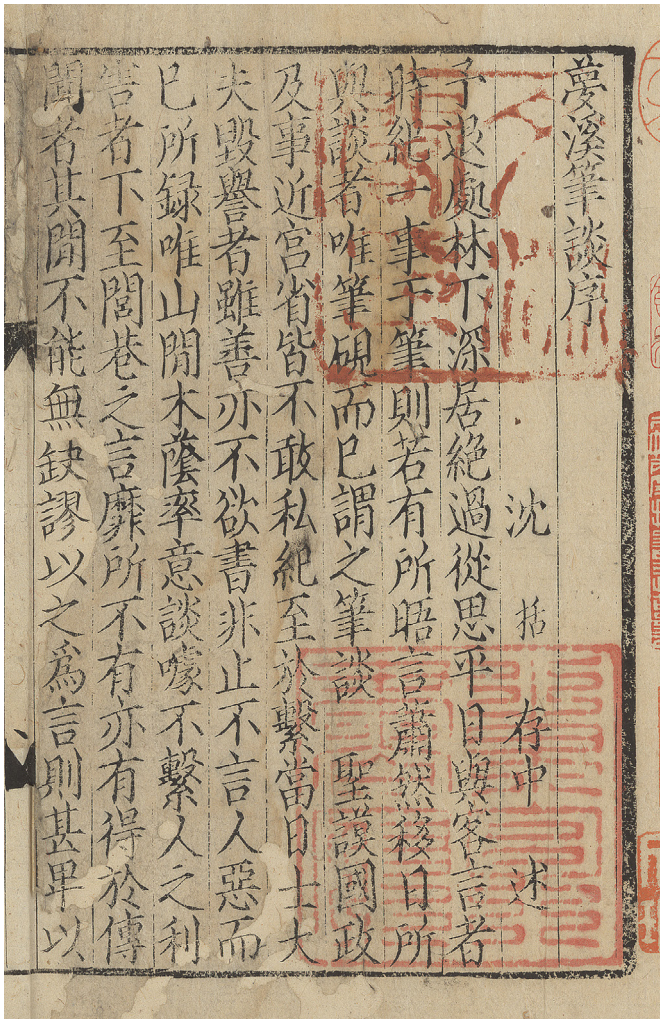


Figure 3.2
Bi Sheng's tombstone, rubbing.
Source: Hiroshi Komiyama (private collection).



夢溪筆談序

予退處林下深居絕過從思平日與客言者
時紀一事于筆則若有所晤言蕭然移日所
與談者唯筆硯而已謂之筆談聖謨國政
及事近宮省皆不敢私紀至於繫當日士大
夫毀譽者雖善亦不欲書非止不言人惡而
已所錄唯山間木蔭率意談噱不繫人之利
害者下至閭巷之言靡所不有亦有得於傳
聞者其間不能無缺謬以之為言則甚卑以

Figure 3.3
First page of the earliest extant edition of *Dream Pool Essay* printed in 1305.
Source: National Library of China.

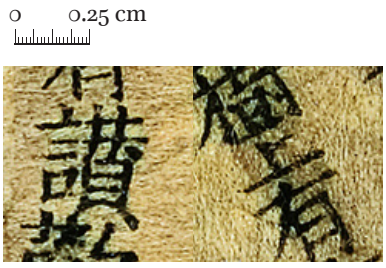


Figure 3.4a
Chinese character '囋' and '上'.
Source: cropped and enlarged from figure 3.4

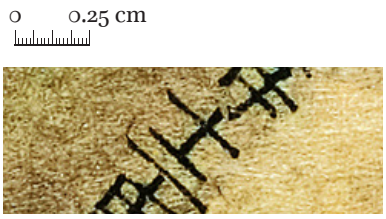


Figure 3.4b.
Chinese character '十' and '一' are combined into '士'. Source: cropped and enlarged from figure 3.4

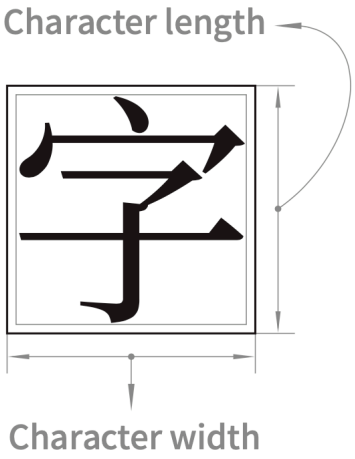


Figure 3.5
Character length and width.
Font in use: Noto Serif CJK SC.

about Bi Sheng's invention (figure 3.3). Shen Kuo's description bears the marks of an eye-witness and the authenticity of his writings is generally not disputed.[11]

Shen Kuo's record provides a historical narrative of the creation process and use of the movable ceramic type invented by Bi Sheng. It notes how this was created after many attempts, solutions to the technical problems of making ceramic type, composition, printing and other processes of movable type printing. Although Bi Sheng's method is quite primitive, it is the same basic principle of subsequent movable type printing using other materials. Moreover, it could be argued that the invention of movable ceramic type laid the foundation for the development of wood and metal type.

The fragments of Amitayurdhyana Sutra

Although Bi Sheng's movable ceramic type and printed works do not survive, the fragments of *Amitayurdhyana Sutra* (佛说观无量寿佛经)(figure 3.4), discovered in the White Elephant Pagoda, Wenzhou, Zhejiang province in 1987, were most likely printed by movable ceramic type.[12] Compared with the fragments of *Xie Jing Yuan Qi* (写经缘起) found at the same place and dated 'May, the 2nd year of Chongning (崇宁, 1102–1106),'[13] it is likely that this version of *Amitayurdhyana Sutra* would have been printed around the same time.[14] The *Amitayurdhyana Sutra* fragments are 13cm wide and 8.5–10.5 cm high, and the characters are set in 12 lines. There are 166 recognisable characters, accounting for one-tenth of the total number of characters from the fourth to the ninth Contemplation of *Amitayurdhyana Sutra*.[15]

The fragments of *Amitayurdhyana Sutra* are the earliest extant examples of movable type printing and perhaps confirm Shen Kuo's testimony of Bi Sheng's invention of movable ceramic type. It also demonstrates that in early Chinese movable type printing, the style of typefaces followed the style of woodblock printing, mainly in the Song style.[16] Characters printed by movable type had the same width, but varying lengths, For example, Chinese character '囋' is about three times the length of '上' (figure 3.4a, Diagram 1), and sometimes two characters were combined within one type (figure 3.4b); furthermore, letter-spacing may not have been considered during this period of movable type printing.

11 Carter, 1925, *The invention of printing in China and its spread westward*, p. 160.

12 Tsien Tsuen-hsuin 錢存訓, 1989, 現存最早的印刷品和雕版略評 [A brief review of the earliest existing prints and engravings]. In: *Journal of National Central Library*, no. 22, pp. 1–10.

13 Chongning is the era name of emperor Huizong of Song. Therefore, the 2nd year of Chongning is 1103.

14 Jin Bodong, 2006, 现存最早活字印刷品的发现和研究 [Discovery and research of the earliest existing movable type printed matter]. In: 东方博物 (Journal of Cultural Relics of the East), 2006:1, pp. 46–51.

15 Ibid.

16 Song (宋体) refers to a category of Chinese typefaces influenced by woodblock printing in the Song Dynasty. In Japan, Song also called Ming (明体) because this style was introduced to Japan during the Ming dynasty. Song style can be comparable to serif typefaces. See Appendix 4 for other styles.

Figure 3.4
Fragments of *Amitayurdhyana Sutra*.
Source: Wenzhou Museum.

0 1 cm

The use of movable ceramic type in the Southern Song and Yuan dynasties (1271–1368)

After Bi Sheng's invention of movable ceramic type, there were later generations who recommended and imitated his method. In 1193,[17] Zhou Bida (周必大, 1126–1204) printed his book *Yu Tang Za Ji* (玉堂杂记) following the method recorded by Shen Kuo. Zhou Bida mentioned, 'recently, according to Shen's method, using clay and copperplate, transforming and trace printing, occasionally complete *Yu Tang Za Ji 28 things*'.[18] However, details are unknown due to a lack of further evidence. Nonetheless, it appears to confirm that later generations followed Bi Sheng's invention.

Around the Yuan Dynasty (元朝), two possible applications of movable type printing were recorded. In the 13th century, Yaoshu (姚枢, 1201–1278) persuaded his disciple, Yang Gu (杨古), to print *Xiao Xue* (小学), *Jin Si Lu* (近思录), *Dong Lai Jing Shi Shuo* (东莱经史说) and other books with the method of movable ceramic type printing recorded by Shen Kuo.[19] The other is recorded in a summative article attached to the end of Wang Zhen's (王桢, fl. 1290–1333) book, *Nong Shu* (农书), named 'A method of making movable wood types for printing books' (造活字印书法). Wang Zhen mentioned an alternative method of baking movable clay type together with a clay frame and filling it to make whole blocks.[20] Both records are imprecise; however they at least prove that there were attempts at making movable ceramic type in the 13th century.[21]

Revival of ceramic type in the Qing dynasty (1644–1911)

There is no evidence of movable ceramic type printing in the Ming dynasty (明朝, 1366–1644). In fact, movable ceramic type was rarely used until the middle of Qing dynasty.[22] In 1718, Xu Zhiding[23] developed a printing process with a ceramic printing plate. He afterwards printed *Zhou Yi Shuo Lue* (周易说略)(figure 3.7 & 4.8),[24] a commentary on the *Book of Changes* (周易) in 1719 and *Hao An Xian Hua* (蒿庵闲话) (figure 3.9 & 4.10) in 1730; both books written by Zhang Er Qi (张尔歧, 1612–1677).[25]

However, there are doubts as to whether he used ceramic type. Tsien Tsuen-hsuin (1910–2015) in his research, 'Paper and Printing,' agreed with Zhu Jialian's (朱家濂, 1909–1997) analysis in 1962 that Xu Zhiding used

17 The year was marked in Zhou Bida's book, 文忠集 卷198 [Wen Zhong Ji, vol. 198], which mentioned: the 4th year of Shaoxi (绍熙, the era name of emperor Shaoxi, Southern Song).

18 Original text in Chinese: '近用沈存中法以胶泥铜版，转换摹印，今日偶成玉堂杂记二十八事.' Zhou Bida, 1792, 文忠集 卷198 [Wen Zhong Ji, vol. 198]. In: 钦定四库全书 集部 1149 [Qinding Siku Quanshu, Ji section 1149].

19 Yao Sui, *c.* 1310, 牧庵集 [Mu An Ji], vol. 14, p. 4 <ctext.org/wiki.pl?if=gb&chapter=134091&remap=gb>; this book was written by Yao Sui (姚燧, 1238–1313), who was the nephew of the noted official Yao Shu.

20 Wang Zhen, 1530, 造活字印书法 [A method of making moveable wooden types for printing books]. In: 农书 [Nong Shu]. 山东布政司刊本 [Edition of Shandong Bu Zheng Si], vol. 22.

21 Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 203.

22 Qing dynasty, 清朝, established in 1636, and ruled China proper from 1644 to 1911; Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 14. Also mentioned in: Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 203.

23 Xu Zhiding (徐志定) , courtesy name Jing Fu (静甫) was a scholar and county magistrate. Yan Xishen, Cheng Cheng & Li Wenzao, 1760, 选举制 [Xuan Ju Zhi]. In: 泰安府志 [Tai An Fu Zhi], vol. 21.

24 Zhang Erqi, 1719, 周易说略 [Zhou Yi Shuo Lue], the last page.

25 Zhang Erqi, 1730, 蒿庵闲话 [Hao An Xian Hua].

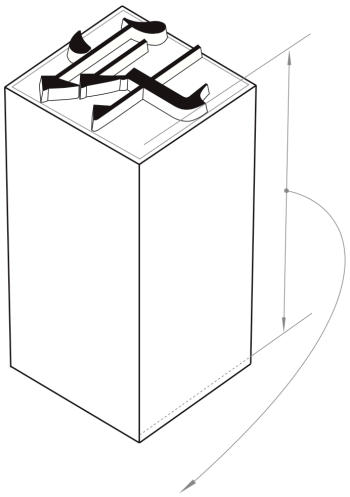


Figure 3.6
Type height.
Font in use: Noto Serif CJK SC.

enamelware type to print *Zhou Yi Shuo Lue* and *Hao An Xian Hua*. And Zhang Xiumin (张秀民, 1908–2006) in the *History of Chinese Printing* (中国印刷史) also notes the use of enamelware type. However, Tao Baoqing (陶宝庆) doubts the use of movable type in his thesis, 'Porcelain Printing Plate or Porcelain Movable Type' in 1981 and 'A Precious Porcelain Printed Book of *Zhou Yi Shuo Lue*' in 1984.[26] Nowadays, there is still controversy about the use of movable type by Xu Zhiding. The style of printed characters belongs to the character style of woodblock printing in the Kangxi period (康熙, 1654–1722) and possesses a strong sense of handwriting; traces of stroke connections which are difficult to engrave are also visible.[27]

Another person who was inspired by Bi Sheng's ceramic movable type is Zhai Jinsheng (翟金生). By 1844, Zhai Jinsheng created five different sizes of ceramic movable type, with a total of more than 100,000 individual types after 30 years of continuous research and development.[28] Three well-preserved books printed by Zhai Jinsheng with ceramic movable type have so far included the *First Edition of Ceramic Version Trial Printing* (泥版试印初编) in 1844 (figure 3.11), *Xian Ping Shu Wu Chu Ji Shi Lu* (仙屏书屋初集诗录) edited by Huang Jue Zi (黄爵滋) in 1847 (figure 3.13) and *Clan Record of the Zhai Family* (泾川水东翟氏宗谱) edited by Zhai Zhen Chuan (翟震川) in 1857. Not only books but also thousands of ceramic movable individual types have been preserved. Excluding the fount with the largest character size printed in Clan Record of the Zhai family; four different sizes of types have survived: No. 1, No. 2, No. 3, No. 4 and a considerable number of blank types for spacing and matrices for making types (figure 3.12).[29] The table below shows the average size of Zhai Jinsheng's four different movable ceramic types (figure 3.5 & 3.6).[30]

	No.1	No.2	No.3	No.4
Length	0.9 cm	0.7 cm	0.75 cm	0.5 cm
Width	0.85 cm	0.66 cm	0.6 cm	0.35 cm
Height	1.2 cm	1.2 cm	1.2 cm	1.2 cm

From the table above, font No.1, 2, 3 and 4 have the same type height, which allows typesetters to set them in one layout. All character lengths are slightly longer than the character width which indicated that proportions of the characters tends to be narrow. Moreover, although the length of No.3 is slightly longer than No.2, the width of No.3 is narrower than No.2. Therefore, font No.3 may have a specific usage, for example, commentary on the main text. Font No.2 and 3 indicates that Zhai Jinsheng's typeface has two different styles.

26 Tao Baoqing, 1989, 是磁版还是磁活字版? [Porcelain Printing Plate or Procelain Movable Type] & 一部珍贵的磁版印本《周易说略》 [A Precious Porcelain Printed Book of *Zhou Yi Shuo Lue*]. In: 活字印刷源流 [The origin of movable type printing], pp. 249–255.

27 Zhu Jialian, 1989, 清代泰山徐氏的瓷活字印刷 [Porcelain movable type printing of the Xu family of Tarzon in the Qing dynasty]. In: 活字印刷源流 [The origin of movable type printing], pp. 243–248.

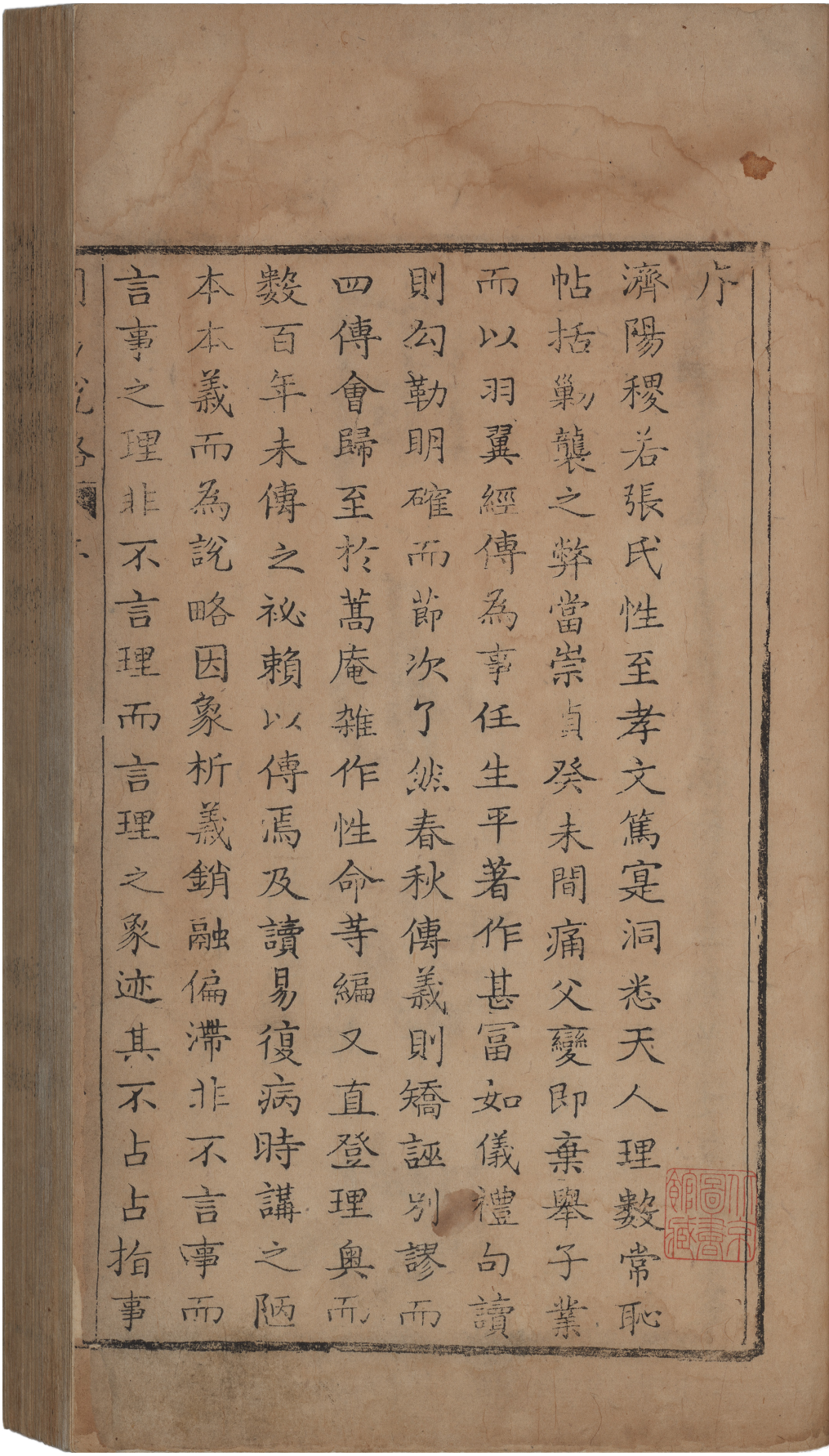
28 Zhang Shaoxun, 1997, 中国印刷史话 [Chinese printing history], p. 401.

29 Zhang Binglun, 1989, 关于翟氏泥活字的制造工艺问题 [About manufacturing Process problems of Zhai's movable types], 关于翟金生的泥活字问题的初步研究 [Preliminary study on Zhai Jinsheng's ceramic movable types]. In: 活字印刷源流 [The origin of movable type printing], pp. 223–232.

30 Ibid, p. 226.

In terms of function, all the fonts are legible, including the smallest font No.4. The proportions of No.1, No.2 and No.4 fonts are similar and appear condensed. The typeface style in these three preserved books is mainly in favour of the Song Style, perhaps imitating woodblock printing in the Qing Dynasty. The shape of the strokes tends to be straight and unified. Also, the contrast between horizontal and vertical strokes is high. Notably, the horizontal strokes are thin, and some printed characters lose their horizontal strokes when printed. However, the quality of characters is far lower than xylography because of technological restraints which include uneven type sizes, complex type making and the typesetting process. Even so, Zhai Jinsheng did not merely have one fount size, but five sizes and two styles to satisfy the needs of Chinese typography.

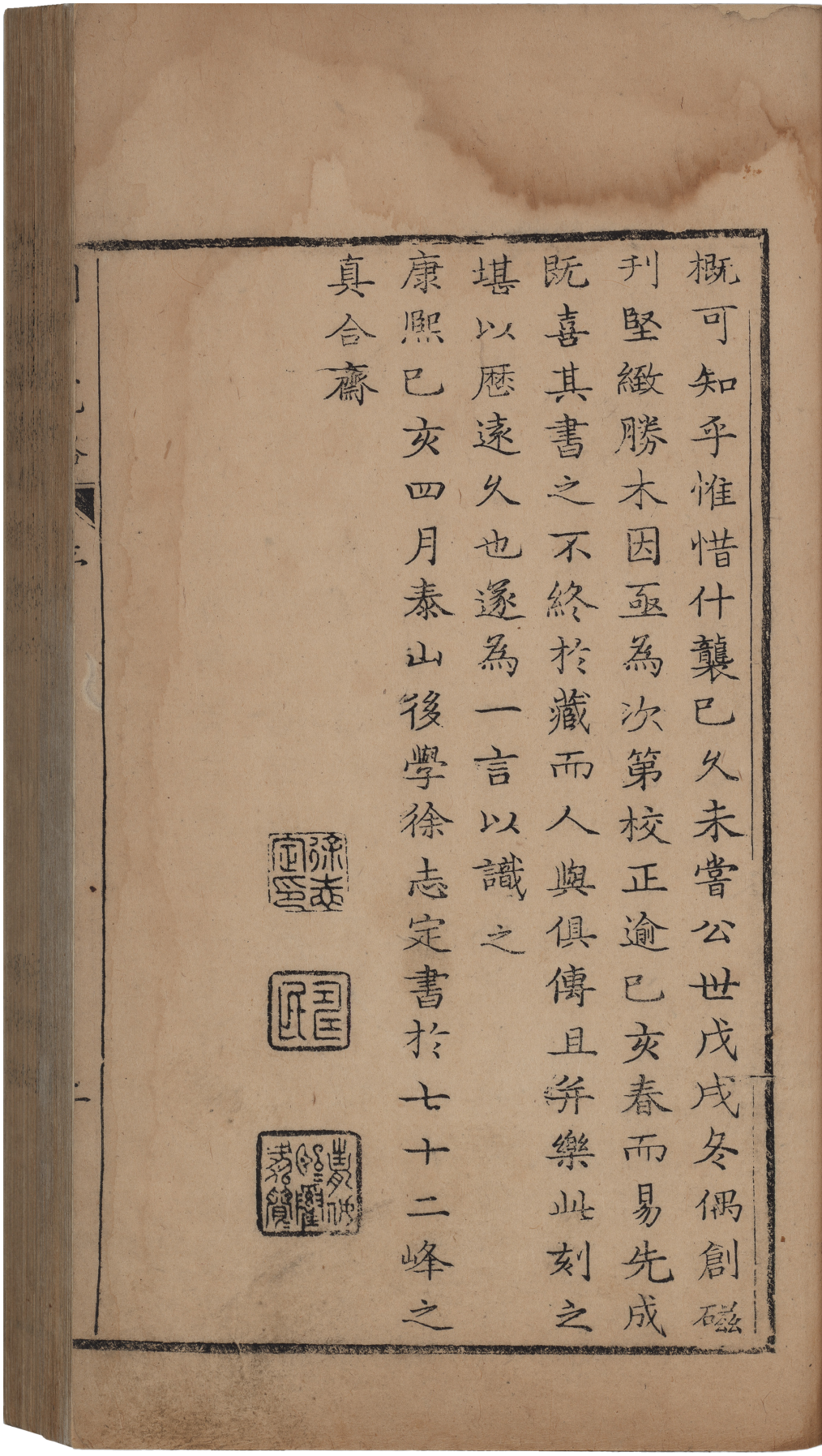
Figure 3.7
First and cover page of *Zhou Yi Shuo Lue*, printed by Xu Zhiding in Zhen He Zhai (真合斎).
Source: National Library of China.



泰山磁版

周易說略

Figure. 4.8
Last page of *Zhou Yi Shuo Lue*, printed by Xu Zhiding in Zhen He Zhai. Source: National Library of China.


概可知乎惟惜什襲已久未嘗公世戊戌冬偶創磁
刊堅緻勝木因亟為次第校正逾已亥春而易先成
既喜其書之不終於藏而人與俱傳且幷樂此刻之
堪以歷遠久也遂為一言以識之
康熙己亥四月泰山後學徐志定書於七十二峰之
真合齋

略矣而理無不包不斤斤釋理略矣而象元不該此其寧為略而不為詳者正乃所以為詳而恐涉于略也又何至如時說之言事則掛一漏萬言理則泛舉失旨者之真為略哉讀之者誠依以為揲策叩不失密義周文孔子之本意而依以為文章即天下事物繁賾之狀亦多能核其真占法制藝庶幾兩得之矣吳門顧林亭先生閱其書而遺之以詩有云緇帷白室觀風標為嘆斯人久寂寥又曰長期六籍傳無絕能使羣言意自消則其操行之卓越著述之淵源不

Figure 3.9
First page of *Hao An Xian Hua*, printed by Xu Zhiding in Zhen He Zhai.
Source: National Library of China.

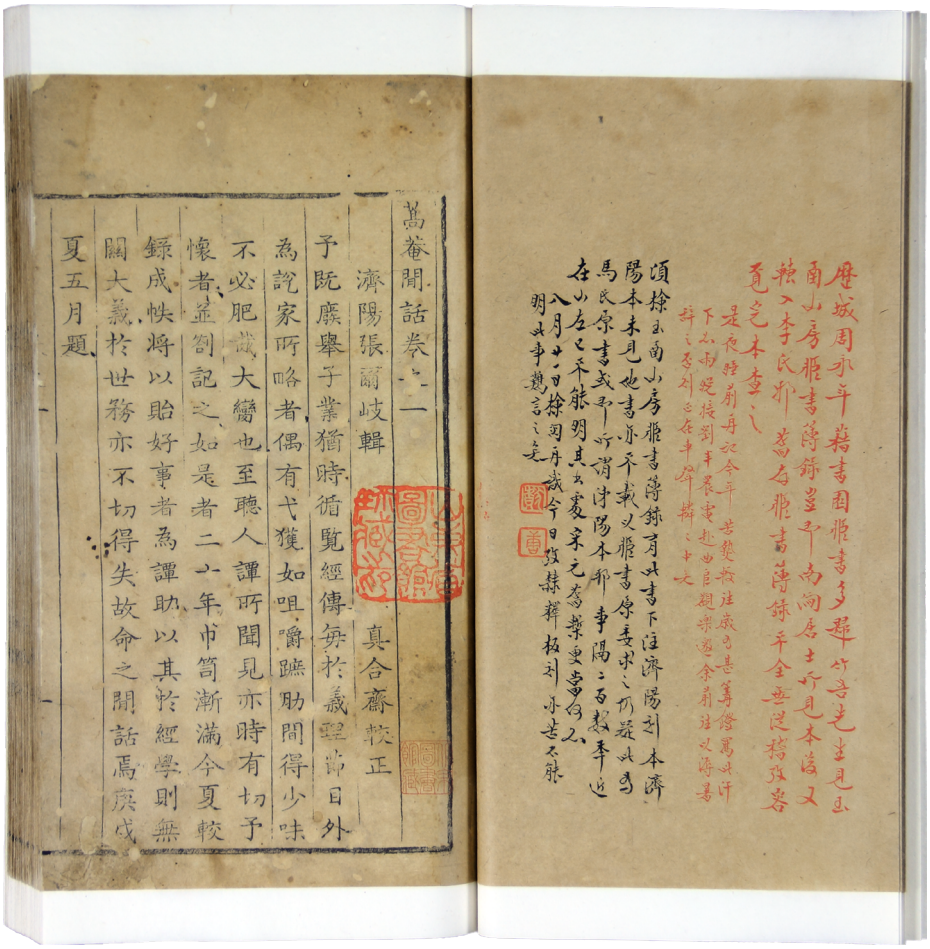
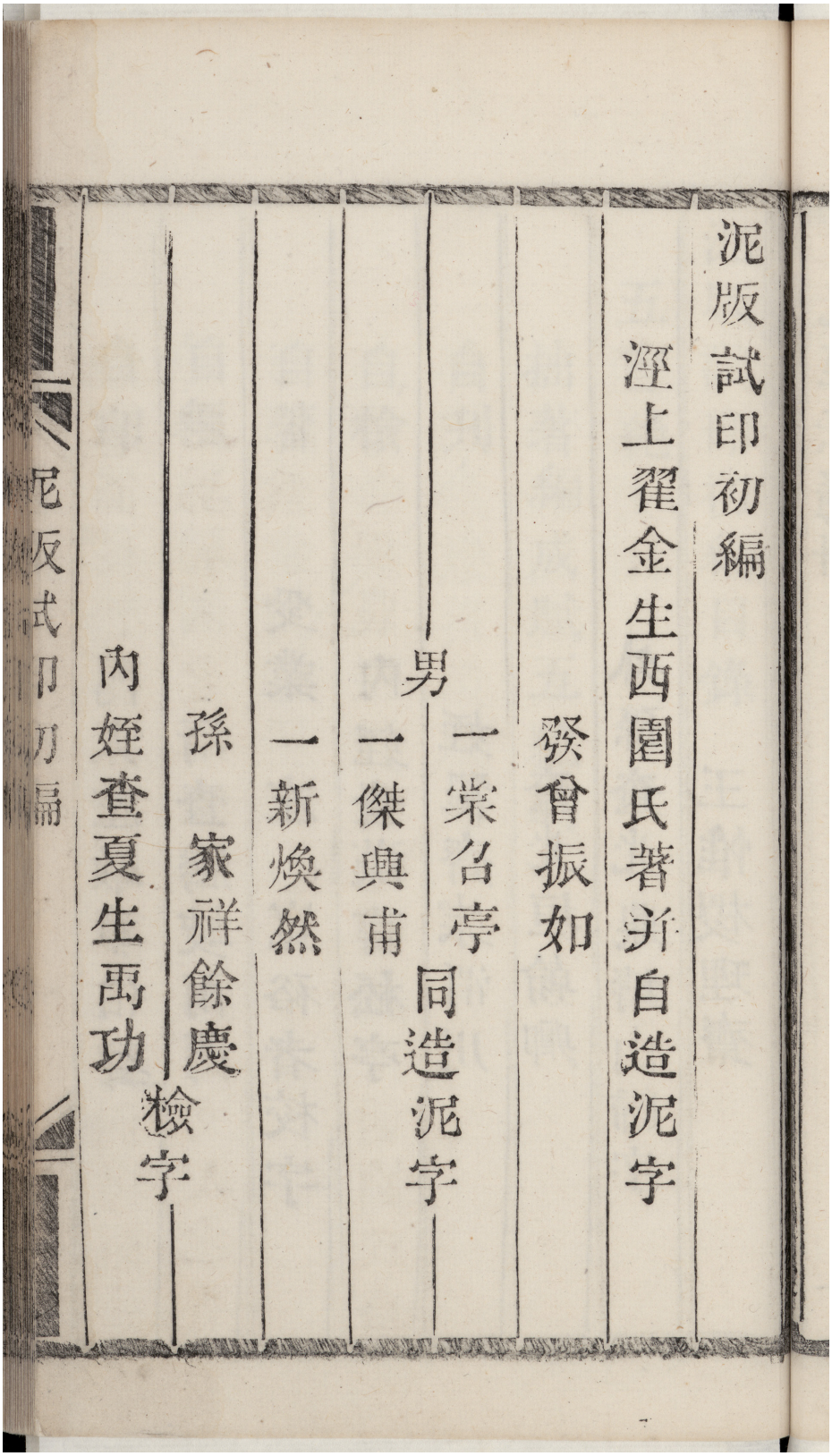


Figure 3.10
Pages 23 & 24 of *Hao An Xian Hua*, printed by Xu Zhiding in Zhen He Zhai.
Source: National Library of China.

Figure 3.11
The First Edition of Ceramic Version Trial Printing (泥版试印初编)printed with ceramic movable type by Zhai Jinsheng in 1844, Qing dynasty.
Source: National Library of China.



0 1 cm

Figure 3.12
Ceramic movable type by Zhai Jin Sheng. Top half of the image shows four different sizes of types and below image shows are the printed characters from the No. 1 types. Source: Courtesy of the Institute of History of Science, Chinese Academy of Sciences; Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 206.

Figure 3.13
Contents page of *Xian Ping Shu Wu Chu Ji Shi Lu* edited by Huang Jue Zi (黃爵滋) in 1847. Frame (border lines around the page) size: 12.5×17.5cm. Source: The Palace Museum, Beijing.

3.2 Wood type

Invention of wood type in the Yuan Dynasty (1271–1368)

When Bi Sheng used clay to make types, he also experimented with wood types. But he found that the grain of the wood was uneven, and wood absorbed moisture, eventually choosing clay to make types. However, ceramic types require the process of calcining the clay to harden types, which causes specific difficulties in terms of cost and technology. In contrast, wood types require similar materials to woodblock printing, such as pear wood, jujube wood or willow wood. As such, the material for wood types can be easily obtained, xylographers were familiar with engraving on wood.[31]

The earliest official use of wood type was by Wang Zhen, a scientist in the Yuan Dynasty and county magistrate of Jingde and Yongfeng County.[32] He spent ten years completing his famous book, *Nong Shu*, or Book of Agriculture with more than 100,000 written Chinese characters. After the completion of *Nong Shu*, he felt that the number of Chinese characters was extremely large and would be difficult to print using woodblock printing. In response, he invited engravers to create more than 30,000 movable wood types which took two years.[33] However, he did not use wood types to print his book because the carving of the text onto woodblocks was done before the completion of the wood types. Later, he printed 100 copies of *Records of Jingde County* (旌德县志), a book of more than 60,000 Chinese characters.[34] However, this book did not survive. Nevertheless, the experience of a successful trial production of the wood types was written as a summative article attached to the end of his book, *Nong Shu*, named 'A method of making movable wood types for printing books' (figure 3.14).[35]

In Wang Zhen's summary, he mentioned the method of making wood types. The first step is to write the characters on paper and leave appropriate space between them. Then paste the paper on a wood block and engrave the characters. Next, use a small saw to saw each type apart, and use a small knife to trim each wood type to the same size. From his description, it can be speculated that the letterform of characters on movable wood type would not be much different from that of xylography, but the spacing may be slightly loose since the reserved character spacing is often larger to make up for the lack of connective strokes, which helps to separate the movable type from the wood block. Wang Zhen not only summarised the method of producing wood types, but also a systematic arrangement of Chinese characters. 'A division is made of all characters into the five tones and into rhyme sections according to the official *Book of Rhymes*'.[36] To

31 Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 16.

32 Jingde (旌德) and Yongfeng (永丰) counties are now located in Anhui and Jiangxi provinces, respectively.

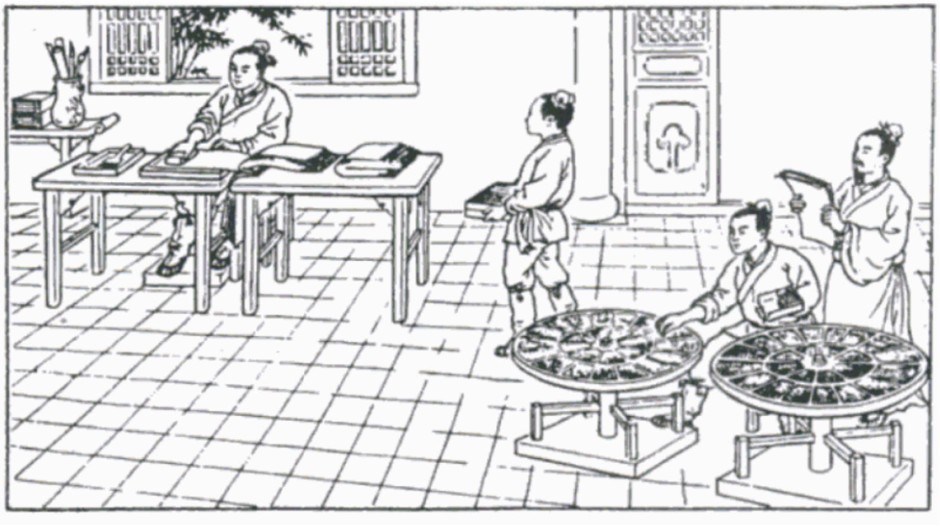
33 Zhang Xiumin, 1989, [Chinese Printing History], p. 673.

34 Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 18.

35 The translation of A method of making movable wood types for printing books can be found in Carter, 1925, *The invention of printing in China and its spread westward*, pages 162–166.

36 The five tones refer to the five traditional tones classes of ancient Chinese language. Original tex in Chinese: '先照监韵内可用数字，分为上、下平，上，去，入五声，各分韵头.' Wang Zhen, 1530, 造活字印书法 [A method of making moveable wooden types for printing books]. In: 农书 [Nong Shu]. 山东布政司刊本 [Edition of Shandong Bu Zheng Si], vol. 22. The translation refers to: Carter, 1925, *The invention of printing in China and its spread westward*, p. 163.

Figure 3.14
Processes of wooden movable type printing process in 1300.
Source: Original from Liu Kuo-Chun; Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of Science and Civilisation in China, p. 253.



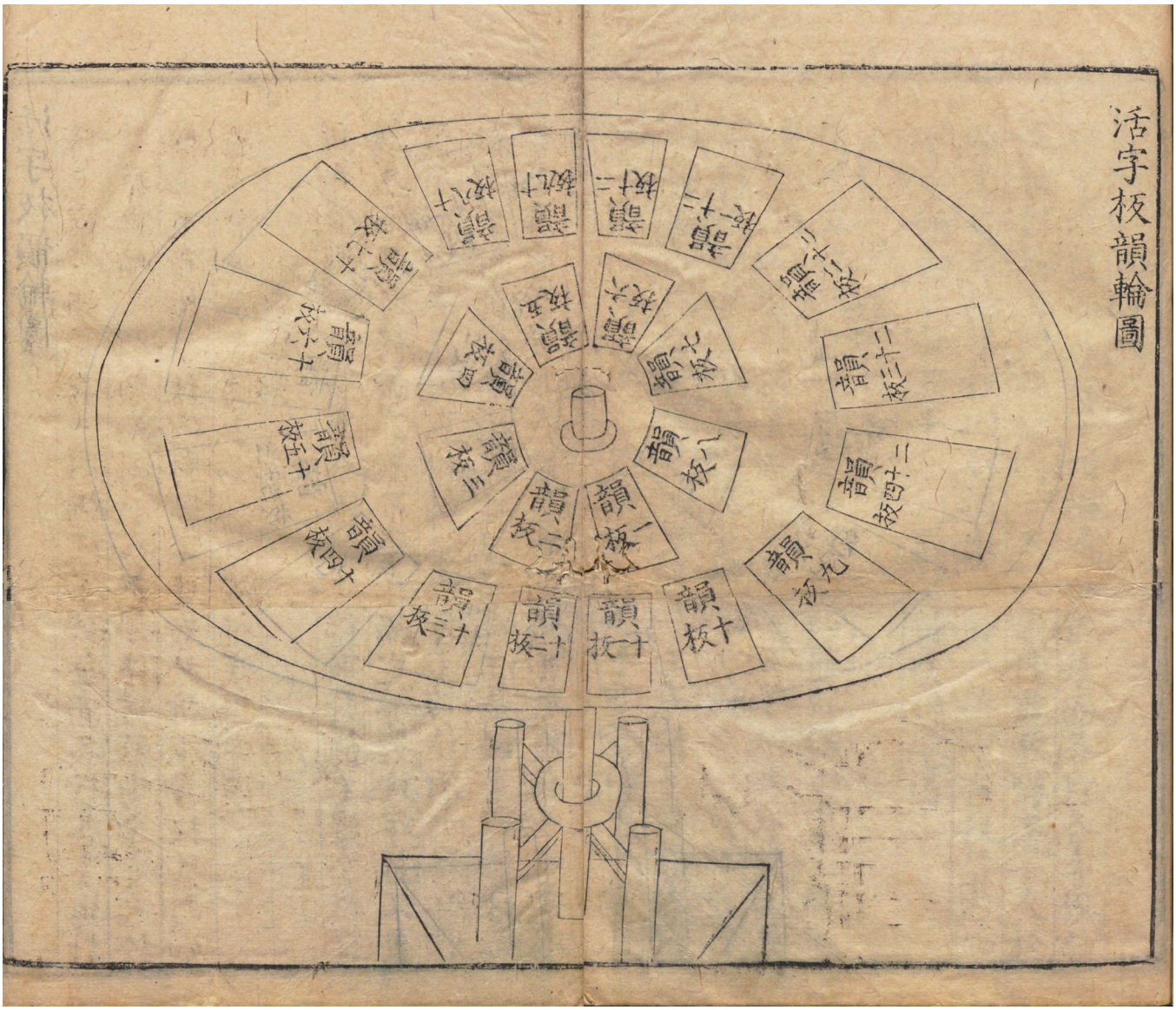


Figure 3.15
A revolving table typecase with individual movable type characters arranged primarily according to the rhyming scheme described in Wang Zhen's 1313 publication, *Nong Shu*. This version was engraved by Bu Zheng Si (布政司) from Shan Dong province (山东省) in 1530. Source: <shuge.org> (accessed on 10 March 2020)

reduce fatigue and improve the efficiency of compositors, he also invented the revolving table typecase (figure 3.15).

Movable wood type in the Ming (1368–1644) and Qing dynasties (established in 1636, ruled China proper in 1644–1911)

Wood types continued to be used and developed in later Chinese dynasties. After more than 300 years of experimentation and development, wood types became more prevalent during the Ming Dynasty. More than 100 books were printed, especially during the Wanli period (1573–1620).[37]

Of the works printed from wood types, one worth mentioning is *He Guanzi* (鹖冠子) (figure 3.16) printed in the Ming Dynasty. Since emperor Qianlong (1711–1799) mentioned it a great deal, and this edition was used as the base of the *Siku Quanshu* (四库全书), it was highly regarded by the official imperial publisher. In addition, during the Ming dynasty, *Dibao* (邸报), a type of publication issued by central and local governments in imperial China, began to be printed from wood types.[38]

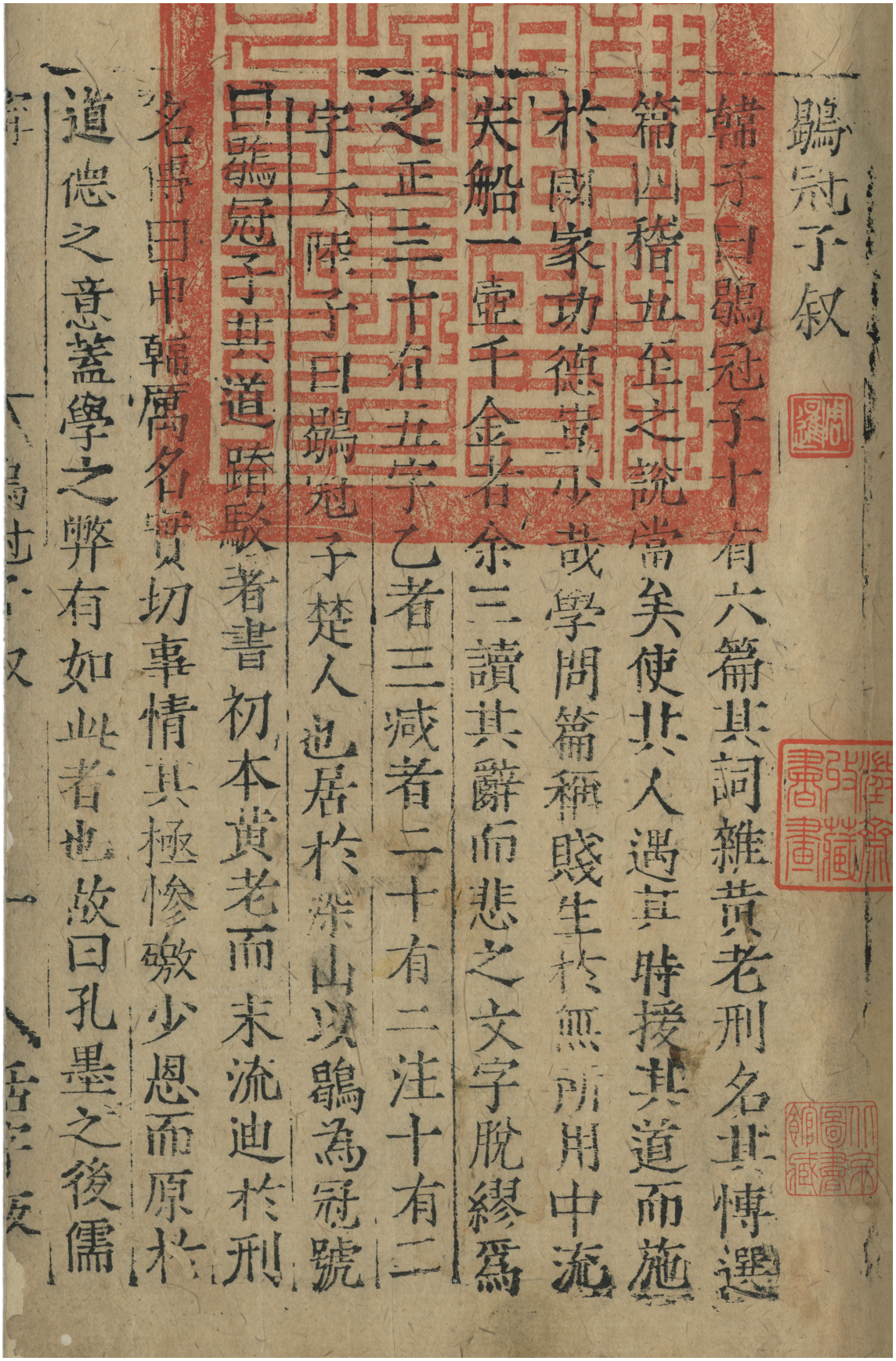
In 1733, on the order of emperor Qianlong, the *Qin Ding Wu Ying Dian Juzhen Ban Shu* (钦定武英殿聚珍版书) series of books were printed with 253,500 wood types made from jujube wood, and the name 'Huo Zi' (which means movable type, 活字) was changed to ' Juzhen'(which means 'gathering treasure,' 聚珍). This series of printed books was the largest existing wood type printing project in China at the time. Moreover, one book in this series, *Wu Ying Dian Juzhen Ban Cheng Shi* (武英殿聚珍版程式) (figure 3.17), outlines and summarises the results and experience of movable wood type printing since the Song and Ming Dynasties.[39]

The style of wood types in *Wu Ying Dian Juzhen Ban Cheng Shi* is inherited from the Song Ti style in contemporaneous woodblock printing. The typeface used in the text has two sizes: a larger and a smaller one. To adapt to the practicability of typesetting, the width of the larger typeface is more extensive than its length, while the smaller size is the opposite. This is done so that characters in the larger size can be set more readily in a vertical layout. Because the vertical column width is constant, if it is necessary to set more characters, the shape of character may be compressed vertically. Also, the contrast of strokes of the large is more prominent. On the other hand, the smaller size typeface is mainly used for explanatory text, such as comments. In order to keep the style consistent with the larger size and because the type size is so small, there is no visible contrast in stroke of the smaller typeface (figure 3.18).

37 Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 19. Zhang also mentioned in the page 20: [There are more than a hundred books with verified titles printed by movable wood type in Qing dynasty. Most of them were printed in the Wanli (万历, 1573–1620) period, and it is rare to find one printed before the Hongzhi (弘治, 1488–1505) period].

38 忆昔时邸报至崇祯十一年 (公元1638年) 方有活版，自此以前并是写本。 Recalling that until the eleventh year of Chongzhen, in 1638 when Dibao was printed in movable type; it was handwritten before. Written by Gu Yanwu (顾炎武) around 17th century in *Ting Lin Wen Ji* 亭林文集, vol. 3.

39 He Buyun, 1989, 中国活字小史 [The small history of Chinese movable type]. In: 活字印刷源流 [The origin of movable type printing], p. 76.

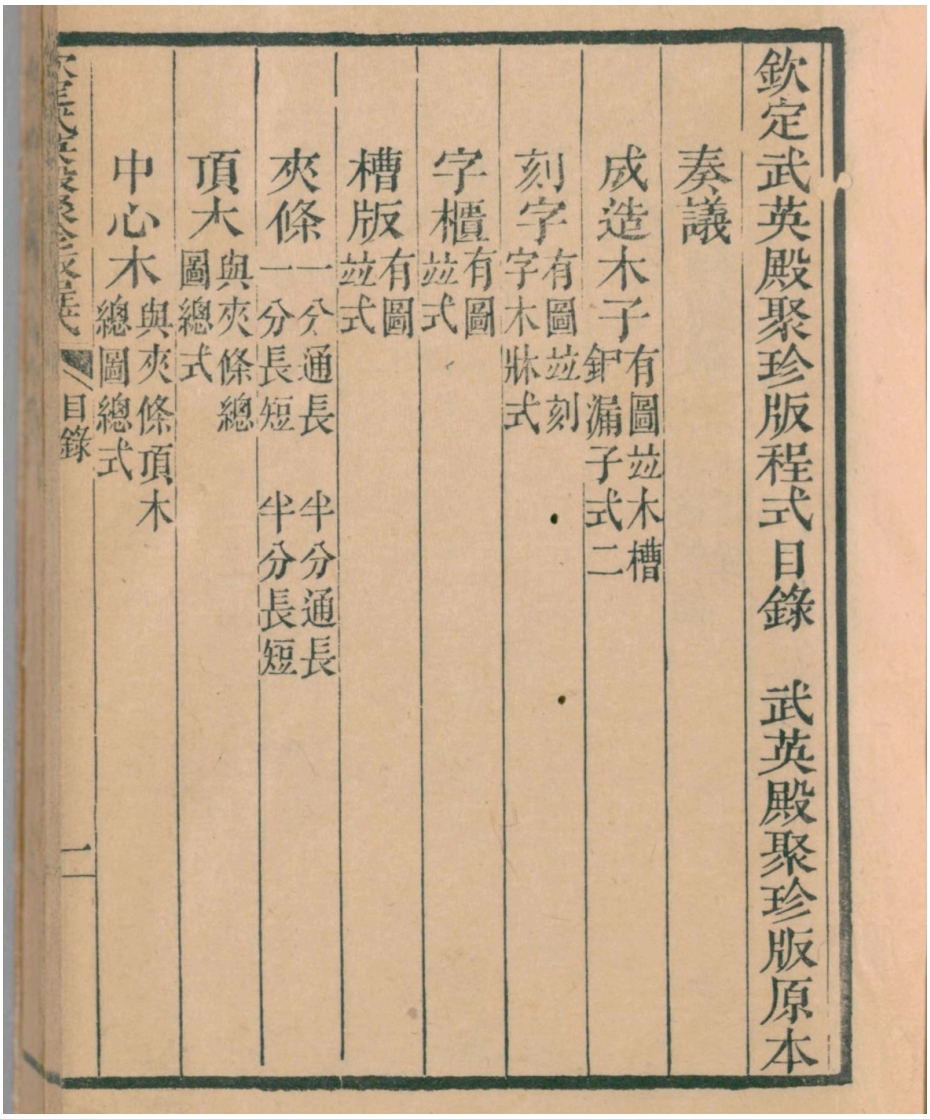

鶡冠子叙

鶡子曰鶡冠子十有六篇其詞雜黃老刑名其博選
篇中稽五至之說當矣使其人遇真時授其道而施
於國家功德豈小哉學問篇稱賤生於無所用中流
失船一壺千金者余三讀其辭而悲之文字脫繆爲
之正三十有五字乙者三減者二十有二注十有二
字云陸子曰鶡冠子楚人也居於深山以鶡爲冠號
曰鶡冠子其道賅駁者書初本黃老而末流迪於刑
名傳曰申韓厲名實切事情其極慘礉少恩而原於
一道德之意蓋學之弊有如此者也故曰孔墨之後儒

0 1 cm

Figure 3.16
Preface of *He Guanzi* (鶡冠子).
Source: National Library of China.

Figure 3.17
Processes of wood movable type printing in the *Wu Ying Dian Juzhen Ban Cheng Shi.*
Source: <shuge.org> (accessed on 15 March 2020)


欽定武英殿聚珍版程式目錄　武英殿聚珍版原本

奏議

成造木子有圖並木槽鉚漏子式二

刻字有圖並刻字木牀式

字櫃有圖並式

槽版有圖並式

夾條一分通長半分通長一分長短半分長短

頂木與夾條總圖總式

中心木與夾條頂木總圖總式

目錄　二

Figure 3.18
Contents page of the *Wu Ying Dian Juzhen Ban Cheng Shi.*
Source: <shuge.org> (accessed on 15 March 2020)

3.3 Early metal type

Invention of early movable metal type in China

Following the invention of ceramic and wood type printing, movable metal type printing appeared in China. The earliest mention of a metal used for making movable type was tin in Wang Zhen's *Nong Shu*, used probably before the Southern Song dynasty (1127–1279), but this was mostly experimental.[40] The appearance of Jiaozi (交子), a form of promissory note which appeared around the 11th century, proves that metal plate printing was in use since the Song dynasty (960–1279) (figure 3.19). However, there are different views on when the metal type originated. For example, a Chinese scholar, Pan Jixing (潘吉星) believes that Jiaozi is the combination of copperplate printing and copper type printing. The reason is that there are hollow blanks used for filling in with 'types' which can be seen on the plate (figure 3.20).[41]

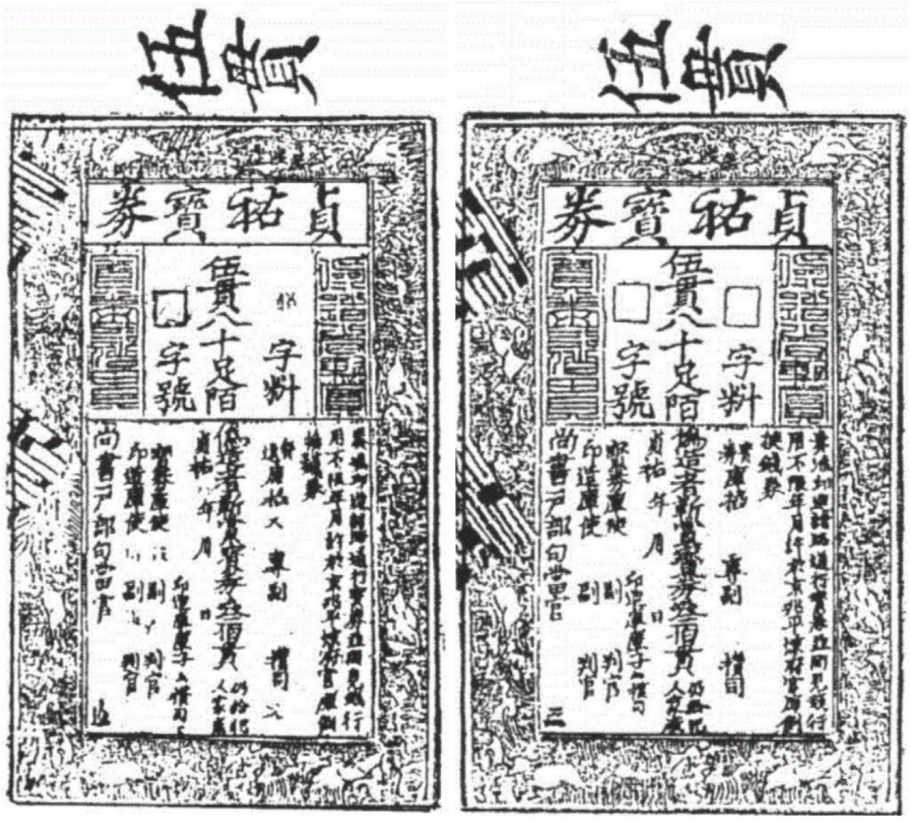


Figure 3.19
Rubbings of the Zhenyou Bao- quan which was cast around 1216. The left rubbing has a blank and a character 'You' (輶), but the right rubbing has two blanks for filling with 'type.' Source: Pan Jixing, 2000, 中国金属活字印刷技术史 [A history of movable metal-type printing technique in China], p. 42.

Figure 3.20
Copperplate of Zhenyou Bao- quan which is a kind of Jiaozi cast around 1216 in the Jin dynasty (1115– 1234). Source: <auction.artron.net> (accessed on 15 March 2020)

40 In more recent times (late 13th century), type has also been made of tin by casting. It is strung on an iron wire and thus made fast in the columns of the form, in order to print books with it. But none of this type took ink readily, and it made untidy printing in most cases. For that reason, they were not used for long. (近世又有铸锡作字，以铁条贯之作行，嵌于盔内界行印书。但上项字样，难于使墨，率多印坏。所以不能久行。) Recorded by Wang Zhen in his book, *Nong Shu* 农书.

41 Pan Jixing, 2000, 中国金属活字印刷技术史 [A history of movable metal-type printing technique in China].

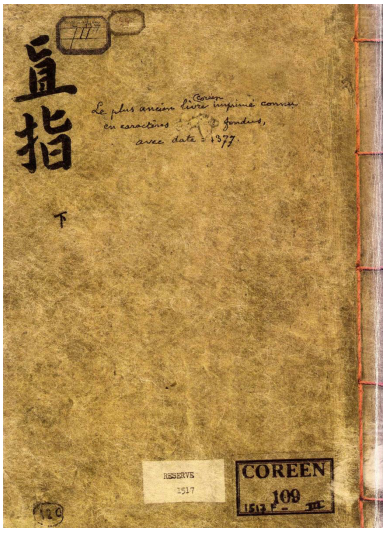


Figure 3.21
Cover of *Jikji*.
Source: Hiroshi Komiyama (private collection).

The world's oldest extant book printed with metal types is *Jikji* which is the abbreviated title of a Korean Buddhist document, *Baegun Hwasang Chorok Buljo Jikji Simche Yojeol* (불조직지심체요절, 佛祖直指心體要節),[42] printed in Hanja (Chinese characters in Korean pronunciation) during the Goryeo Dynasty in 1377 (figure 3.21). The title of *Jikji* can be translated as *Anthology of Great Buddhist Priests' Zen Teachings*.[43] There are two strong pieces of evidence to prove *Jikji*'s printing age and printing method. Firstly, there are several upside-down characters in *Jikji*, such as the character, '日' which proves the use of movable types (figure 3.22). Secondly, the text, '寺铸字印施', on page 39 of Jikji indicates that the movable types used were cast. There is also a date mark, '宣光七年丁巳,' which indicates the year of printing is 1377 (figure 3.23). The typeface style used in the Jikji is similar to Kai Ti style, which is close to handwriting since it maintains the ligatures found in writing. It is apparent that the technology was still in an experimental stage, and there is almost no improvement in the typeforms for movable type printing.

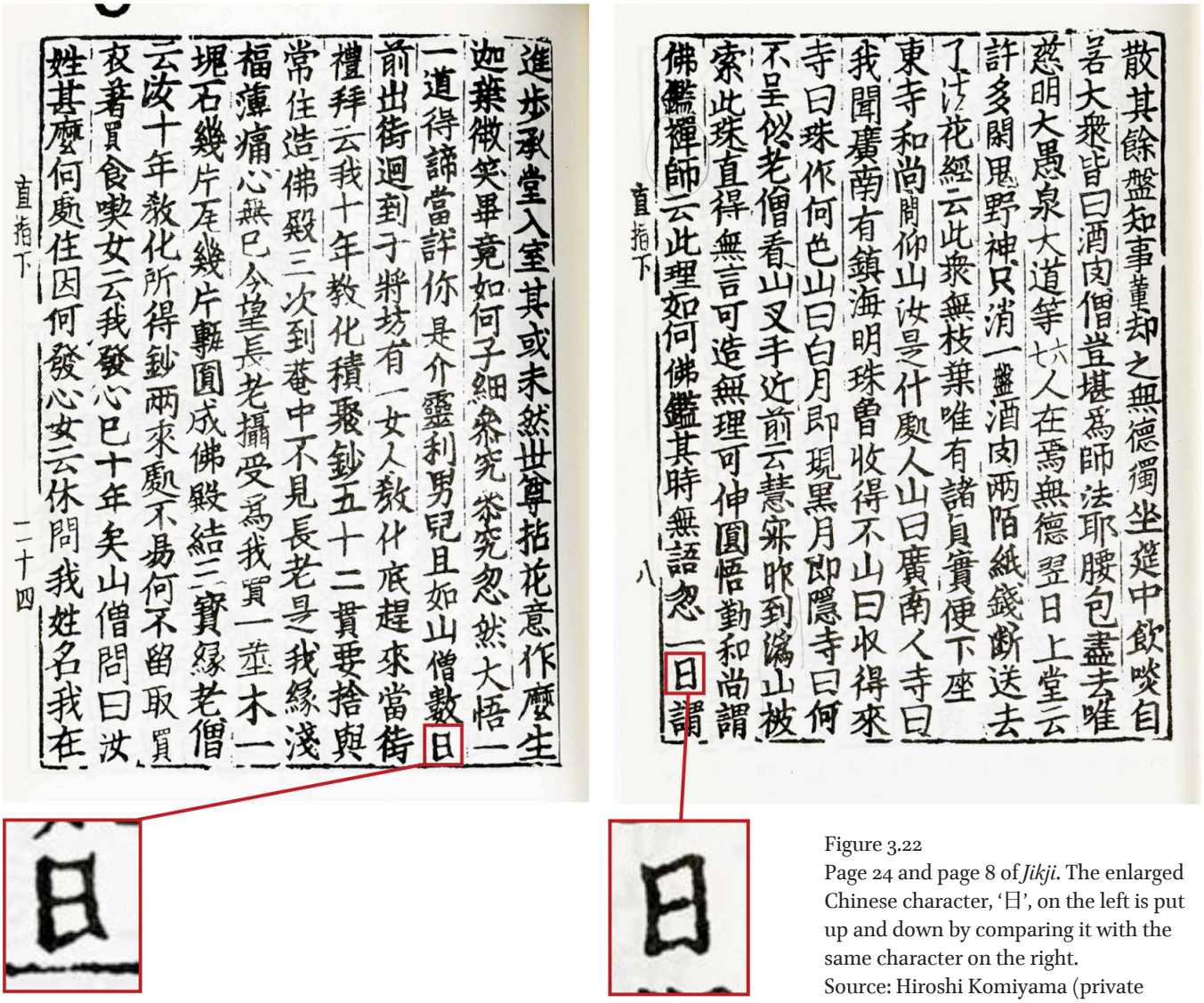
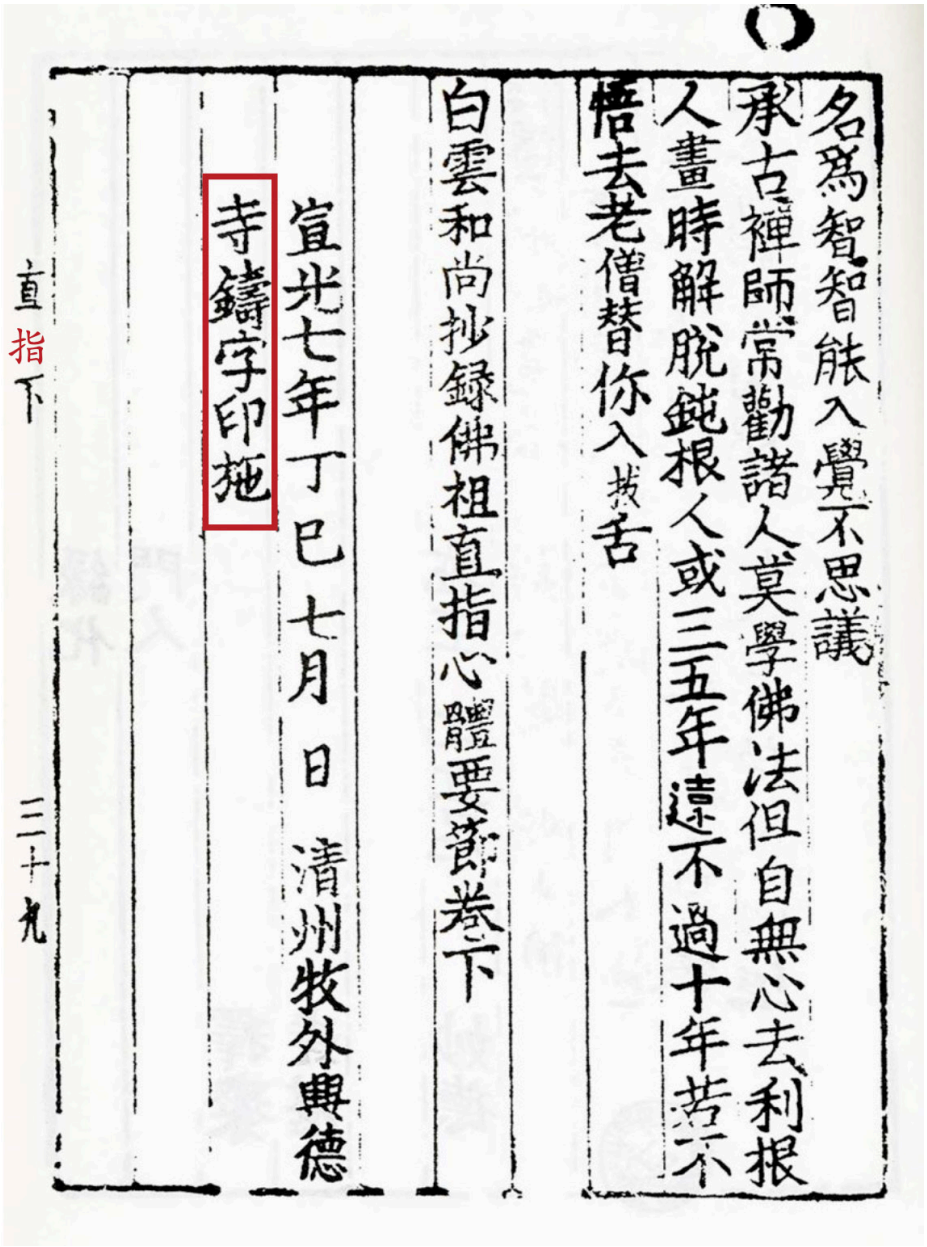


Figure 3.22
Page 24 and page 8 of *Jikji*. The enlarged Chinese character, '日', on the left is put up and down by comparing it with the same character on the right.
Source: Hiroshi Komiyama (private collection).

42 The revised romanization, Korean and Chinese are from wiki, <//en.wikipedia.org/wiki/Jikji>.

43 The translation is from Memory of the World, <unesco.org> (accessed on 10 October 2019).

Figure 3.23
Page 39 of *Jikji*. The information in the red box proves that the book was printed using cast types. And the Chinese character, '指', in red on the left, is a missing character.
Source: Hiroshi Komiyama (private collection).


名爲智智能入覺不思議
承古禪師常勸諸人莫學佛法但自無心去利根
人畫時解脫鈍根人或三五年遠不過十年若不
悟去老僧替你入拔舌

白雲和尚抄錄佛祖直指心體要節卷下

宣光七年丁巳七月日 清州牧外與德
寺鑄字印施

直指下 三十九

Early metal type in the Ming and Qing dynasties

Metal type printing began to be widely used in China in the late 15th century during the Ming dynasty. Many wealthy families in Jiangsu province printed with metal types. And the most famous amongst them are the Hua and An families.

One of the members of the Hua family, Hua Sui (华燧, 1439–1513) created metal types around 1490 to reduce the workload of handwriting.[44] Hui Tong Guan (会通馆, Studio of Mastery and Comprehension) was his printing house, and all books printed by him contain the name Hui Tong Guan. He printed 50 copies of *Song Zhu Chen Zou Yi* (宋诸臣奏议) in 1490 which is the earliest-known book printed using metal type in China. (figure 3.24) This and one other book, Xie Weixin's (谢维新) *Gu Jin He Bi Shi Lei Qian Ji* (古今合璧事类前集), used two sizes of copper types: large and small. Hua Cheng (华珵, 1438– 1514), uncle of Hua Sui, also made types for reprinting his collections. In 1502, he printed Lu Fangweng's (陆放翁) *Wei Nan Wen Ji* (渭南文集) and *Jian Nan Xu Gao* (剑南续稿), later than Hua Sui. Moreover, a nephew of Hua Sui, Hua Jian (华坚, fl. 1513–16) was another metal type printer of the Hua family, and the name of his printing house was Lan Xue Tang (蓝雪堂, Hall of Orchid and Snow).[45] One of his printed publications is *Yiwen Leiju* (艺文类聚) which is a Chinese leishu encyclopedia.

Equally famous as the Hua family is An Guo (安国, 1481–1534), who began to make metal types and print books around 1512. An Guo was a wealthy merchant and he had a printing house named Gui Po Guan (贵坡馆, House of the Cassia Slope). Around 1521, he printed *Dong Guang Xian Zhu* (东光县志), a book on local history, but it was lost. He also printed *Wu Zhong Shui Li Tong Zhi* (吴中水利通志) which related to water conservancy in 1524. In total, he issued at least 10 titles from 1516 until his death.[46]

In addition to the Jiangsu province, there were also books printed with metal type in the Fujian province (福建). The most notable book is an edition of *Mo Zi* (墨子) printed in blue ink in 1552 (figure 3.25).[47] There is an imprint, 'Zhi Cheng copperplate movable type' (芝城铜板活字) at the end of volume 8, which proves the use of metal type (figure 3.26).

In the Qing Dynasty, the Qing government not only had movable wood type but also made movable copper type 60 years earlier than the movable wood type. Of Qing printed works, the largest printing project during the Qing Dynasty was *Gujin Tushu Jicheng* (古今图书集成, *the Imperial Encyclopaedia*), which was printed with movable copper type between 1723 and 1728. In addition to Jiangsu, Zhejiang, and Fujian, as well as Beijing and Taiwan, movable metal type in the Qing dynasty was more extensive, and the geographical scale was larger that it was during the Ming dynasty. Also, the quality of carving was better than that of the Ming Dynasty (figure 3.27).[48]

Regarding the process of producing metal type in China, there are different records by later generations since there is no surviving type nor are there precise descriptions. Therefore, it still is uncertain whether metal

44 Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 31..

45 Tsien Tsuen-hsuin, 1985, Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, p. 213.

46 Ibid.

47 Zhang Xiumin, 1989, [A brief history of Chinese movable type printing], p. 34..

48 Ibid, p. 36..

types were directly cut, or cast.[49] Either way, it required great financial support. Expectedly, metal type in the Ming and Qing dynasties was produced only by the government or a few wealthy merchants. Due to economic constraints, metal type was not as popular or mainstream as wood type. Before the introduction of Gutenberg's mechanical movable metal type to China.

Conclusion

Although the earlist movable type technology can be attributed to China, the complexity of the Chinese writing system meant that the development of movable type technology based on Chinese characters occurred only intermittently. Movable type did not replace xylography before the introduction of Western methods of making metal type and the printing press.

What is of note is that a standard style of Chinese written characters had been finalised during the Tang Dynasty (618-907) called Kai Ti style.[50] Despite the invention of movable type, the Kai Ti style as a standard meant that there were specifications and conventions for Chinese written characters which movable type makers needed to adapt to. This standard also meant that early experiments of Chinese movable type were mainly based on the innovation of different materials used for the types, so as not to affect the forms, shapes, and strokes of Chinese characters.

49 Ibid, p. 41..

50 This view of the standard style of Chinese characters, Kai Ti, is discussed in chapter 2.4 Formation of Chinese writing and its evolution.

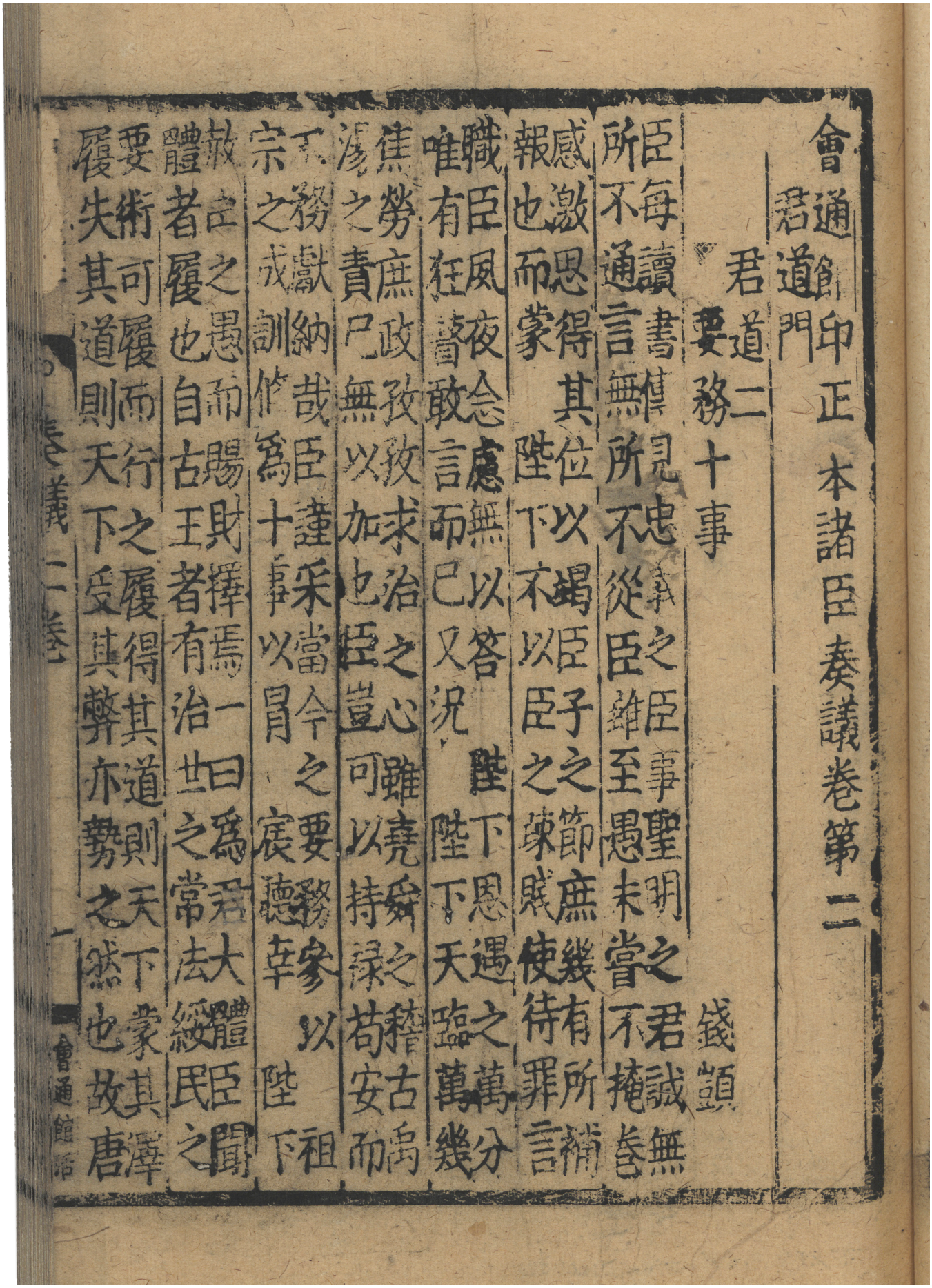

會通館印正 本諸臣奏議卷第二
君道門
君道二
要務十事
錢顗
臣每讀書傳見忠臣事聖明之義君誠無所不通言無所不從臣雖至愚未嘗不感激思得其位以竭臣子之節庶幾有所補陛下不以臣之疎賤使待罪言報也而蒙
職臣夙夜念慮無以答
陛下恩遇之萬分唯有狂瞽敢言而已又況
陛下天臨萬幾焦勞庶政孜孜求治之心雖堯舜之稽古禹湯之責己無以加也臣豈可以持祿苟安而不務獻納哉臣謹采當今之要務參以
祖宗之成訓條爲十事以冒
宸聽幸
陛下
敢言之愚而賜財擇焉一曰爲君大體臣聞
體者履也自古王者有治世之常法經民之要術可履而行之履得其道則天下蒙其澤履失其道則天下受其弊亦勢之然也故唐
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Figure 3.24
Volume 2 of the *Song Zhu Chen Zou Yi* (宋诸臣奏议).
Source: Tianyi Ge Museum, Ningbo, China.
0 1 cm

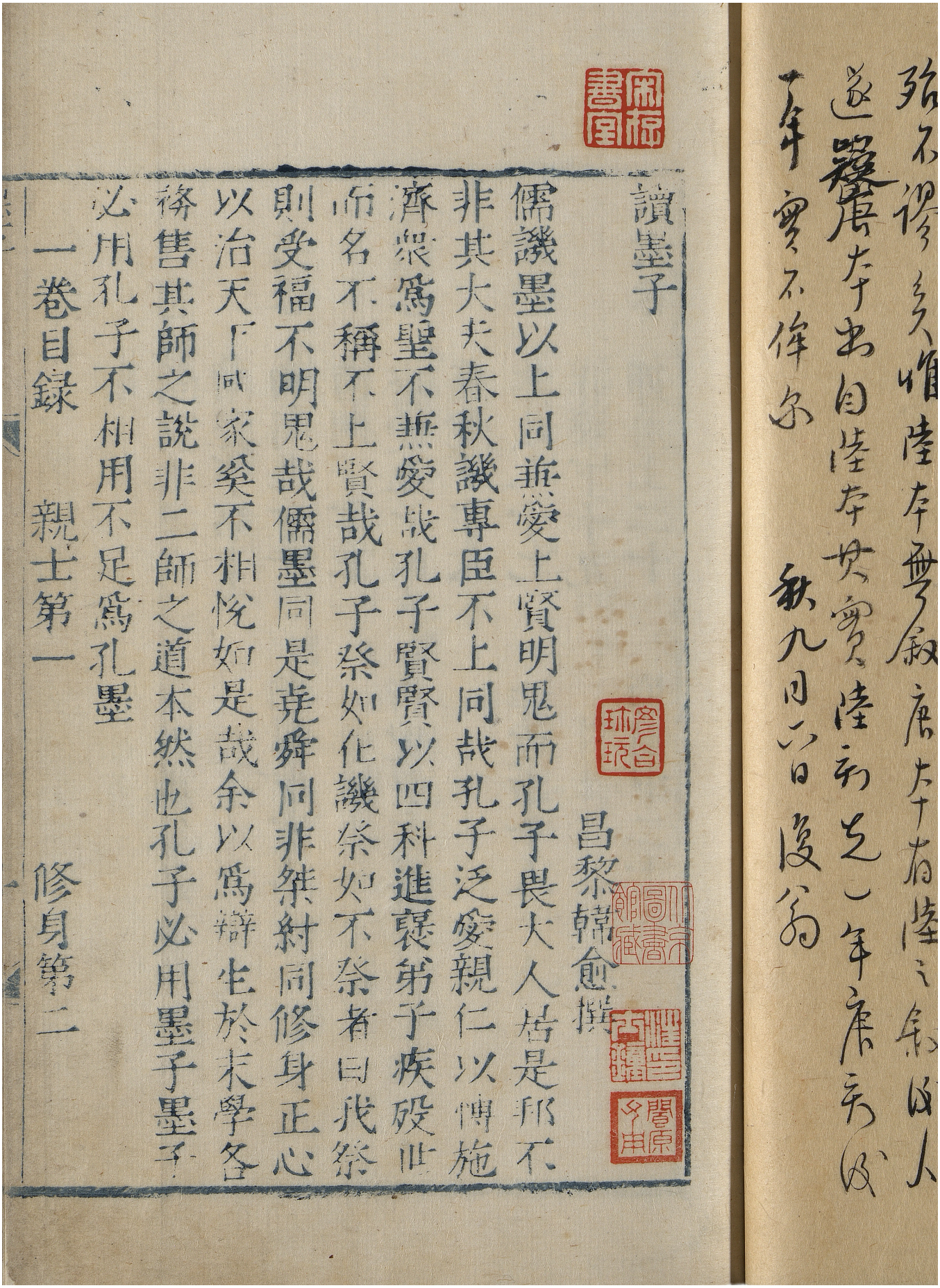


Figure 3.25
First page of an edition of *Mo Zi* printed in blue ink in 1552.
Source: National Library of China.

0 1 cm

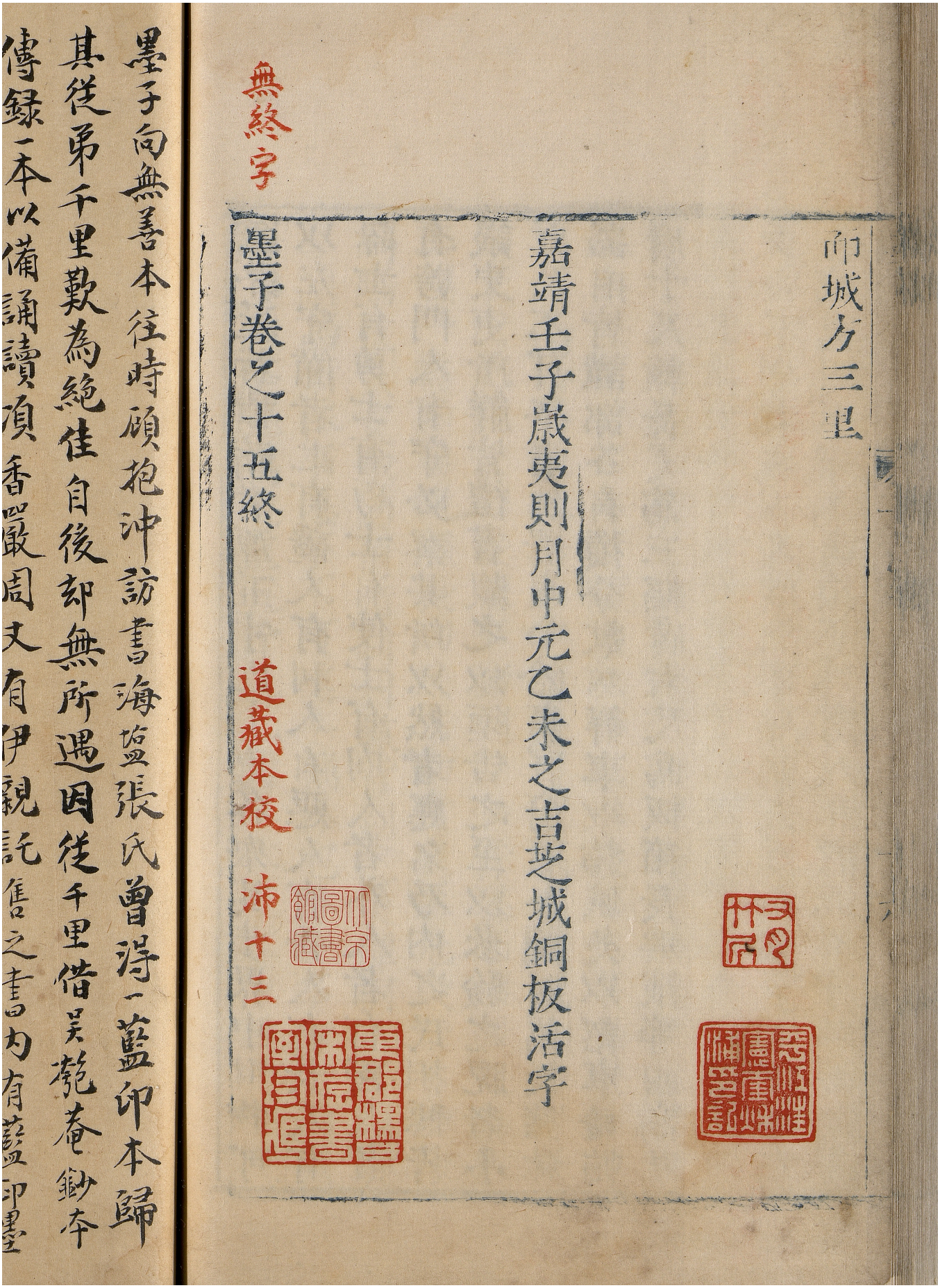
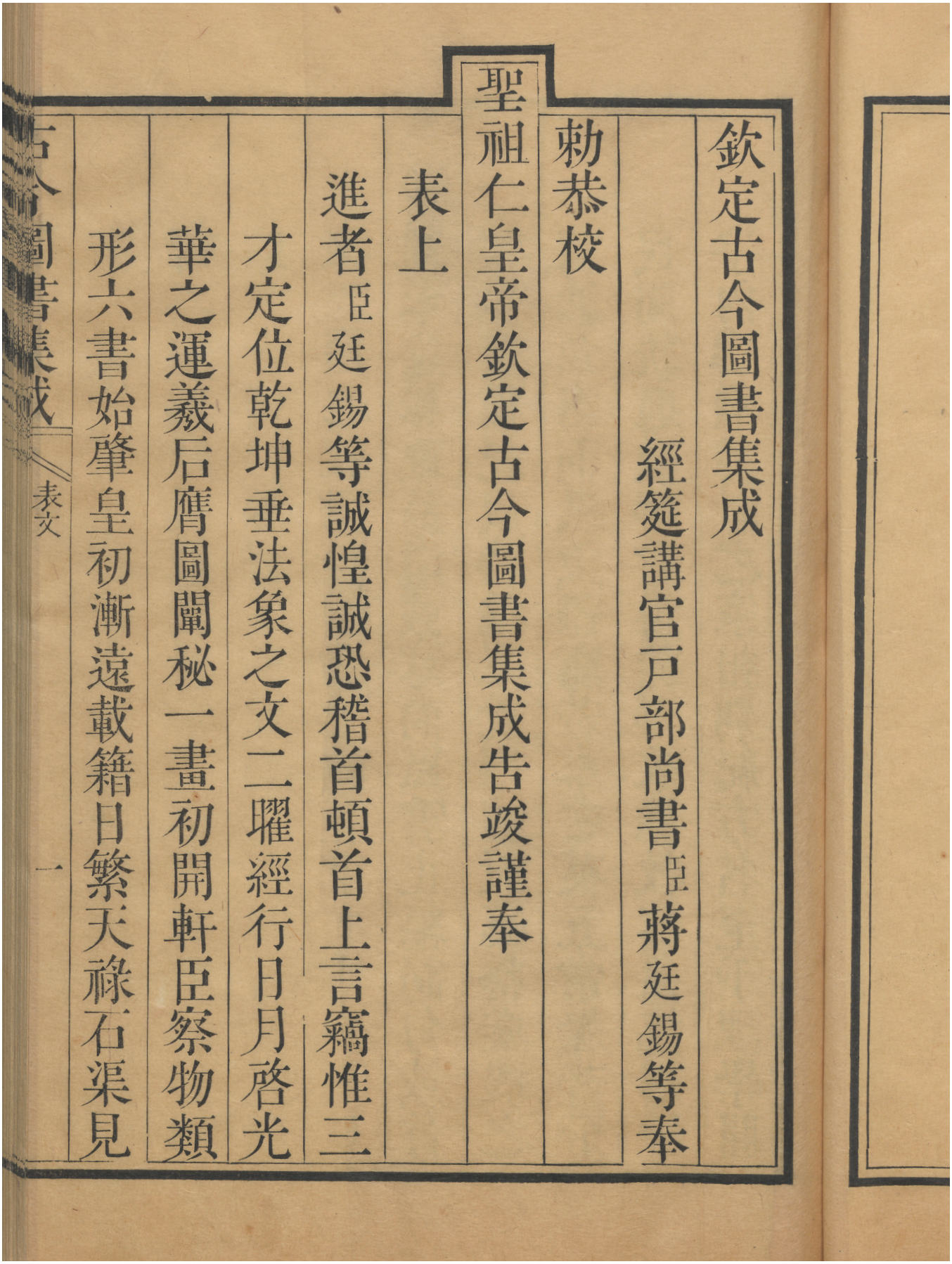


Figure 3.26
Last page of volume 15 of *Mo Zi* printed in blue ink in 1552.
Source: National Library of China.

0 1 cm



欽定古今圖書集成

經筵講官戶部尚書臣蔣廷錫等奉

勅恭校

聖祖仁皇帝欽定古今圖書集成告竣謹奉

表上

進者臣廷錫等誠惶誠恐稽首頓首上言竊惟三

才定位乾坤垂法象之文二曜經行日月啓光

華之運羲后膺圖闡秘一畫初開軒臣察物類

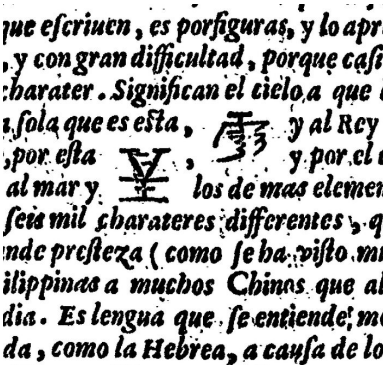
形六書始肇皇初漸遠載籍日繁天祿石渠見

古今圖書集成　表文　一

Figure 3.27
Title page of the *Gujin Tushu Jicheng*.
Source: National Library of China.

0 1 cm

Chapter 4. Chinese movable type in Europe


que eſcriuen, es porfiguras, y lo apr
, y con gran difficultad, porque caſi
charater. Significan el cielo, a que
ſola que es esta, 天 y al Rey
por esta 王, 主 y por el
al mar y 海 los de mas elemen
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nde preſteza (como ſe ha viſto m
ilippinas a muchos Chinos que a
dia. Es lengua que ſe entiende; m
da, como la Hebrea, a cauſa de lo

Figure 4.1
Chinese characters on the first page of the chapter on Chinese language in González de Mendoza's 1585 book. The first Chinese character is hard to identify, and the second one is '皇'. Source: <gallica.bnf.fr/ark:/12148/bpt6k75292n> (Accessed on 10 Dec 2022).

With the increasing cultural exchange between China and the West, Chinese characters have gradually entered Western consciousness with the publishing of *the History of the great and mighty kingdom of China* and the situation thereof by Juan González de Mendoza in 1585, which was the first best-selling book containing Chinese characters in Europe (figure 4.1). For Westerners who do not understand Chinese, the complexity of the Chinese language and character system presents a great challenge in the production and use of Chinese types. William Milne (1785–1822)[1] who played an essential role in making Chinese types, said when he was studying the Chinese language:

> Learning the Chinese language requires bodies of iron, lungs of brass, heads of oak, hands of spring steel, eyes of eagles, hearts of apostles, memories of angels, and lives of Methuselah.

Faced with such a tremendous challenge, European sinologists and movable type makers nonetheless produced many Chinese founts in Europe in the 18th century. This chapter investigates the development of Chinese movable type in Europe. It is divided into four parts according to the different adaptations of Chinese characters, made by Westerners, in order to fit Chinese with Western movable type technology. These are: Chinese movable type from the Imprimerie nationale; divisible Chinese movable types; constructed Chinese movable types; and other Chinese movable types in Europe. It is worth noting that this section focuses on the Chinese movable types produced in Europe, and the following section on the production of Chinese movable types by westerners in Asia.

4.1 Chinese types from the Imprimerie nationale

In the 18th and 19th centuries, with the support of the French government, the Imprimerie nationale produced many Chinese movable types that played an essential role in the printing of Chinese characters and the spread of sinology in Europe.[2] The printed effect of the Chinese founts by the Imprimerie nationale can be seen in the *Spécimen typographique de l' Imprimerie royale*.[3] Moreover, Leon De Rosny (1837–1914) also listed most of the Chinese founts that the Imprimerie nationale produced according to the size of type in the *Notice sur l'écriture chinoise et les principales phases de son histoire, comprenant une suite de spécimens de caractères chinois de diverses époques* published in 1854 (figure 4.2).

1 William Milne was the second Protestant missionary sent by the London Missionary Society to China. His contribution is discussed in detail in Chapter 6 Chinese movable type in Asia.

2 As a national institution, the Imprimerie nationale had different names at different times. It originated from the Imprimeurs du roi pour le Grec (royal Greek printers) founded by François I in 1543. After the establishment of the Imprimerie royale founded by Louis XIII of France in 1640, successive governments named it the Imprimerie de la République, then the Imprimerie impériale, the Imprimerie royale and finally the Imprimerie nationale. Therefore, various official documents found in the archives have different names for it, but always refer to the same institution. The name, 'Imprimerie nationale', is used uniformly in this article.

3 Refer to: <gallica.bnf.fr/ark:/12148/bpt6k10404972/f163.image>.

Figure 4.2
List of the Chinese founts produced in the Imprimerie nationale. Source: <play.google.com/store/books> (accessed on 16 Mar 2020).

que l'on rencontre, entr'autres, dans la grammaire d'Endlicher, sont aussi fort médiocres. Il paraît, du reste, qu'ils sont décomposables en un grand nombre d'éléments.

L'espace me manquant, je ne parlerai point des types de M. MARSHMAN, ni des autres usités en Asie et surtout dans les ports chinois ouverts aux Européens.

Nous mettons ici en regard quelques groupes des principaux corps de caractères chinois gravés en France, et qui font, pour la plupart, partie des types de l'Imprimerie impériale de Paris.

CARACTÈRES CHINOIS GRAVÉS SUR 24 POINTS,

SOUS LA DIRECTION D'ABEL-RÉMUSAT.

驩日始國便

CARACTÈRES CHINOIS GRAVÉS SUR 18 POINTS,

SOUS LA DIRECTION DE KLAPROTH.

Forme cursive.—Éléments mobiles.

鬸　　牲　　碾　　眍

Décomposition de ces mêmes caractères en éléments ou types séparables :

骨 易　　忄 生　　石 長　　目 瓜

CARACTÈRES CHINOIS GRAVÉS SUR 16 POINTS,

à *Li-ming-fou*, en Chine,

PAR LES SOINS DE M. STANISLAS JULIEN.

謝歃大筋處

CARACTÈRES CHINOIS GRAVÉS SUR 15 POINTS,

SOUS LA DIRECTION DE M. PAUTHIER.

Forme carrée.—Éléments mobiles.

1　2　3　4　5

木　各　艹　寺　國

1. clef latérale.—2. complément latéral.—3. clef supérieure.—4. complément inférieur.—5. groupe typographiquement indécomposable.

Figure 4.3
List of the 214 Kangxi Radicals in a fount imitating the original character shapes of the *Kangxi Dictionary*. Source: <en.wikipedia.org/wiki/Kangxi_radical> (accessed on 8 Mar 2020).

List of the 214 Kangxi Radicals　二百十四個康熙部首表

1 一丨丶丿乙亅
2 二亠人儿入八冂冖冫几凵刀力勹匕匚匸十卜卩厂厶又
3 口囗土士夂夊夕大女子宀寸小尢尸屮山巛工己巾干幺广廴廾弋弓彐彡彳
4 心戈戶手支攴文斗斤方无日曰月木欠止歹殳毋比毛氏气水火爪父爻爿片牙牛犬
5 玄玉瓜瓦甘生用田疋疒癶白皮皿目矛矢石示禸禾穴立
6 竹米糸缶网羊羽老而耒耳聿肉臣自至臼舌舛舟艮色艸虍虫血行衣西
7 見角言谷豆豕豸貝赤走足身車辛辰辵邑酉釆里
8 金長門阜隶隹雨青非
9 面革韋韭音頁風飛食首香
10… 馬骨高髟鬥鬯鬲鬼　魚鳥鹵鹿麥麻　黃黍黑黹　黽鼎鼓鼠　鼻齊　齒　龍龜　龠

40-point fount by Étienne Fourmont

Despite the challenging task of developing Chinese type, the Imprimerie nationale had already produced the first Chinese movable wood type by the 18th century. The project started in 1715 and lasted until the 1740s. It was mainly attributed to three people, Jean-Paul Bignon (1662–1743), Arcadio Huang (1679–1716) and Étienne Fourmont (1683–1745).

Jean-Paul Bignon was appointed to succeed to Seat 20 in the French Academy and charged to head the Bignon Commission.[4] By 1721, he had control of almost every official cultural institution in Paris.[5] It was Bignon who entrusted the project of developing Chinese type to Fourmont. However, Étienne Fourmont was a professor of Arabic and not understand Chinese when he was selected to preside over the project of making Chinese movable type. The reason was simply that there were no known European speakers of Chinese at that time, nor did any European academic institutions teach Chinese as a language of study.[6]

The factor that made this seemingly unfeasible project possible was the appearance of Arcadio Huang. He was a Chinese Christian convert born in Fujian province, who arrived in Paris on 31 October, 1702.[7] Beginning in 1706, Arcadio Huang was hired to help French researchers learn Chinese through the recommendation of Bignon. Later, Louis XIV of France appointed Huang as his Chinese translator, responsible for translating Chinese letters and beginning an inventory of Chinese works in the royal library. Undertaken with the assistance of Nicolas Fréret and Étienne Fourmont, his main contributions to the project involved the development of the first Chinese-French lexicon, the first Chinese grammar, and the dissemination of the system of 214 radicals in French (figure 4.3).[8] However, neither of Huang's works were published.

On 1 October, 1716, shortly after the Chinese type project started, Huang died of tuberculosis.[9] He left behind a lot of manuscripts on the history and grammar of Chinese characters in French, which played a vital role in the production of Chinese movable type. Notably, the introduction of the 214 radicals enabled Westerners to classify and organise tens of thousands of Chinese characters by radicals and stroke count. When Fourmont and Fréret heard about the 214 radicals of Chinese characters, they thought that it was equivalent to the Latin alphabet and far more than just a classification method.[10] Therefore, they took the existence of the radicals as a remarkable discovery as they felt that a shortcut to learning Chinese

4 Académie francaise 'Jean-Paul Bignon', <www.academie-francaise.fr/les-immortels/jean-paul-bignon>.

5 Mungello, 2019, *The Silencing of Jesuit Figurist Joseph de Prémare in Eighteenth-century China*. Rowman & Littlefield. p. 216.

6 Michela & Isabelle, 2019, 法国中文印刷与汉字活字 (18—19世纪) [French Chinese printing and Chinese movable type (18th–19th century)]. In: 法国汉学 [FRENCH SINOLOGY], 2019:18.

7 Xu Minglong, 1986, 中法文化交流的先驱黄嘉略——一位被埋没 二百多年的文化使者 [Arcadio Huang, the pioneer of Sino-French cultural exchanges – a cultural messenger buried for more than 200 years]. In: 社会科学战线 [Social Science Front], 1986:3, p. 244.

8 'The 214 radicals' is the most popular system used to index the traditional Chinese characters for Chinese dictionaries.

9 Leung, 2002, *Étienne Fourmont (1683–1745)*, vol. 13, Leuven University Press, p. 150.

10 App, 2011, *The birth of orientalism*, p. 191.

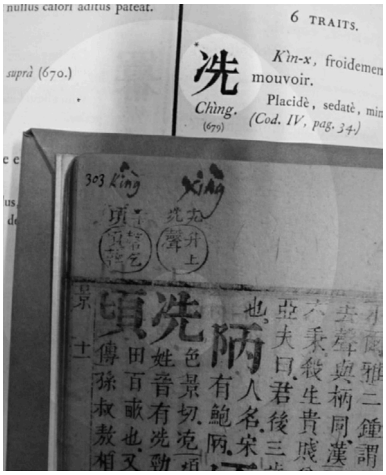


Figure 4.4
Comparison of the same Chi- nese character, '洗' in the *Dictionary of Chinese, French and Latin* in 1813 shown above and *Xie Sheng Pin Zi Jian* issued in 1677 shown below. Source: Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type].

Figure 4.5
Four Chinese characters cut on a wooden bar that has never been separated. Source: Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type].

characters had been found.[11] However, the 214 radicals was only one of the indexing systems for dictionaries to organise Chinese characters. Moreover, the Chinese writing system was not 'formed from its origin after a general system'; instead, it had evolved gradually from 'the necessity of inventing a sign to express some thing or some idea.'[12] Because two dictionaries used by Arcadio Huang, *Zihui* (字汇) and *Zhengzitong* (正字通), adopted the 214 radicals, he introduced it to Fourmont and Fréret.[13]

Nevertheless, this indexing system of Chinese characters played a infliential role in the production of the first Chinese fount in Europe. All types were arranged and stored according to the 214 radicals and the sides of each type were marked with the same numbers as in the Dictionary of Chinese, French and Latin printed in 1813 (figure 4.6).[14] It is a possibility that a numbering system for all Chinese characters following the 214 radicals could have been formulated and established at the beginning of the project in 1715. Then, even a compositor or engraver who did not understand Chinese could find the corresponding Chinese character according to its number.

However, the numbering system of Chinese characters alone was not enough for the Western engravers to make Chinese types. Fourmont's student, Joseph de Guignes mentioned that the model of Fourmont's Chinese types was *Xie Sheng Pin Zi Jian* (谐声品字笺) published in 1677, and two different fount sizes were taken from two different parts of the book (figure 4.8).[15] Comparing printed Chinese characters in the *Xie Sheng Pin Zi Jian* and the Dictionary of Chinese, French and Latin published in 1813 which used Fourmont's fount, the strokes are similar in shape and have sharp features (figure 4.4).[16] It can be speculated that *Xie Sheng Pin Zi Jian* was handed over to the copyists and after transcribing it, they handed it to the engraver. The engravers may have tried to imitate the model as much as possible, although there were still apparent errors. For example, some of the Chinese characters possess an incorrect structure, as the process would have been challenging for Western engravers. Fourmont's method of making Chinese types is similar to the traditional Chinese method of wood types that are directly engraved onto blank types. The difference is that French engravers first engraved several Chinese characters on a wooden bar and then cut them into separate types (figure 4.5).

In April 1730, Fourmont mentioned that 50,000 types had been engraved. By December 1744, the number of types had reached 120,000.[17] There were two sizes of engraved wood types, 40 and 24-point, most of the types in 40 point.[18] However, some types were not an exact match for 40

11 Fréret's manuscript, The Paris Observatory Library, number B2-1; Xu Minglong, 1986, [Arcadio Huang, the pioneer of Sino-French cultural exchanges], p. 251.

12 Klaproth, 1828, 'Sur les Clefs chinoises.' *Nouveau Journal Asiatique* 1, pp. 233–27; App, 2011, *The birth of orientalism*, p. 191.

13 Zihui is a Chinese dictionary edited by Mei Yingzuo (梅膺祚) in 1615. Zhengzitong is the other dictionary as a supplement to Zihui initially published in 1627 by Zhang Zilie (张自烈).

14 The Dictionary of Chinese, French and Latin in French is the Dictionnaire chinois, français et latin; Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type].

15 De Guignes, 1787, *Essai historique sur la typographie orientale et grecque de l'imprimerie royale*;

16 The original French title of *Dictionary of Chinese, French and Latin is Dictionnaire chinois, français et latin.*

17 Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type].

18 1 point (l'Imprimerie nationale) = 0.39877 mm. Source: Mosley, 1997, French academicians and

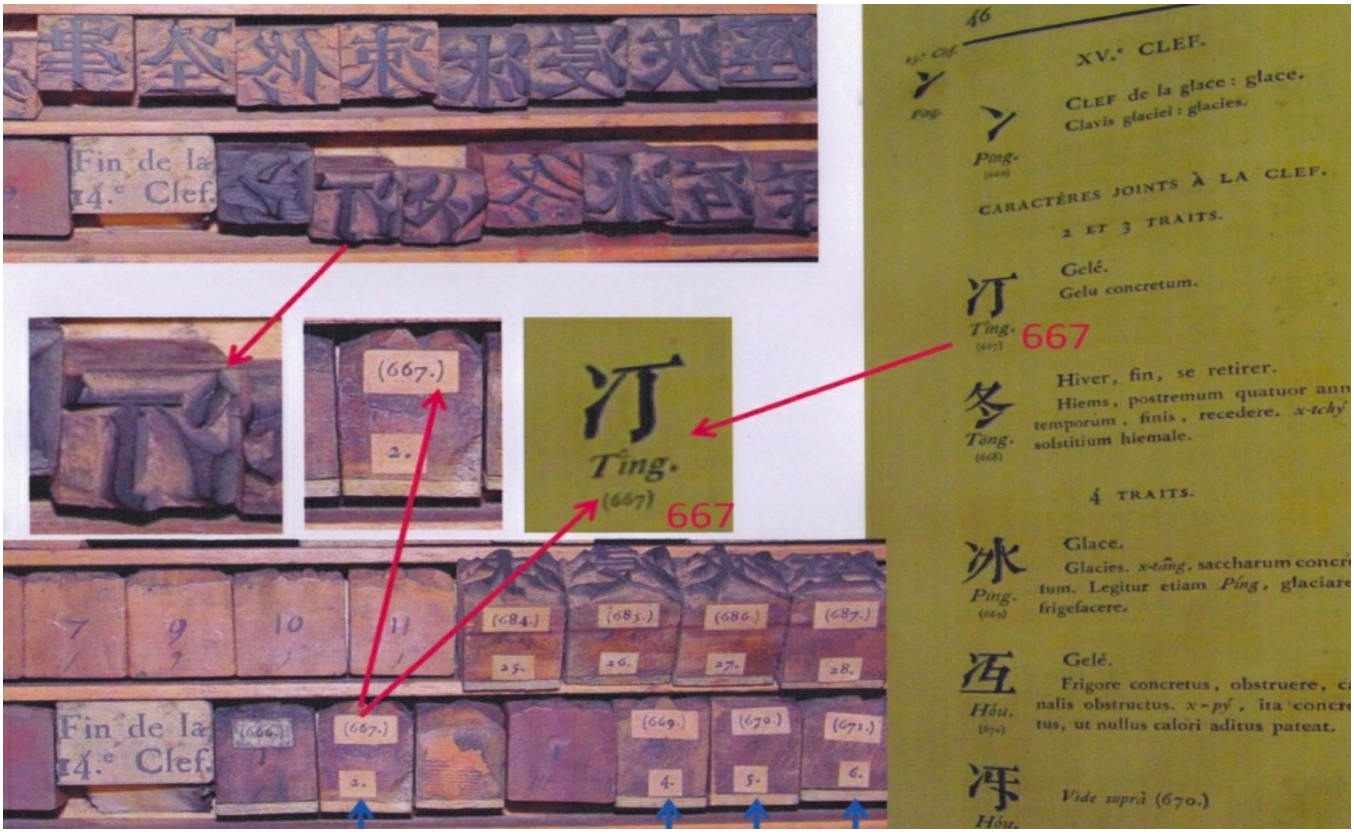


Figure 4.6
Comparison of the numbering system of the *Dictionary of Chinese, French and Latin* printed in 1813 and Fourmont's types.
Source: Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type]

Figure 4.7
Wood types in different sizes.
Source: Hiroshi Komiyama (private collection).

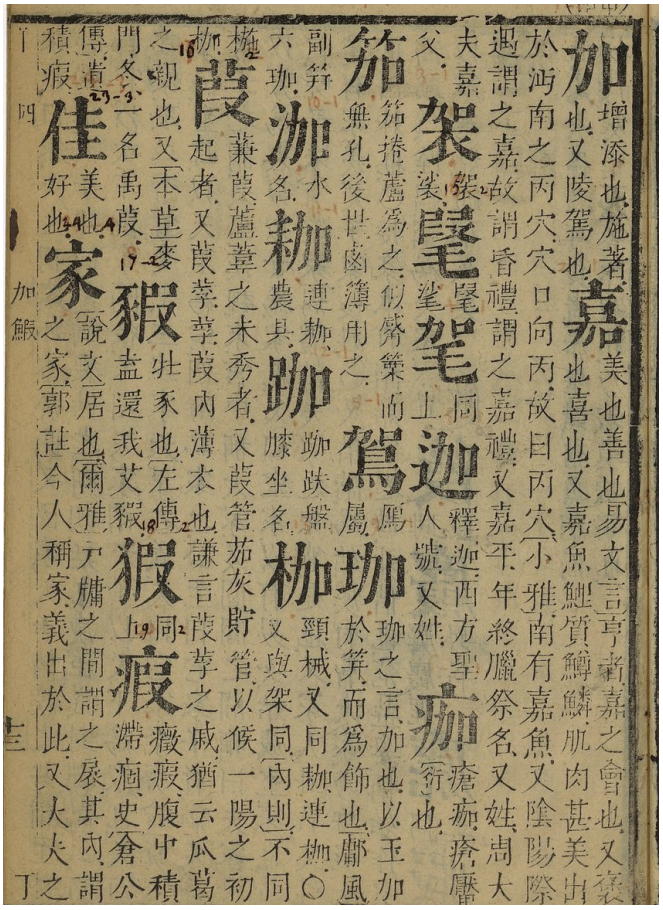


Figure 4.8
A page of *Xie Sheng Pin Zi Jian* issued in 1677.
Source: <gallica.bnf.fr/ark:/12148/btv1b52506737f/f79.image> (accessed on 12 Mar 2020).

Figure 4.9
'List of Chinese Emperors,' page 441 of *Réflexions critiques sur les histoires des anciens peuples* in 1735.
Source: <gallica.bnf.fr/ark:/12148/bpt6k6523751m/f455.item> (accessed on 16 Mar 2020)

Figure 4.10
Page 14 of *Meditationes Sinicae* in 1737. Source: <play. google. com/store/books> (accessed on 16 Mar 2020).

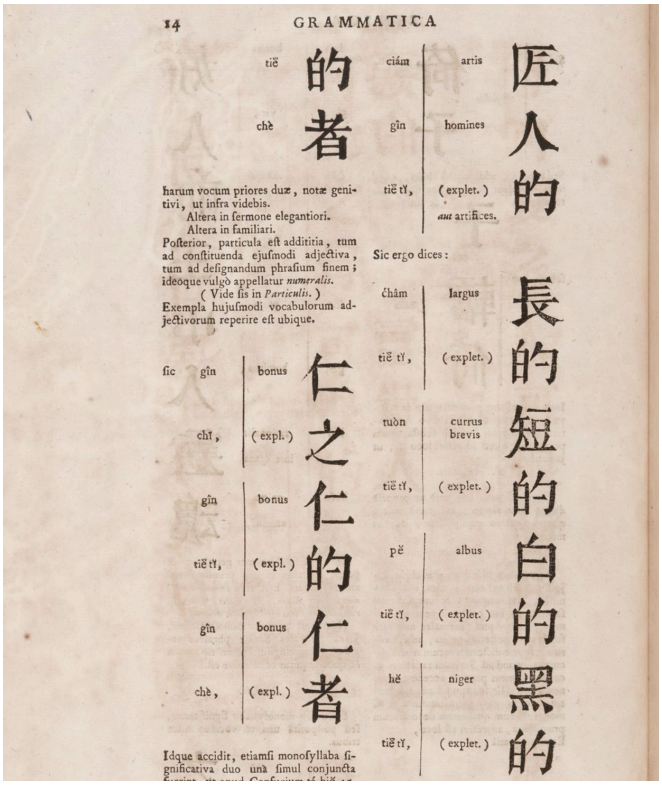


Figure 4.11
Page 14 of *Linguae Sinarum mandarinicae hieroglyphicae grammatica duplex* in 1742.
Source: <gallica.bnf.fr/ark:/12148/bpt6k10403892> (accessed on 16 Mar 2020)

point, and different types showed different sizes (figure 4.7).

Fourmont used this fount mainly for three works: 'List of Chinese Emperors' from *Réflexions critiques sur les histoires des anciens peuples* in 1735, *Meditationes Sinicae* in 1737 and *Linguae Sinarum mandarinicae hieroglyphicae grammatica duplex* in 1742 (figure 4.9, 10 & 11).[19] After Fourmont's death in 1745, printing using his type was temporarily suspended, and Joseph de Guignes inherited Fourmont's types. Then in 1805, this fount was used again when printing the Chinese version of the *Oratio Dominica* (figure 4.12).[20] Chrétien-Louis-Joseph de Guignes, son of Joseph de Guignes also used Fourmont's fount in the *Dictionary of Chinese, French and Latin* in 1813, and more Chinese types were added to the fount produced by Fourmont from 1715 to 1746. The supplementary movable types were engraved by Delafond from 1732 to 1813.[21]

Although Fourmont's fount had *Xie Sheng Pin Zi Jian* as its template, copyists and engravers were all non-Chinese speakers and did not understand the culture conventions of Chinese characters. Therefore, this is a Chinese fount that strips away Chinese aesthetics and simply imitates the shapes of Chinese characters. In terms of functionality, because the size of 40 point is large, it is only suitable for books such as dictionaries, which limits its use. However, the aim of this Chinese fount project was not to consider printing and communication but to gain a sense of accomplishment and to garner accolades. Despite these shortcomings, this Chinese fount made by Westerners is a significant cross-cultural attempt in type history.

24-point fount by Jean-Pierre Abel-Rémusat and Delafond

Jean-Pierre Abel-Rémusat (1788–1832) was the first Chair of Sinology at the Collège de France in 1816. He talked about the dilemma of printing Chinese characters in Europe in 1811, which had previously affected the spread of Chinese knowledge in Europe and hindered China's progress. He used a list comprising the Chinese emperor's era, temple, first and last names as an example. These terms are essential for studying Chinese history and the marking of time in imperial China, but they were not printed because they required an excessive amount of different Chinese characters.[22]

After becoming the chair of sinology, Rémusat began to produce a new Chinese fount of 24 point in order to fulfill all the Chinese characters required for printing the original Chinese version of *Doctrine of the Mean* (中庸). Rémusat's types were originally made of wood and employed in the *Doctrine of the Mean* published in 1817, which was the earliest European specimen of Chinese typography (figure 4.13).[23] However, when he typeset his new work, *Les élémens de la grammaire chinoise*, in 1822, types were

modern typography: designing new types in the 1690s. *Typography papers,* no. 2, pp. 5–29.

19 Stahl, 2010, 西汉字, 东字母 [Western Hanzi, Eastern Alphabet] (Ph.D. Thesis, Central Academy of Fine Arts), p. 134.

20 Michela & Isabelle, 2019, [French Chinese printing and Chinese movable type].

21 Imprimerie royale, 1845, *Spécimen typographique de l'Imprimerie royale*.

22 Abel-Rémusat, 1811, *Essai sur la langue et la littérature chinoises: avec cinq planches, contenant des textes chinois, accompagnés de traductions, de remarques et d'un commentaire littéraire et grammatical. Suivi de notes et d'une table alphabétique des mots chinois.*

23 Griffiths, 1822, *The Monthly review*, p. 470.

Figure 4.12
A page of the *Oratio Dominica* in 1805. The 3rd character in the left-hand colum, '国', is placed upside down. Source: Library of Congress.

re-engraved because of the insufficient character set (figure 4.14).[24] With funding from the French government, Rémusat specially hired an engraver, Delafond, to cut new Chinese characters and make matrices based on the original wood types (figure 4.15). The result was a total of 1,400 Chinese characters.[25]

For Rémusat, Fourmont's method of engraving types by imitating the shape of Chinese characters in Chinese books was appropriate. However, the quality of the fount was not high as printed Chinese characters have different sizes. Besides, the thickness of the strokes of the Chinese characters are uneven; and the proportion of some characters appear unbalanced. Rémusat's method for designing types may also have been similar to Fourmont's, which engraved Chinese characters for movable type by imitating the shape of Chinese characters in printed Chinese books.[26]

Nevertheless, Rémusat's new fount received acclaim, including from Robert Morrison (1782–1834).[27] In a letter to George Thomas Staunton (1781–1859), Morrison stated that he could not tell whether the printed characters in Rémusat's *Chinese Grammar* were engraved or cast. In 1829, a group of Chinese scholars were deeply attracted to the new fount when they visited Paris, and they praised this method of making movable type.[28]

4.2 Divisible Chinese movable types

18 point fount by Heinrich Julius Klaproth and Delafond

The most considerable difficulty in printing Chinese characters has always been the number of characters, because the relative number of frequently-used Chinese characters is around 5,000. If types for printing a book are needed for a specific subject, such as botany, zoology, or medicine, there would be hundreds of extra types that cannot be provided by a standard fount. Moreover, if it is a relatively complete Chinese character set, more than 10,000 types would be required. This meant that it would be difficult and complicated to produce, use and store these movable types.

In order to solve this problem, Parisian scholars, Rémusat and Heinrich Julius Klaproth (1783–1835) tried to divide the Chinese characters into separate elements and to combine the component parts to form distinct whole characters. In 1830, they tried printing with these new, divisible, types. To demonstrate the technique, they also printed the components of the Chinese characters.[29]

The design approach of Klaproth's types was similar to that of Rémusat's 24 point and Fourmont's 40 point fount, which modelled the shape of Chinese characters from existing Chinese books collected in the Imprimerie nationale. The difference is that Klaproth's fount imitated Kai Ti style,

24 Hiroshi Komiyama, 2017, 小宮山博史的活字百宝箱 [Mr Hiroshi Komiyama's treasure chest of movable type], 2017:6.

25 Abel-Rémusat, 1857, *Élémens de la Grammaire chinoise*, p. xxiv.

26 Stahl, 2010, [Western Hanzi, Eastern Alphabet], p. 136.

27 Robert Morrison was the first missionary to China officially sent from the London Missionary Society.

28 Lundbaek, 1992, Notes on Abel Rémusat and the Beginning of Academic Sinology in Europe; Stahl, 2010, [Western Hanzi, Eastern Alphabet], p. 136.

29 Imprimerie royale, 1830, *Album typographique de l'Imprimerie royale: exécuté pour LL. MM.* Siciliennes.

l'oiseau *s'envole aussitôt; puis, ayant plané, en regardant par-tout* avec attention, il revient se poser *à sa place*. Les traducteurs Mandchous ont rendu ce passage par ces mots :

.. ᠪᠣᠣᠴᠠᠨ ᠪᠣᠣᠪᠠᠨᠠᠪᠠ ᠪᠣᠣᠴᠠᠨ ᠪᠣᠣᠪᠠᠨᠠᠪᠠ ᠪᠣᠣᠴᠠᠨ ᠪᠣᠣᠪᠠᠨᠠᠪᠠ

qui signifient littéralement : *Apparentiæ — statim — volat — scrutata — pòst — sistit.* Assurément, dans cet exemple, les formes grammaticales ajoutées par les Mandchous, n'aident en rien à l'intelligence du sens. Remarquez que cette phrase, dans l'original, ne tient ni à ce qui précède ni à ce qui suit, et que, pour la faire entendre, les traducteurs devoient nécessairement exprimer le sujet, et spécifier les circonstances qui déterminent l'oiseau à s'envoler.

Lir. XV, tch. 10. Voici un autre passage du même ouvrage, que son extrême concision rend obscur :

顏淵問爲邦。子曰。
行夏之時。乘殷之
輅。服周之冕。樂則
韶舞。放鄭聲。遠佞
人。鄭聲淫。佞人殆。

Yan-Youân

Figure 4.13
Page 16 of *Doctrine of the Mean* published in 1817.
Source: <books.google.co.uk> (accessed on 18 Mar 2020).

vement le rapport d'attribution, de propriété, d'appartenance. Quelquefois il est indifférent d'exprimer *tchî* ou de le sous-entendre. On dit également :

命 *ming*, mandatum. 天 *thiân* cœli ou 命 *ming*, mandatum. 之 *tchî* (n. g.) 天 *thiân* cœli

« L'ordre du ciel. »

82. Généralement on doit mettre *tchî* toutes les fois que l'un des termes, antécédent ou conséquent, étant composé ou complexe, il est nécessaire d'en marquer la séparation, pour éviter l'amphibologie. Ainsi l'on dira :

道 *taó*, via. 之 *tchî* (n. g.) 學 *hiŏ* studii 大 *taï* magni

« La voie de la grande étude (ou de la philosophie politique). »

始 *chì*, initium. 仁 *jin* humanitatis 善 *chén* virtutum 之 *tchî* (n. g.) 孝 *hiáo* pietas
義 *i* justitiæque 之 *tchî* (n. g.) 源 *youân* fons 百 *pĕ* centum
之 *tchî* (n. g.) 宗 *tsoûng* principalis 衆 *tchóung* omnium 行 *hîng* actionum

« La piété filiale *est* la source des *bonnes* actions, la plus illustre des » vertus, et le commencement de l'humanité et de la justice. »

命 *ming*, mandatum 明 *ming* clarum 之 *tchî* (n. g.) 天 *thiân* cœli

« Le brillant ordre du ciel (la providence). » [Cf. 97, 235, 241.]

83. Le substantif, sujet d'un verbe quelconque, ou complément d'un verbe actif, ne prend aucune marque particulière. Le premier se place avant, et le second après le verbe. Cette règle ne souffre presque pas d'exception [Cf. 157]:

善 *chén* virtutem. 好 *háo* amat 王 *wâng* rex

« Le roi aime la vertu. »

84. Le terme d'une action se marque par des prépositions diffé-

Figure 4.14
Page 41 of *Chinese Grammar* in 1822.
Source: <books. google.co.uk> (accessed on 18 Mar 2020).

CARACTÈRES CHINOIS.

VINGT-QUATRE POINTS.

之達道也。節致中和。天地位焉。萬物
中也者。天下之大本也。和也者。天
之未發。謂之中。發而皆中節。謂之和。
恐懼乎其所不睹。莫見乎隱。莫顯
乎微。故君子愼其獨也。節喜怒哀樂
非道也。是故君子戒愼乎其所不
謂教。節道也者。不可須臾離也。可離
道也。修道之謂性。率性之謂道。
○天命之謂性。

Figure 4.15
Rémusat's 24-point fount printed in the *Spécimen typographique de l'Imprimerie royale*.
Source: <gallica.bnf.fr> (accessed on 18 Mar 2020).

which was the standard handwriting style of Chinese characters influenced by Chinese brush strokes. Engraving this type of Chinese character is very difficult and complicated because of the complex, hand-drawn curves made by brushes. Besides, using the method of divisible type increased the difficulty because this method limited the proportions of some components (figure 4.16).

Klaproth's Kai Ti style composite fount was also engraved by Delafond between 1830 and 1834.[30] The size of this fount is 18 point, which is much smaller than Rémusat's 24-point fount. Therefore, it could be presumed to have a wide range of applications. However, the final effect of Klaproth's fount was 'strange' in that it had the charm of Chinese calligraphy but had lost its structure of proper stroke construction. The development of this fount ended with the death of Klaproth in 1835.

16-point fount (*Paris Type*) *by Jean-Pierre Guillaume Pauthier and Marcellin Legrand*

Marcellin Legrand (dates unknown), one of the most accomplished type foundries in France, made another attempt to create a Chinese fount by means of using divisible types under the direction of Jean-Pierre Guillaume Pauthier (1801–1873), who was a member of the Société Asiatique de Paris.

Pauthier was one of Rémusat's students, alongside another fellow student and competitor Stanislas Aignan Julien (1797–1873), Pauthier also continued Rémusat's oriental studies, conducting sinological research and translations of Chinese literature, such as *Le Ta-Hio ou la Grande Étude, ouvrage de Confucius* (*Da Xue* or *Great Learning*, 大学) published in 1837 and *Táo-Té-King* (*Tao Te Ching*, 道德经) in 1838.[31] When Pauthier worked on the *Tao Te Ching*, he set out to design a new Chinese fount that contained not only full characters, but also parts of characters that, in different combinations, could be used to construct different characters. These parts of characters were not based on the 214 radicals because those 214 radicals have infinite variations in size, proportion, and position depending on the specific character. Pauthier's solution was to break down Chinese characters into recognisable component parts, much like how Latin compound words were broken into several individual morphemes rather than directly into letters.[32]

Pauthier did not limit the character set to those characters used in the *Tao Te Ching* with a custom-tailored fount specific to this work. Instead, he extracted a list of 30,000 Chinese characters from the *Kangxi Dictionary* in order to make a complete fount for printing various Chinese books.[33] To put his theories into practice in typeface design, Pauthier communicated with Marcellin Legrand regarding his experimental method of Chinese fount production. In the interests of science, Legrand was willing to assist

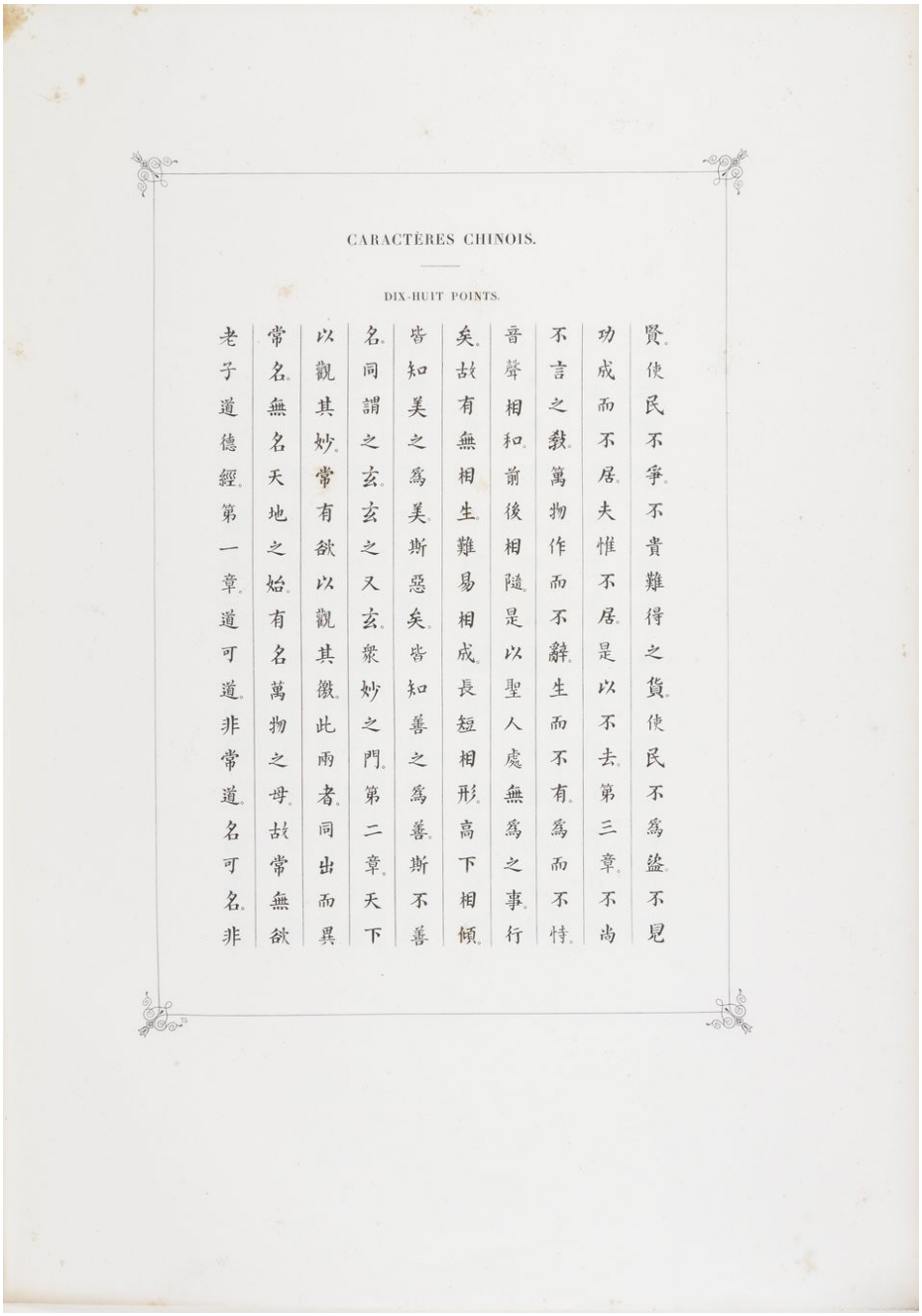
30 Hiroshi Komiyama, 2017, [Mr Hiroshi Komiyama's treasure chest of movable type], 2017:6.

31 *Le Ta-Hio ou la Grande Étude, ouvrage de Confucius* is one of the 'Four Books'(四书) which are authoritative books of Confucianism in China; the *Táo-Té-King* is a significant source of philosophical and religious Taoism. Jean-Pierre Guillaume Pauthier, *Le Ta-Hio ou la Grande Étude, ouvrage de Confucius.* 1837 (text, Latin tr. by Gaubil, French tr.); *Táo-Té-King*. Livr. 1. 1838 (text, Latin and French tr., comm.).

32 A morpheme is the smallest meaningful unit in a language that cannot be further divided.

33 Stahl, 2010, [Western Hanzi, Eastern Alphabet], p. 137.

Figure 4.16
Klaproth's fount printed in the *Spécimen typographique de l'Imprimerie royale*.
Source: <gallica.bnf.fr> (accessed on 18 Mar 2020).



CARACTÈRES CHINOIS.

DIX-HUIT POINTS.

賢。使民不爭。不貴難得之貨。使民不爲盜。不見
功成而不居。夫惟不居。是以不去。第三章。不尚
不言之敎。萬物作而不辭。生而不有。爲而不恃。
音聲相和。前後相隨。是以聖人處無爲之事。行
矣。故有無相生。難易相成。長短相形。高下相傾。
皆知美之爲美。斯惡矣。皆知善之爲善。斯不善。
名。同謂之玄。玄之又玄。衆妙之門。第二章。天下
以觀其妙。常有欲以觀其徼。此兩者。同出而異
常名無名天地之始。有名萬物之母。故常無欲
老子道德經。第一章。道可道。非常道。名可名。非

Figure 4.18a
Radicals or keys of Chinese characters. Source: Legrand, 1859, *Spécimen de caractères chinois: gravés sur acier et fondus en types mobiles*, page VI.

Figure 4.18b
Additional phonetic groups of Chinese characters. Source: Legrand, 1859, *Spécimen de caractères chinois: gravés sur acier et fondus en types mobiles*, page VI.

Figure 4.18c
Complete Chinese characters formed by radicals and phonetic groups. Source: Legrand, 1859, *Spécimen de caractères chinois: gravés sur acier et fondus en types mobiles*, page VI.

Pauthier,[34] but learning of Pauthier's method, he realised the challenges he faced:

> Of all the languages in the known world, the most difficult to represent by movable types, is, without controversy, the Chinese; having hitherto baffled the most skillful European typographers.[35]

After Legrand's study and research, the manifestation of his analysis was the 'Table of 214 Keys and Their Variants' (Tableau des 214 clefs et de leurs variantes) published in 1845 (figure 4.17).[36] Legrand adopted a system of dividing the elements of Chinese compound characters, which considerably reduced the number of groups to be classified.[37] Moreover, this combination is very simple in that Chinese characters would never be divided into more than two parts. Firstly, there is the group of 'radicals' or 'keys' of Chinese characters, which occupies a third of the body of a character, either perpendicularly or horizontally (figure 4.18a).[38] Secondly, there are the additional 'phonetic groups,' which occupy the other two-thirds (figure 4.18b). Finally, the radicals and phonetic groups are combined to form complete Chinese characters (figure 4.18c).[39] In addition, the radicals and phonetic groups of Chinese characters were arranged according to 'the 214 Kangxi radicals' and number of strokes.[40] A Chinese character that could not be divided was produced as a single type.

The size of Legrand's fount was Two-line Brevier, 16-point, which is smaller than the previously produced Chinese founts of the Imprimerie nationale. Walter Henry Medhurst appreciated Legrand's Chinese fount that:

> respects fineness of stroke, and exactness of height, superior to anything that Asiatic workman can produce. Although the characters are a bit stiff and disproportionate, they are exceedingly neat and handsome on the whole.[41]

Furthermore, the American Presbyterian Mission Press ordered a complete set of matrices as early as 1836. It is obvious from these responses that Legrand's fount was indeed highly regarded by sinologists. However, there were several errors in Legrand's fount, for example in the *Album typographique* by G. Silbermann in 1840, the left and right parts of the Chinese character '经' were reversed (figure 4.19).[42] Legrand's fount also ignored the aesthetic factors in Chinese characters and simplified the structure of a large part of Chinese characters in order to constrain them to a fixed type

34 Medhurst, 1838, *China: its state and prospects*, p. 557.

35 Ibid, p. 558.

36 Legrand, 1845, *Tableau des 214 clefs et de leurs variantes.*

37 Compound Chinese characters specifically refer to Chinese characters used in the second class of Chinese types constructed from two units described below, rather than in the Chinese writing system: 'The Chinese types are of two classes: 1st whole, which form the characters by a single type; 2nd divided, which form it (sic) by the union of two. The second class is again sub-divided into two: 1st horizontally divided; 2nd perpendicularly divided; and each of these must be arranged in cases by themselves.' Bridgman & Williams, 1845, *The Chinese Repository* (Vol. 14), p. 127.

38 'Radicals' and 'keys' here were determined by Legrand.

39 Legrand, 1859, *Spécimen de caractères chinois: gravés sur acier et fondus en types mobiles*, p. VI.

40 Ibid.

41 Medhurst, 1838, *China: its state and prospects*, p. 557.

42 Silbermann, 1840, *Album typographique, publ. a l'occasion de la quatrieme fete seculaire de l'invention de l'imprimerie.*

Figure 4.17
Table of 214 keys by Marcellin Legrand.
Source: Legrand, 1845, *Tableau des 214 clefs et de leurs variantes*; Thomas, 2017, *The Chinese Typewriter*, p. 93.

size.[43] As can be seen in the *Specimen of the Chinese type, including also those cut at Ningpo belonging to the Chinese Mission of the Board of Foreign Missions of the Presbyterian Church in the USA* published in 1852, Legrand only retained variants of full character with one radical type, which clearly do not satisfy the proportional and aesthetic requirements of Chinese radicals (figure 4.20).

Because of the low quality of the shapes of some of Legrand's Chinese types, Walter Lowrie (1784–1868), the corresponding secretary of the Presbyterian Board of Foreign Missions requested Auguste Beyerhaus (1805–1874) to remake 189 types needed by the missionaries in China. Lowrie was pleased with the new versions of the types and sent these to missionaries in China to replace the original types by Legrand in October 1848.[44] Moreover, in addition to the characters reproduced by Beyerhaus, natives also supplemented additional types when using Legrand's fount; these were mainly types with full characters, in the Presbyterian Mission Press's Ningpo station around 1852 (figure 4.21). A Japanese researcher, Mr Komiyama, has calculated the number of divisible types by Legrand included in the American Presbyterian Mission Press in China in 1844 from the *Characters Formed by the Divisible Type Belonging to the Chinese Mission of the Board of Foreign Mission of the Presbyterian Church in the United States of America*. There were 1,963 types with indivisible characters, 1,415 types with left-right radicals, and 475 with top-bottom radicals, for a total of 3,852 types. The total number of characters produced for Legrand's fount is 20,858.[45]

22-point fount (Berlin Type) by Auguste Beyerhaus

The other divisible Chinese fount made is the 22-point 'Berlin Type' produced by Auguste Beyerhaus (1805–1874) in Germany who, as mentioned, helped to revise Legrand's 189 types. Beyerhaus, a court engraver and a type founder, began making Chinese founts when he was commissioned by Frederick William III to improve the quality of Chinese fount made by Karl F. A. Gützlaff.[46] In 1833, Gützlaff decided to produce a Chinese fount to enhance his evangelical publishing and missionary activities in China. His solution was to hire a Chinese engraver to make a Chinese fount in Macao. Gützlaff used a method of making his fount which differed from other missionaries, omitting the punchcutting by directly chiselling the matrix.[47] Samuel Wells Williams (1812–1884), who was in charge of the printing press of the American Board of Commissioners for Foreign Missions at Guangdong, assessed Gützlaff's fount attempt in the Chinese Record of 1875:

> In 1833, the Rev. Charles Gützlaff conceived the idea of having matrices made by chiseling out the character in intaglio in reverse, on copper plates half an inch square. He spent many hundred dollars in cutting about four thousand common characters; but as might have been

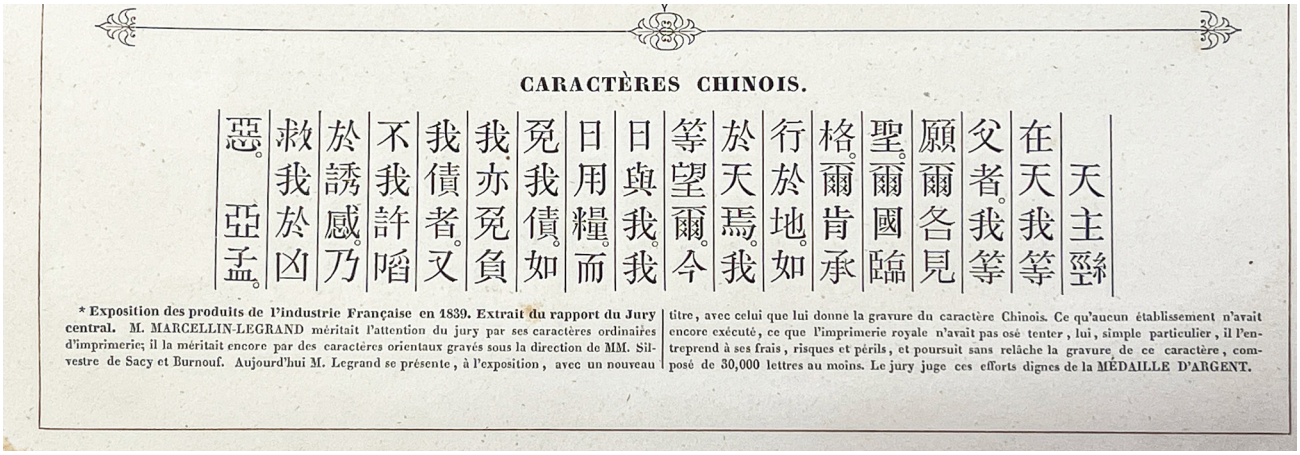
43 See chapter 5.2 for the comparison of Dyer's type and Legrand's type.

44 Su Ching, 2019, 美华书馆二号(柏林)活字的起源与发展 (The origin and development of No. 2 (Berlin) movable type in the American Presbyterian Mission Press). In: 中国出版史研究 (Research on the History of Publishing in China), 2019:2, pp. 163–176; BFMPC/CH, vol. 79, no. 12. W. Lowrie to Ningpo Mission, New York, 26 October 1848.

45 Hiroshi Komiyama, 2017, [Mr Hiroshi Komiyama's treasure chest of movable type], 2017:6.

46 *Missionary Register*, 1834, pp. 268–270.

47 Su Ching, 2019, (The origin and development of No. 2 (Berlin) movable type in the American Presbyterian Mission Press). In: (Research on the History of Publishing in China), 2019:2, pp. 163–176.



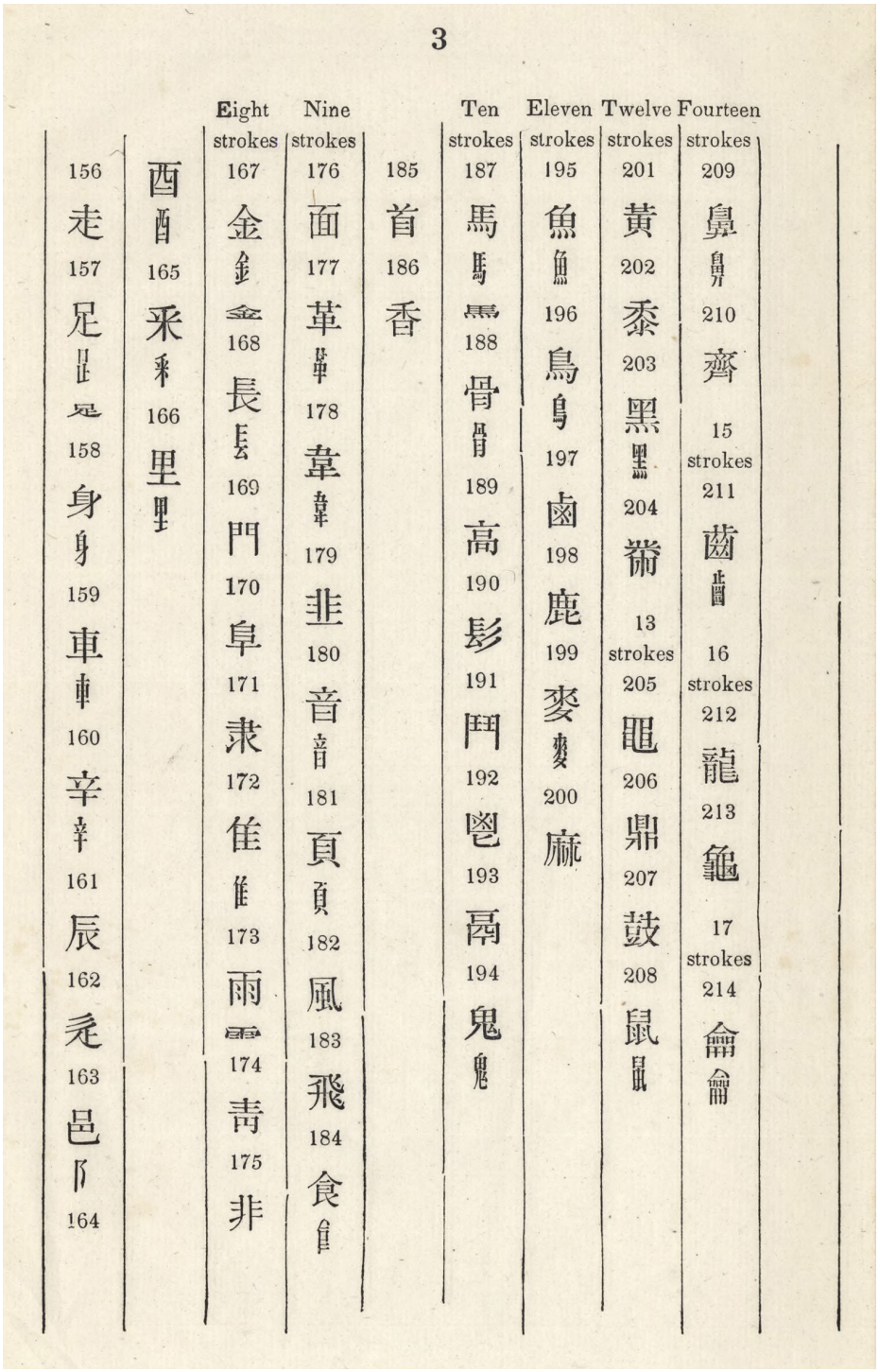
CARACTÈRES CHINOIS.

天主降
在天我等
父者。我等
願爾各見
聖。爾國臨
格。爾肯承
行於地。如
於天焉。我
等望爾。今
日與我。我
日用糧。而
免我債。如
我亦免負
我債者。又
不我許陷
於誘感。乃
救我於凶
惡。亞孟。

* Exposition des produits de l'industrie Française en 1839. Extrait du rapport du Jury central. M. MARCELLIN-LEGRAND méritait l'attention du jury par ses caractères ordinaires d'imprimerie; il la méritait encore par des caractères orientaux gravés sous la direction de MM. Silvestre de Sacy et Burnouf. Aujourd'hui M. Legrand se présente, à l'exposition, avec un nouveau titre, avec celui que lui donne la gravure du caractère Chinois. Ce qu'aucun établissement n'avait encore exécuté, ce que l'imprimerie royale n'avait pas osé tenter, lui, simple particulier, il l'entreprend à ses frais, risques et périls, et poursuit sans relâche la gravure de ce caractère, composé de 30,000 lettres au moins. Le jury juge ces efforts dignes de la MÉDAILLE D'ARGENT.

Figure 4.19
Specimen of Chinese characters from the *Album typographique, publ. a l'occasion de la quatrieme fete seculaire de l'invention de l'imprimerie* by G. Silbermann, 1840.
Source: Museum of English Rural Life and Special Collections.

0 1 cm



3

Eight strokes
167 金 金
168 長 長
169 門
170 阜
171 隶
172 隹
173 雨 雨
174 青
175 非

Nine strokes
176 面
177 革 革
178 韋 韋
179 韭
180 音 音
181 頁 頁
182 風
183 飛
184 食 食

185 首
186 香

Ten strokes
187 馬 馬
188 骨 骨
189 高
190 髟
191 鬥
192 鬯
193 鬲
194 鬼 鬼

Eleven strokes
195 魚 魚
196 鳥 鳥
197 鹵
198 鹿
199 麥 麥
200 麻

Twelve strokes
201 黃
202 黍
203 黑 黑
204 黹
13 strokes
205 黽
206 鼎
207 鼓
208 鼠 鼠

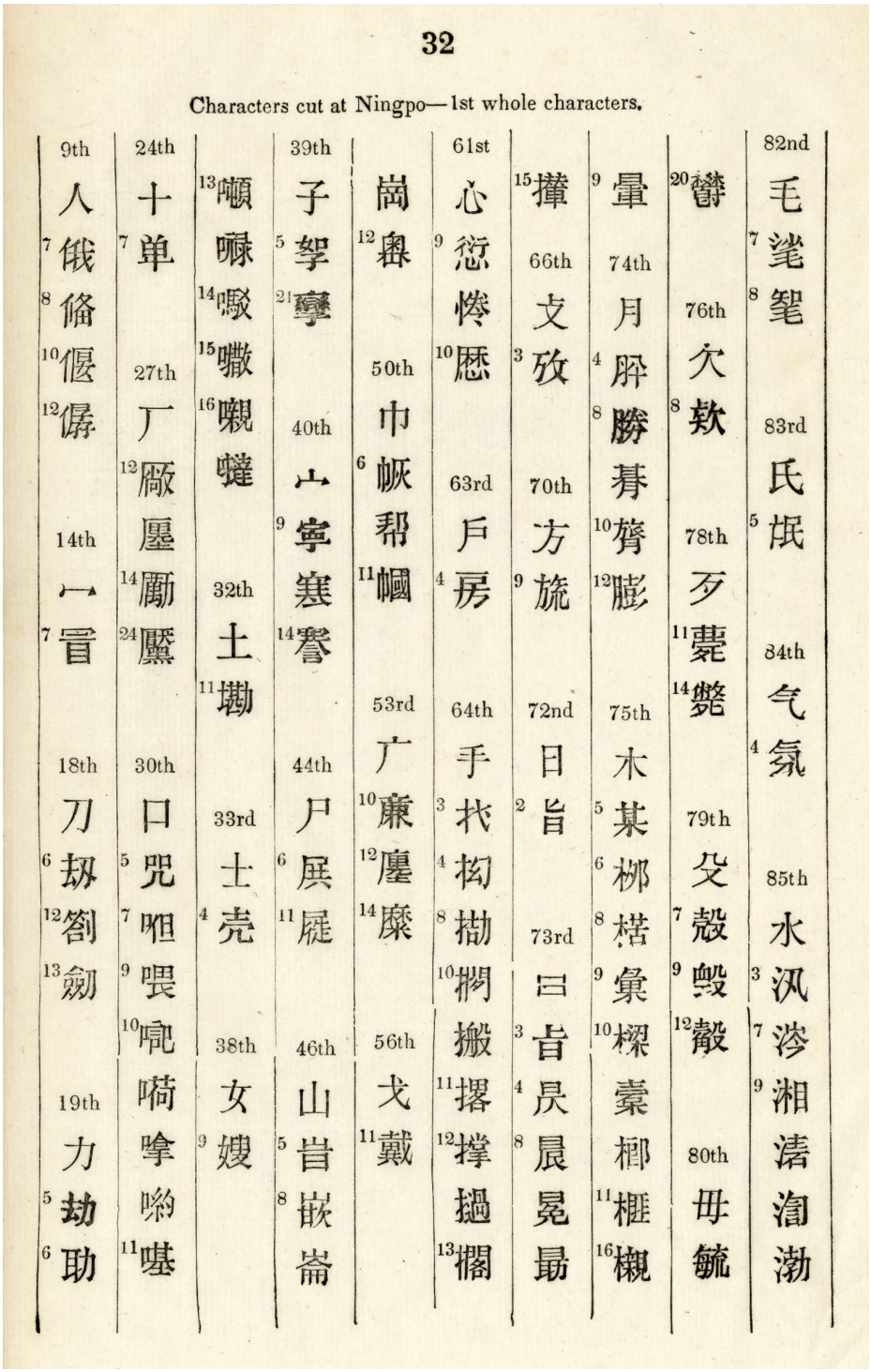
Fourteen strokes
209 鼻 鼻
210 齊
15 strokes
211 齒 齒
16 strokes
212 龍
213 龜
17 strokes
214 龠 龠

156 走
157 足 足
158 身 身
159 車 車
160 辛 辛
161 辰
162 辵
163 邑 阝
164

酉 酉
165 釆 釆
166 里 里

Figure 4.20
Page 2, *Specimen of the Chinese type including also those cut at Ningpo belonging to the Chinese Mission of the Board of Foreign Missions of the Presbyterian Church in the USA* published in 1852.
Source: The National Library of Australia.

Figure 4.21
Page 32, *Specimen of the Chinese type including also those cut at Ningpo belonging to the Chinese Mission of the Board of Foreign Missions of the Presbyterian Church in the USA* published in 1852.
Source: The National Library of Australia.



32

Characters cut at Ningpo—1st whole characters.

9th
人
7俄
8倫
10偃
12僞

14th
一
7冒

18th
刀
6刻
12劉
13劒

19th
力
5劫
6助

24th
十
7单

27th
厂
12廠
14廳
24黶

30th
口
5咒
7咀
9喂
10喫
嗝
喲
11嗇

33rd
士
4壳

38th
女
9嫂

39th
子
5孥
21孿

40th
山
9寧
14寨

32th
土
11壩

44th
尸
6屐
11屣

46th
山
5岩
8嵌
嵩

50th
巾
6帙
帮
11幗

53rd
广
10廉
12廛
14廢

56th
戈
11戴

61st
心
9愆
悕
10歷

63rd
戶
4房

64th
手
3扙
4扣
8拗
10搆
搬
11擄
12撐
摑
13擱

66th
支
3攸

70th
方
9旒

72nd
日

73rd
曰
3旨
4昃
8晨
晷
晸

74th
月
4胛
8勝
朁
10膂
12膨

75th
木
5某
6梛
8楛
9棄
10樑
棗
椰
11棰
16欖

76th
欠
8欸

78th
歹
11薨
14斃

79th
殳
7殼
9毀
12轂

80th
毋
毓

82nd
毛
7毿
8毫

83rd
氏
5氓

84th
气
4氛

85th
水
3汎
7涉
9湘
清
溷
渤

> expected, when these matrices were sent to Serampore to be used in casting type, they proved to be utterly useless, for the type they produced were ill-formed, uneven and imperfect.[48]

It is clear from William's words that Gützlaff's attempts to produce a Chinese fount were unsuccessful and that the resulting fount was of such poor quality that it could not be used. In response, Gützlaff sent his types and matrices to Frederick William III, who then approached Beyerhaus to improve them. When Beyerhaus had the fount, he used traditional Western metal type techniques to improve it, cutting punches and then using punches to produce matrices and eventually casting types from these matrices. By the time Gützlaff received the improved fount, most of his religious books had already been published from 1835–1837;[49] therefore, he sent all types and matrices to Walter H. Medhurst. Medhurst only used Gützlaff's fount to supplement Samuel Dyer's fount when Dyer's fount was lacking in characters for typesetting.[50] Researcher, Su Ching, compared the sample of Beyerhaus's Chinese types in the Gutenbergs-Album, published in 1840, with prints in *Zhen Li Tong Dao* (真理通道) published by Medhurst in the London Missionary Society Press Shanghai (Mo Hai Shu Guan, 墨海书馆) from 1844–1845.[51] He found 17 types in both publications to be identical. For example, the character '美' in figures 46 and 47 is identical (figure 4.22 & 23).

In 1844, Gützlaff also sent the specimen of improved types by Beyerhaus to Walter Lowrie (1784–1868) from the Presbyterian Church in the U.S.A., Board of Foreign Missions. Samuel W. Williams (1812–1884), the American missionary printer of the American Board of Commissioners for Foreign Missions at Guangdong (Canton), had seen the specimen from Lowrie and praised its aesthetic qualities which had a 'Chinese flavour'.[52] Williams hence began corresponding with Beyerhaus in 1845 to enquire about his Chinese fount but was informed that he lacked funds and so only produced a small number of Chinese types. After negotiating with Lowrie, Williams decided that the American Board of Commissioners for Foreign Missions, to which he belonged, and the Presbyterian Church in the U.S.A., Board of Foreign Missions, to which Lowrie belonged, would cooperate in ordering a Chinese fount,[53] each paying half of the cost. They also reached an agreement in which Lowrie made a specific condition that the Berlin Type must be divisible type made in the same method as the Paris Type, as he insisted that the divisible type would reduce the cost and time of production. This,

48 *The Chinese Record*, vol. 6, no. 1 (Jan–Feb 1875), pp. 22–30, S. Wells Williams, 'Movable Type for Printing Chinese.'

49 Ching, 2011, *Christianity and the Chinese in Singapore 1819-1846*, pp. 97-130.

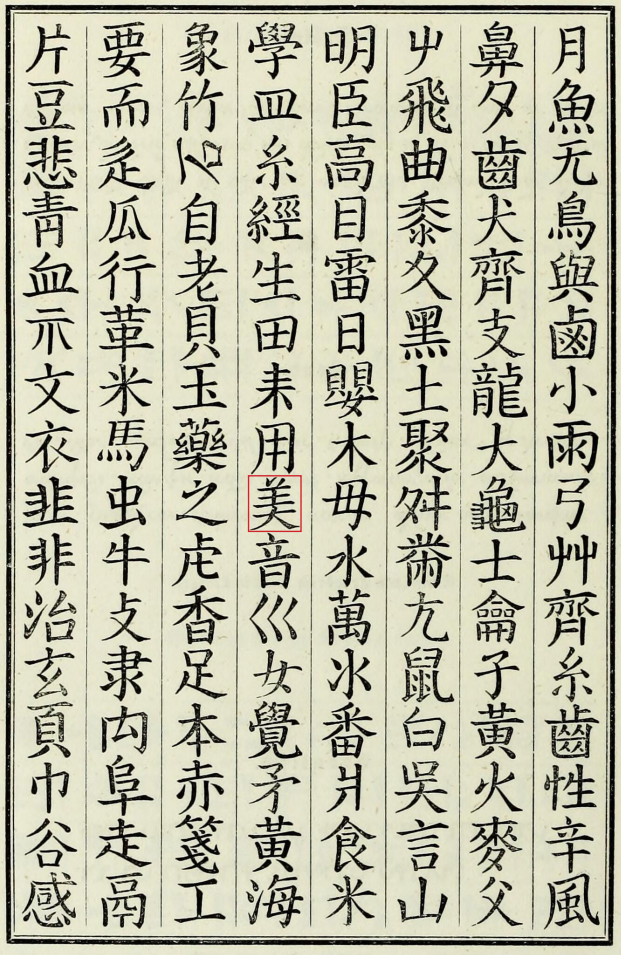
50 LMS/UG/BA, 5.B., W. H. Medhurst to the Directors, Batavia, 10 April 1843; 3; LMS/CH/CC, 1.1.A., W. H. Medhurst to A.Tidman, Shanghai, 1 May 1844; Su Ching, 2019, (The origin and development of No. 2 (Berlin) movable type in the American Presbyterian Mission Press). In: (Research on the History of Publishing in China), 2019:2, pp. 163–176.

51 The fount used in *Zhen Li Tong Dao* is Samuel Dyer's 24–point fount supplemented by Gützlaff's characters as modified by Beyerhaus.

52 *Unpublished Letters from and to Samuel Wells Williams in Yale University Library, U.S.A*, Vol. 2, pp. 469-472, S. W. Williams to Harriet C. Wood, Macao, 10 August, 1844.

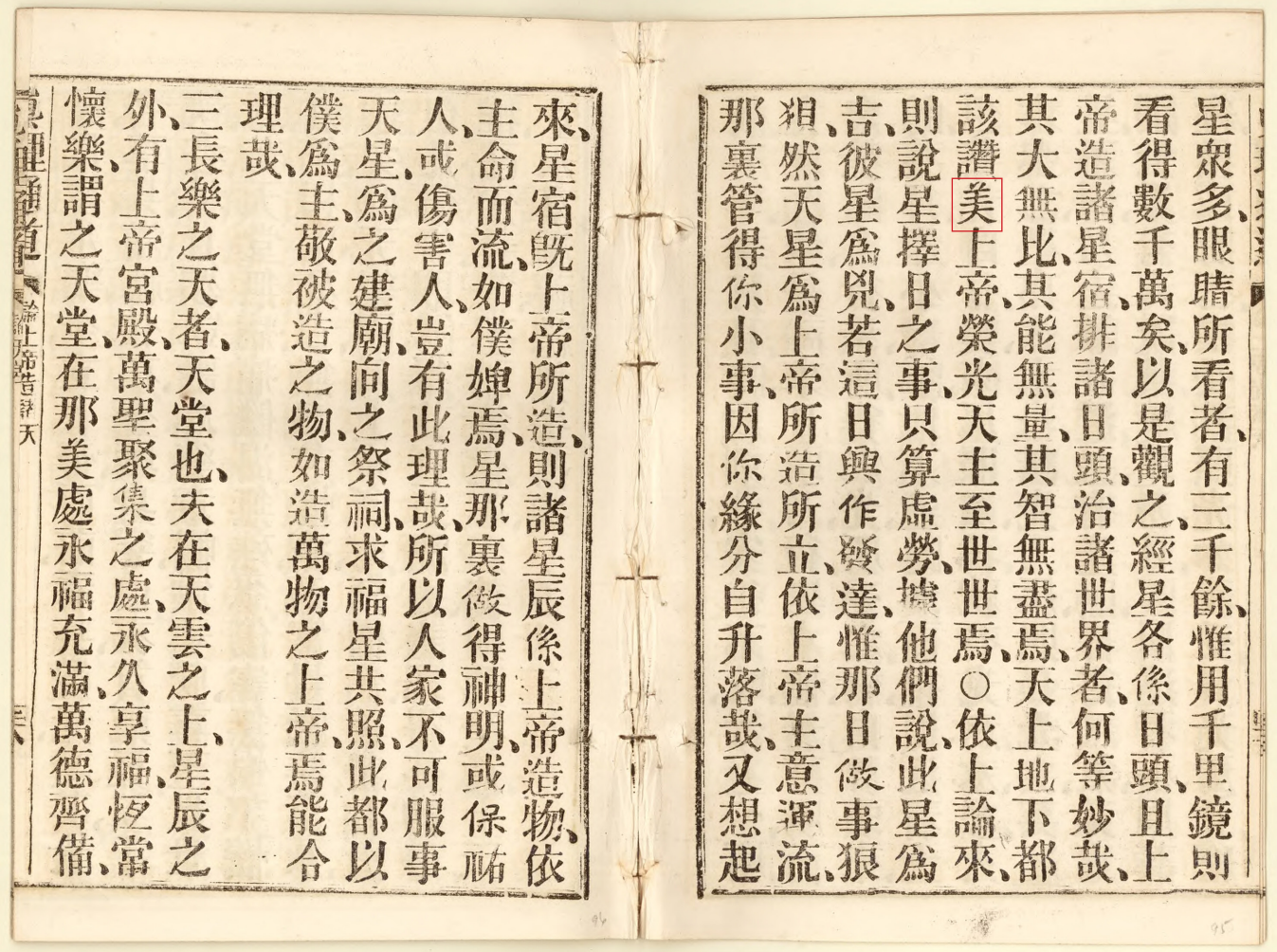
53 The fount refers to a set of matrices, and the character set was jointly proposed by Williams and Lowrie. See ABCFM/Unit 3/ABC 16.3.3, vol.1, S. W. Williams to R. Anderson, New York, 13 December 1845.

Chineſiſch.



Schrift von A. Beyerhaus in Berlin.

Figure 4.22
Page 344, *Gutenbergs-Album* published in 1840 by Heinrich Meyer.
Source: Wellcome Collection.



星衆多眼睛所看者、有三千餘、惟用千里鏡則看得數千萬矣、以是觀之、經星各係日頭、且上帝造諸星宿、排諸日頭、治諸世界者、何等妙哉、其大無比、其能無量、其智無盡焉、天上地下都該讚美上帝榮光天主至世世焉、○依上論來、則說星擇日之事、只算虛勞、壞他們說、此星爲吉、彼星爲兇、若這日興作發達、惟那日做事狠狽、然天星爲上帝所造所立、依上帝主意運流、那裏管得你小事、因你緣分自升落哉、又想起來、星宿既上帝所造、則諸星辰係上帝造物、依主命而流、如僕婢焉、星那裏做得神明、或保祐人、或傷害人、豈有此理哉、所以人家不可服事天星、爲之建廟、向之祭祠、求福星共照、此都以僕爲主、敬被造之物、如造萬物之上帝焉能合理哉、

三長樂之天者、天堂也、夫在天雲之上、星辰之外、有上帝宮殿、萬聖聚集之處、永久享福、恆常懷樂、謂之天堂、在那美處、永福充滿、萬德齊備、

Figure 4.23
Two pages of *Zhen Li Tong Dao* (真理通道), published in the London Missionary Society Press, Shanghai, in 1845.
Source: The National Library of Australia.

Figure 4.24
Comparing the combination of division types of Legrand's Paris Type and Beyerhaus' Berlin Type.

	Paris Type	Berlin Type	Improved Berlin Type
Full Body	1,963	2,711	6,664
2/3 Body Vertical	1,415	1,290	1,413
1/3 Body Vertical		109	132
1/2 Body Vertical		20	0
Horizontal division	475	0	0
Character set	20,858	22,031	c. 23,000

was the main reason why the Berlin Type was a divisible type.[54] The agreement also required Beyerhaus to produce the Berlin Type within two years, starting from 1846. However, Beyerhaus underestimated the difficulty of making a Chinese fount, and in the end, the Berlin Type took about eight years, until 1854, after which it was sent to Lowrie in New York.[55]

In 1842, the Qing Dynasty and the United Kingdom signed the *Treaty of Nanking* (Nanjing), which opened five treaty ports for foreign trade at Canton (Guangzhou), Amoy (Xiamen), Foochow (Fuzhou), Ningpo (Ningbo) and Shanghai. From here, the Qing Dynasty was forced to open up and entered an era of colonisation. From 1842 onwards, the Presbyterian Church in the U. S. A., Board of Foreign Missions, made significant changes to China's printing and publishing industries. The American Presbyterian Mission Press (华英校书房), established at Macao in 1844 by Lowrie, was transferred to the Presbyterian mission station at Ningpo in 1845, and named Chinese and American Sacred Classic Book Establishment (华花圣经书房).[56]

From 1844 to 1847, Richard Cole, a skilful printer and type founder, was in charge of press operations. After Cole's departure, the press was directed by missionaries with no printing expertise until 1848, when William Gamble, a professional printer, took charge of the press. At the behest of Lowrie in New York, Gamble brought with him the matrices of Berlin Type.[57] Beyerhaus did not provide a complete list of the Berlin Type, which proved inconvenient to use and manage. Despite this, William Gamble managed to cast types from the matrices, and compiled the *Specimen of the Chinese type: belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U. S. A.* in Ningpo in 1859. This specimen contains 2,711 Whole Body, 1,290 Two Third Body, 20 Half Body, 109 One Third Body, for a total of 4,130 character types and 17 numerals and sentence symbols types.[58] (figure 4.25, 26 & 27) In 1862, William also compiled *the List of Chinese Characters formed by the Combination of the Divisible Type of the Berlin Font* which listed 22,031 different characters formed by the combination of 4,130 martices (figure 4.28 & 29).[59]

The principal advantage of when compared to Legrand's divisible Paris Type was the small number of matrices needed for a large number of characters. The Berlin Type took a compromise by increasing the number of types formed of complete characters. This helped the Berlin Type to avoid creating poorly-shaped Chinese characters formed from the use of divisible characters that did not join properly. As a result, 20 matrices made of half body, and horizontal division were discarded (figure 4.24). The type size of

54 More details about the agreement see: Su Ching, 2019, (The origin and development of No. 2 (Berlin) movable type in the American Presbyterian Mission Press). In: (Research on the History of Publishing in China), 2019:2, p. 168; ABCFM/Unit 3/ABC 16.3.3, vol.1, S. W. Williams to R. Anderson, New York, 13 December 1845.

55 Ibid, p. 171; BFMPC/CH, vol. 8, no. 11, S. W. Williams to W. Lowrie, Canton, 18 August 1854.

56 Gilbert McIntosh, 1895, *The Mission Press in China: Being a Jubilee Retrospect of the American Presbyterian Mission Press, with Sketches of Other Mission Presses in China, as well as Accounts of the Bible and Tract societies at work in China*, pp. 6–10.

57 Ibid, p. 172; BFMPC/CH, vol. 79, no. 123, W. Lowrie to Ningpo Mission, New York, 1 March 1858.

58 Gamble, 1859, *Specimen of the Chinese type : belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U.S.A.*

59 Gamble, 1862, *List of Chinese Characters formed by the Combination of the Divisible Type of the Berlin Font*, Preface.

Figure 4.25
Specimen of Whole Body types in the *Specimen of Chinese Type Belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U. S. A.*, published by Presbyterian Mission Press, Ningpo, in 1859.
Source: The National Library of Australia.

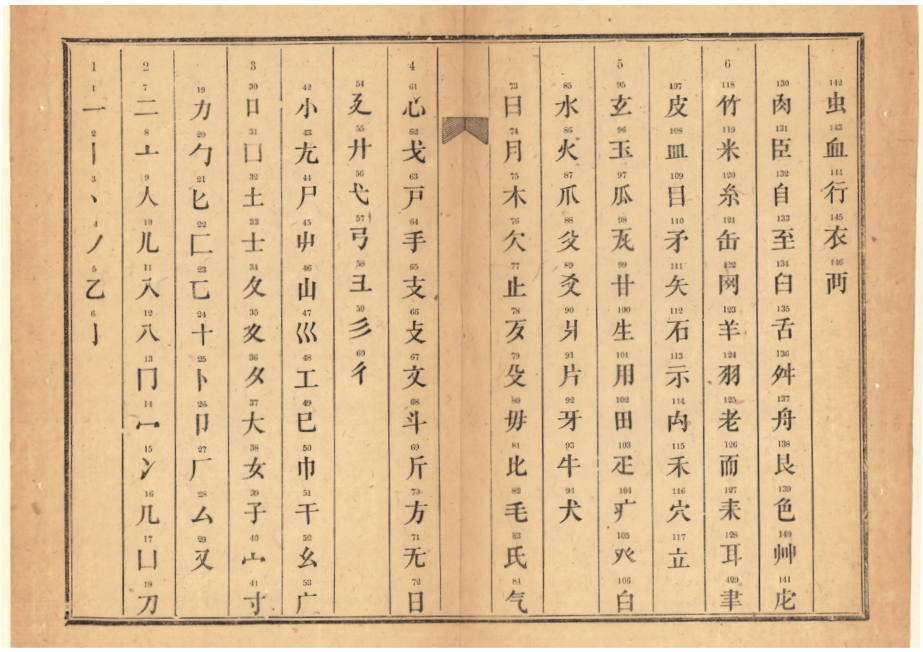


Figure 4.26
Spocimen of Two Third Body and Half Body types in the *Specimen of Chinese Type Belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U. S. A.*, published by Presbyterian Mission Press, Ningpo, in 1859.
Source: The National Library of Australia.

Figure 4.27
Specimen of One Third Body types and 17 numerals and sentence symbols types in the *Specimen of Chinese Type Belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U. S. A.*, published by Presbyterian Mission Press, Ningpo, in 1859.
Source: The National Library of Australia.

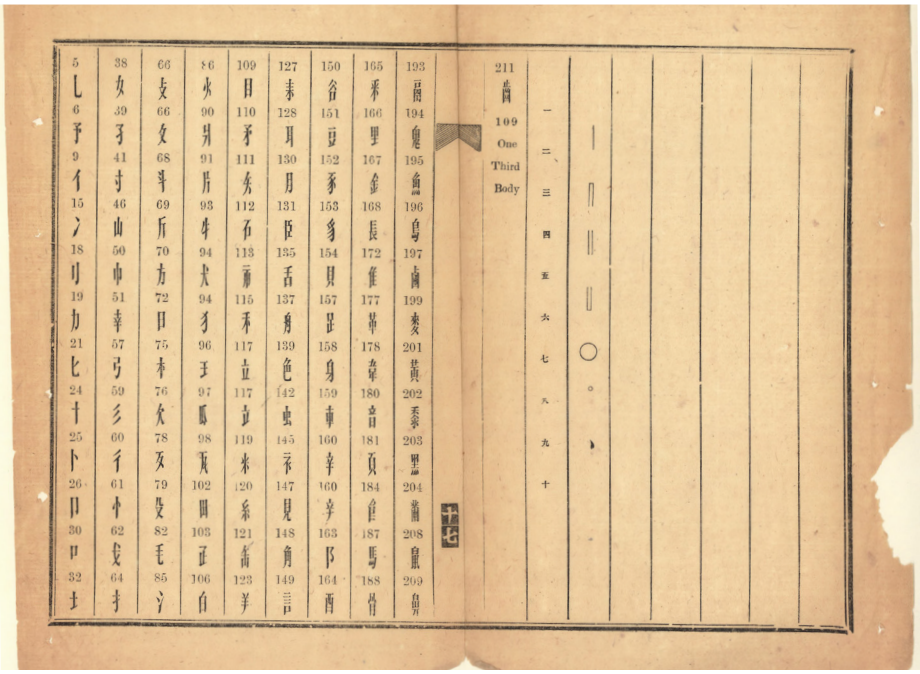


Figure 4.28
Page 1 of *the List of Chinese Characters formed by the Combination of the Divisible Type of the Berlin Font*, published by Presbyterian Mission Press, Shanghai, in 1862.
Source: The National Library of Australia.

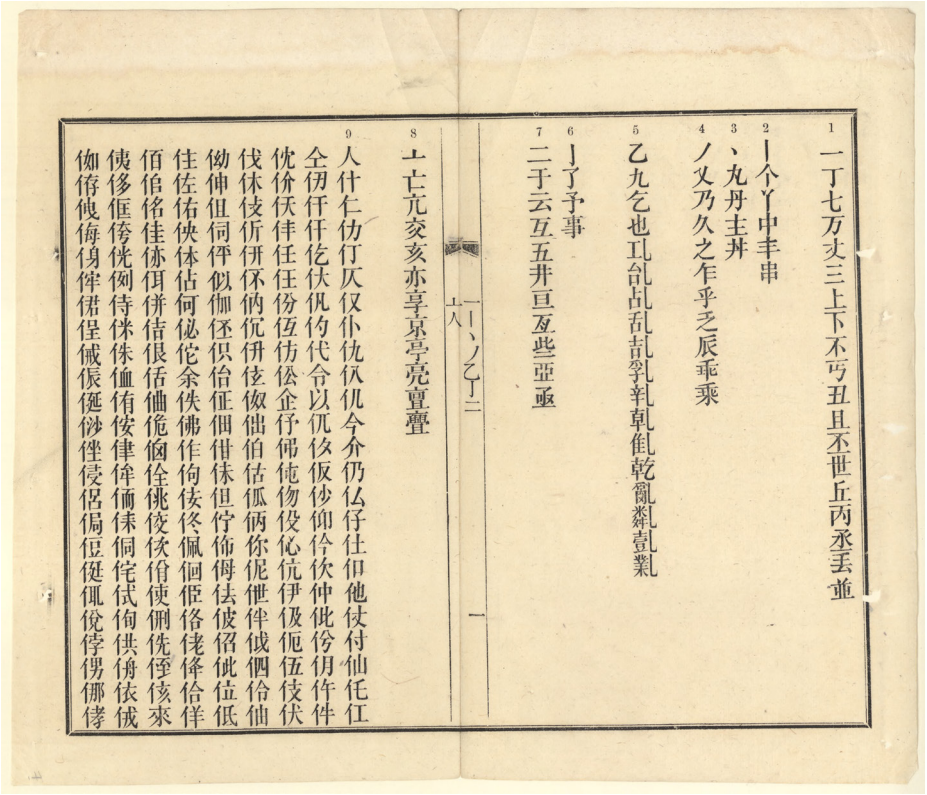
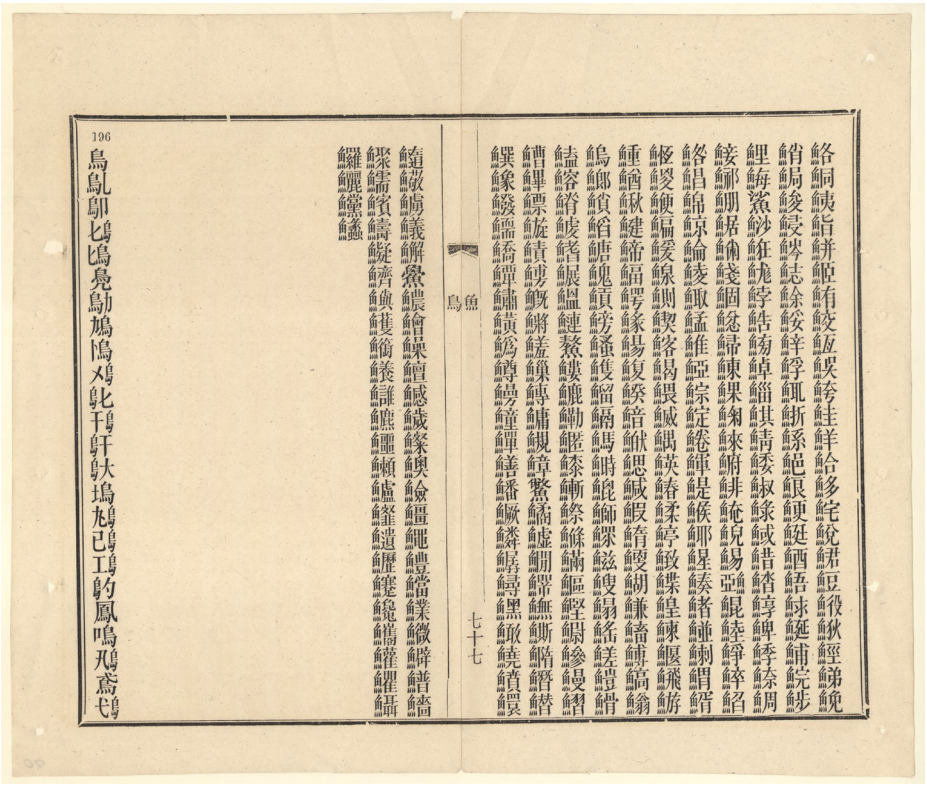


Figure 4.29
Page 77 of *the List of Chinese Characters formed by the Combination of the Divisible Type of the Berlin Font*, published by Presbyterian Mission Press, Shanghai, in 1862.
Source: The National Library of Australia.



the Berlin Type was Double Pica, equal to 22-point (7.61 mm),[60] similar to the size of the characters in traditional Chinese books. The printed quality of the Berlin Type was also recognised by the missionaries, who considered the Berlin Type superior to the Paris Type, and to the taste of literary Chinese; it subsequently became the primary fount used in the American Presbyterian Mission Press during the 1860s. However, Berlin Type still suffered from the disadvantages of the divisible type method, with unbalanced proportions of characters made up of fixed proportional parts. Therefore, in 1866, after completing the Shanghai Type, William Gamble decided to make corrections to change the Berlin Type, which was completed around 1869. In 1873, John L. Mateer compiled *Lists of Chinese Characters in the Fonts of the Presbyterian Mission Press* by using the improved Berlin Type.[61] In the improved set, the number of types with Full Body was increased from 2,711 to 6,664, and types with 1/2 Body was eliminated. In addition, the improved types was written and cut by native Chinese workmen, so that the characters became more aesthetically pleasing than before.

4.3 Constructed Chinese movable types

Both the divisible type and constructed type are based on the reconstruction of Chinese characters, and the difference between them is the degree of division in Chinese characters. Divisible type uses the simple division of Chinese characters, where the separated parts are at the level of radicals. In contrast, constructed type requires the separation of Chinese characters into essential elements which are at the stroke level.

Johann Gottlob Immanuel Breitkopf (1719–1794), a German typographer, invented the technique of printing Chinese characters by using Western Latin-based composing and printing practices in 1789 from the technique of constructed types. In the same year, he published the *Exemplum typographiae Sinicae figuris characterum e typis mobilibus compositum*, in which he showed 15 Chinese characters printed by constructed types and marked the shape of Chinese characters copied from 'Bao Hu Zhai' (宝笏斋) (figure 4.30 & 31). He explained his invention to a contemporary, the scientific author Johann Beckmann (1739–1811) arguing that theoretically, the number of movable types required to print Chinese characters could be less than that of German and Latin. Through his invention, printing with Chinese characters would become the simplest of all printing methods. Johann Gottfried Eichhorn (1752–1827) once remarked that Breitkopf's movable type was composed of 25 to 40 strokes, and they could even combine into the most complicated Chinese characters.[62] From 1815 to 1830, Breitkopf's movable type still appeared in the type list of the Breitkopf & Härtel Publishing House, but not since then; perhaps the movable type has been lost or damaged.[63]

Breitkopf's invention was later improved several times in the 19th cen-

60 Hiroshi Komiyama, 2018, [Mr Hiroshi Komiyama's treasure chest of movable type], 2018:10.

61 Mateer, 1873, *Lists of Chinese Characters in the Fonts of the Presbyterian Mission Press*, Shanghai: American Presbyterian Mission Press; Su Ching, 2019, (The origin and development of No. 2 (Berlin) movable type in the American Presbyterian Mission Press). In: (Research on the History of Publishing in China), 2019:2, p. 175;

62 Eichhorn, 1804, *Geschichte der neuern Sprachkunde*; Stahl, 2010, [Western Hanzi, Eastern Alphabet], p. 142.

63 Lehner, 2004, *Der Druck chinesischer Zeichen in Europa: Entwicklungen im 19. Jahrhundert.*

tury, notably in the fount made by the Austrian Imperial Printing Office in the middle of the 19th century (figure 4.32). The Austrian Imperial Printing Office also reconstructed Chinese characters from essential elements, however, the fount comprised of approximately 400 sorts which was much more than Breitkopf's. The final effect of the fount was not satisfactory: the strokes of the Chinese characters look very stiff, and at times different strokes have been simplified into one stroke; with the structure of Chinese characters completely lost. Since the resulting printed Chinese characters were not beautiful, and the size was too large, no further development continued. However, the technology of constructed type did not disappear but was later adopted in Chinese typewriters.

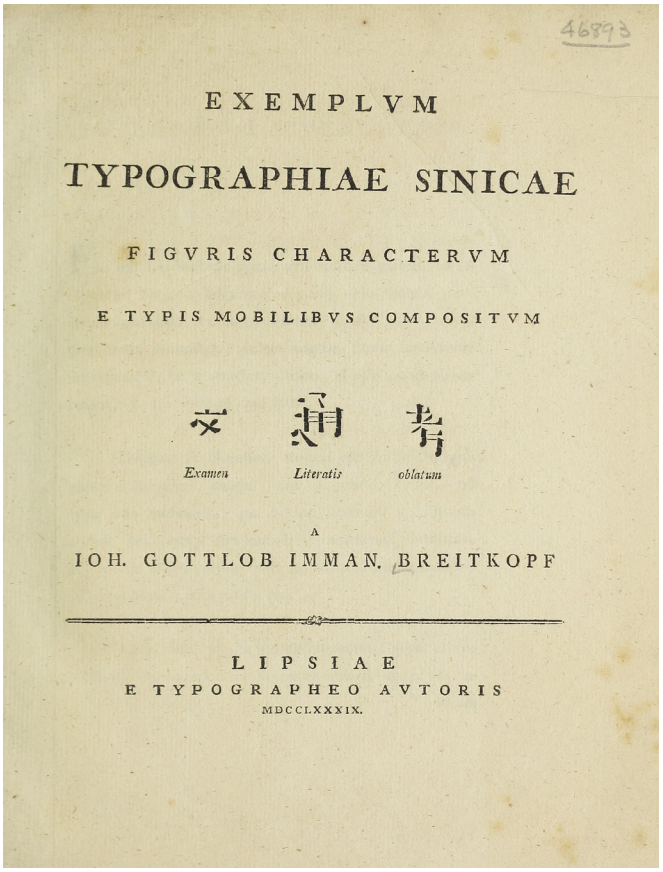
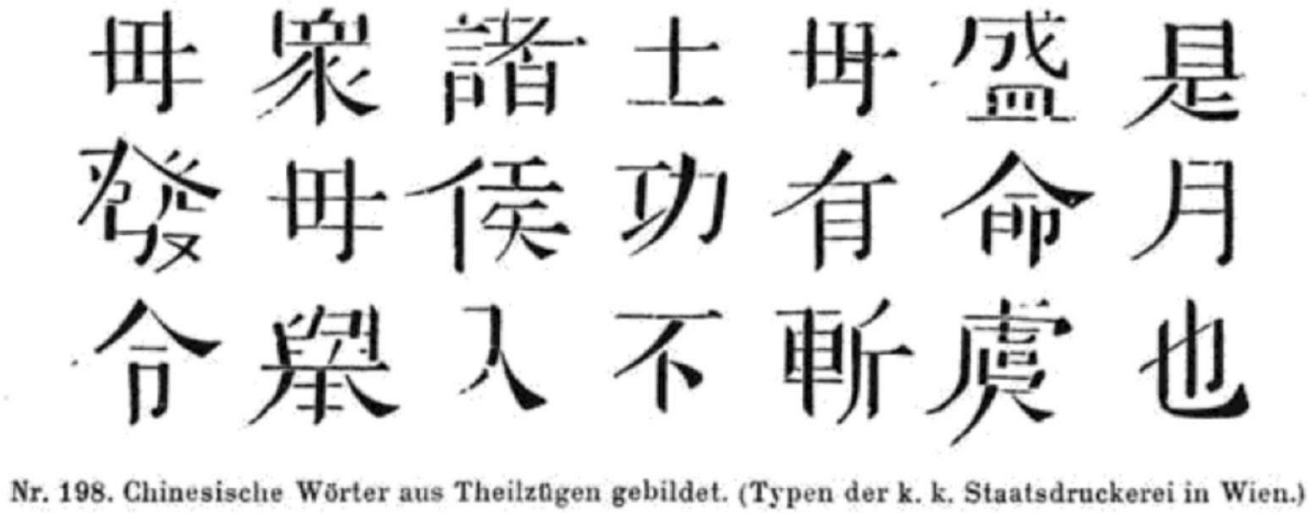


Figure 4.30
Cover of the *Exemplum typographiae Sinicae figuris characterum e typis mobilibus compositum* by Breitkopf published in 1789.
Source: <wellcomecollection.org/works/w5xkna2k> (accessed on 11 Dec 2022).

Figure 4.31
A page with printed Chinese characters in the *Exemplum typographiae Sinicae figuris characterum e typis mobilibus compositum* by Breitkopf published in 1789.
Source: <wellcomecollection.org/works/w5xkna2k> (accessed on 11 Dec 2022).



Nr. 198. Chinesische Wörter aus Theilzügen gebildet. (Typen der k. k. Staatsdruckerei in Wien.)

Figure 4.32
Chinese characters printed by the Austrian Imperial Printing Office.
Source: Faulmann, 2013, *Illustrierte Geschichte der Buchdruckerkunst*, page 505.

4.4 Other Chinese movable type production in Europe

Considering the development and influence of sinology in Europe in the 18th and 19th centuries, in addition to the Chinese founts of Fourmont, Rémusat, Klaproth, Legrand and Beyerhaus, there were also many other Chinese type production projects in Europe. For example, Rémusat's student Stanislas Aignan Julien (1797–1873) commissioned a batch of 16 point Chinese wood type by Li-ming-fou from Sichuan province, China, which Julien used for producing matrices. Other projects include Antonio Montucci (1762–1829) who, in 1806, made Chinese wood type in Berlin. Moreover, William Mavor Watts (1797/98–1874), an English printer, also a 12 Didot point (4.5 cm) Chinese fount in London (figure 4.33).[64] However, these projects in Chinese founts are not within the scope of this thesis, and will be the subject of future research.

64 Hiroshi Komiyama, 2017, [Mr Hiroshi Komiyama's treasure chest of movable type], 2017:6.

The Lord's Prayer,

IN CHINESE,

WITH LITERAL TRANSLATION, AND THE PRONUNCIATION OF EACH CHARACTER,

PRINTED IN METALLIC MOVEABLE TYPES,

BY WILLIAM MAVOR WATTS, ORIENTAL TYPE FOUNDER, AND PRINTER,

CROWN COURT, TEMPLE BAR, LONDON.

wickedness.	*ngoh.*	惡	forgive	*mien*	免	earth	*tí*	地	Our	*Wú*	吾
For	*Kái*	蓋	sin-	*fú*	負	as	*ju*	如		*tang*	等
kingdom	*kwoh*	國	debts	*tsái*	債	in	*yú*	於	father	*fú*	父
the,	*ché,*	者	against	*yu*	與	heaven	*tien*	天	in	*tsái*	在
power	*kiuen*	權	us	*wo*	我	truly.	*jen*	焉	heaven	*tien*	天
the,	*ché,*	者		*tang*	等	Grant	*Tsz'*	賜	he,	*ché,*	者
and	*keih*	及	those	*ché*	者	us	*wo*	我	wish	*yuen*	願
glory	*yung*	榮	so.	*yé*	也		*tang*	等	thy	*'rh*	爾
the,	*ché,*	者	Not	*Puh*	不	to-	*kin*	今	name	*ming*	名
all	*kiái*	皆	lead	*yin*	引	day	*jih*	日	perfectly	*ching*	成
belong-to	*shuh*	屬	us	*wo*	我	the day	*jih*	日	holy,	*shing*	聖
thee	*'rh*	爾		*tang*	等	what	*so*	所	thy	*'rh*	爾
for ever in	*yú*	于	enter	*tsin*	進	use	*yung*	用	dominion	*tsái*	宰
for ever age	*shí*	世	seducing	*yú*	誘	food;	*liáng;*	糧	rule	*wáng*	王
for ever age	*shí*	世	temptation,	*hwoh,*	惑	forgive	*mien*	免	come	*lin*	臨
indeed.	*jen.*	焉	but	*náí*	乃	our	*wo*	我	to	*chí,*	至
Heart	*Sin*	心	save	*kiú*	救	sin-	*fú*	負	thy	*'rh*	爾
wishes	*yuen*	願	us	*wo*	我	debts	*tsái*	債	will	*chí*	旨
exactly	*ching*	正		*tang*	等	as	*jú*	如	received	*fung*	奉
so.	*shí.*	是	out of	*chuh*	出	we	*wo*	我	done	*hing*	行
			evil	*hiung*	凶		*tang*	等	in	*yú*	於

0 1 cm

Figure 4.33
The Lord's Prayer, in Chinese, with literal translation, and the prounciation of each character, printed in metallic moveable types, by William Mavor Watts, oriental type founder, and printer, Crown Court, Temple Bar, London. This specimen was printed around 1880.
Source: St Bride Library.

Conclusion

This chapter describes the origin and development of Chinese movable type in Europe through a selection of influential Chinese founts produced by different people.

In comparison to early Chinese movable types, these types were based on a completely different approach. From the 18th century, with the establishment of Sinology, European sinologists and printers spent a lot of time and money trying to make Chinese characters for printing. Initally, those involved in their production worked under the guidance of sinologists, and did not understand Chinese, nor the aesthetic and cultural qualities inherent in Chinese characters. As Latin-based mechanised printing technology was seen as being more advanced, Western printers and type makers attempted to adapt Chinese characters to Western type and printing technology. Although the shapes of Chinese characters were imitations of those found in Chinese books, many attributes of Chinese characters were lost; for example, the structure and aesthetic proportions of Chinese characters was generally misinterpreted by Western type makers. The results of Chinese founts produced in the West was often of an inferior quality. As such most founts were not widely used, except in specimens and for research purposes. Nevertheless, there were many new methods invented in the process of making Chinese types, such as divisible type and constructed type.

Of all the Chinese founts produced in Europe, there two most influential were Legrand's Paris Type and Beyerhaus' Berlin Type, which were introduced to China in the mid-19th century and further improved on by natives. Both founts used the divisible type method, which reduced the cost of type and the space they occupy when arranged in cases for compositors. However, the divisible type forced the components of the characters to have a fixed proportion, which could not be adjusted again during the combination process, thus making the proportions of complete characters unbalanced. After many modifications and additions by Chinese natives, they still did not meet the aesthetic needs of Chinese readers. As a consequence, the approach of divisible type was eventually discarded, proving that the Chinese founts produced this way could not match Chinese written aesthetics and sensibilities. Even so, these methods and fount designs provided inspiration for later Chinese fount productions and in the design of Chinese typewriters.

Chapter 5. Chinese movable type in Asia

In 1793, the 'father of modern missions,' William Carey, travelled to Calcutta and was to become the Baptist Missionary Society's first missionary to India.[1] His essay, *An Enquiry into the Obligations of Christians to Use Means for the Conversion of the Heathens*, led to the founding of the Particular Baptist Society for Propagating the Gospel Among the Heathen.[2] His enthusiastic appeal also encouraged Christians to be aware of their responsibility to go abroad for missionary work.[3] Therefore, when European sinologists and type foundries produced Chinese founts in Europe, and subsequently in Asia, the activities of Western missionaries gradually disseminated Western typography into South and Southeast Asia and promoted its spread. Furthermore, Claudius Buchanan's *Two Discourses Before Cambridge University,* published in 1811, put forward a religious attempt to promote Chinese learning and works in Southeast Asia:

> In the discussions concerning the promulgation of Christianity, some writers have confined their views entirely to India, merely, it is supposed, because India is connected, by political relation, with Great Britain. India, however, contains but a small part of nations which seeking the Revelation of God. The Malayan Archipelago includes more territory, and a larger population than the continent of India. China is a more extensive field than either; and is, in some respects, far more important. The Romish Church has maintained a long and ineffectual contest with that empire; because it would never give the people, 'the good and perfect gift,' the Bible. It further degraded the doctrine of the Cross by blending it with Pagan rites.[4]

In the interests of religious expansion, protestant missionaries travelled to unfamiliar countries to preach their faith. When missionaries devoted themselves to publishing the Chinese version of the Bible in the early 19th century, they experimented with Chinese characters and compared the advantages and feasibility of various printing methods. In the process, missionaries re-introduced movable metal type technology to China, and Chinese printing began to shift from xylography to movable metal type.[5]

This chapter investigates the development of Chinese movable type in Asia, focusing on the influential Chinese typefounding activities of selected missionaries Joshua Marshman, Robert Morrison, Samuel Dyer, and William Gamble, along with British businessman Ernest Major. These individuals were crucial in advancing Chinese founts, particularly in type-making techniques. Chinese founts in the 19th century served primarily functional purposes, and although some missionaries recognised the aesthetic challenges associated with Chinese characters and involved Chinese engravers, the aesthetics and conventions of Chinese characters remained largely unaddressed. This section, therefore, focuses on the activities of the missionaries and their study of Chinese characters from a practical perspective.

1 Gonzalez, 2010, *The Story of Christianity,* Vol. 2: The Reformation to the Present Day, p. 419.
2 Carey, 1792, *An Enquiry into the Obligations of Christians to Use Means for the Conversion of the Heathens*; The Baptist Missionary Society originally called the Particular Baptist Society for Propagating the Gospel Among the Heathen. Ross, 1988, *The evolution of the printed Bengali character,* p. 40.
3 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese,* pp. 26–27.
4 Buchanan, 1811, *Two Discourses Preached Before the University of Cambridge.*
5 Su Ching, 2015, 铸以代刻——十九世纪中文印刷变局 [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century].

5.1 Joshua Marshman and Robert Morrison

Joshua Marshman (*Serampore, India*)

The first person to print Chinese characters combined with Western typographic methods was the British Baptist missionary, Joshua Marshman.[6] Although Marshman had never been to China, he made significant contributions to the development of Chinese movable type printing and typeface design. Sinologist Alexander Wylie (1815–1887) extrolled the work of Marshman with regard to Chinese:

> Joshua Marshman, although not actually engaged in missionary work among the Chinese, yet devoted so much of his time and great talents, to collateral objects in direct furtherance of that work, that he may fairly claim a place in a catalogue of such agents; and his labours being first in point of time, entitle him to be placed at the head of the list.[7]

Marshman was sent out on missionary work, connected with the Baptist Missionary Society on 3 May 1799. However, because the East India Company prohibited proselytising in Calcutta, on arriving in India on 9 October 1799, Marshman was compelled to join his fellow missionaries in the Danish territory of Serampore. Thus, Joshua Marshman, William Carey (1761–1834) and the printer William Ward (1769–1823), who were to become known as the Serampore Trio, jointly established the Serampore Mission Press (SMP) in 1800 after obtaining a missionary license and local printing rights under the aegis of the Danish government.

The printing of Chinese at the SMP evolved in three stages: woodblock, movable wood type and movable metal type printing. The first, experimental, stage of woodblock printing commenced in 1805 when the SMP attempted to print sample pages of Genesis and the Gospel of St Matthew translated by Joannes Lassar. Later, in 1810, the SMP published the *Gospels of St Matthew and St Mark,* the first printed Christian scripture in Chinese.[8] The entire New Testament was planned to be printed in octaves, and its size would be similar to that of books commonly used and highly respected by the Chinese, for example, books by Confucius.[9] Chinese characters were engraved on wood blocks made from the tamarind tree. When printed, the pages were folded into a typical Chinese form of binding, 'double-leaved binding', with two blank sides facing inward (figure 5.1).[10] The printing processes used show that the SMP followed the manner of traditional Chinese woodblock printing in their first rudimentary trial of printing in Chinese characters.

The second stage was the trial of movable wood type for printing *the*

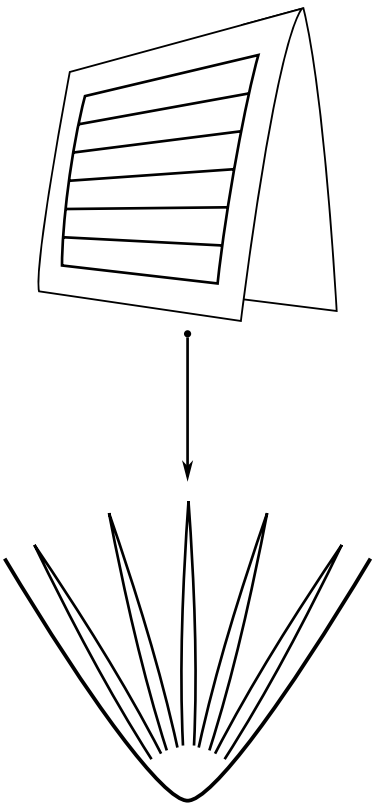


Figure 5.1
One of the traditional Chinese book binding methods, 'double-leaved binding' (包背装).

6 Kang Taiyi, 2014, 19世纪初驻印新教传教士之中文印刷出版——马士曼与塞兰坡传道出版社 [Chinese printing and publishing of Protestant missionaries in India in the early 19th century–Mashman and Serampo Mission Press]. In: 国际汉学 (International Sinology), 2014:1, p. 247.

7 Wylie, 1867, *Memorials of protestant missionaries to the Chinese. Given a List of Their Publications, and Obituary Notices of the Deceased,* p. 1; Kang Taiyi, 2014, [Chinese printing and publishing of Protestant missionaries in India in the early 19th century–Mashman and Serampo Mission Press]. In: (International Sinology), 2014:1, p. 251.

8 *The Gospels of St Matthew and St Mark* are held in Bodleian Library, Oxford.

9 After fieldwork, Taichi Sanko measured the exact dimensions of both *the Gospels of St Matthew and St Mark* to be 13.5cm×23.7cm. Kang Taiyi, 2014, [Chinese printing and publishing of Protestant missionaries in India in the early 19th century–Mashman and Serampo Mission Press]. In: (International Sinology), 2014:1, p. 256.

10 *Periodical Accounts Relative to the Baptist Missionary Society*, Vol. 4, 1817, p. 55.

Works of Confucius (figure 5.2) translated by Joshua Marshman.[11] Around 1808, the Press began to hire local Bengali assistants to work under the supervision of native Chinese speakers. For many years local inhabitants had been accustomed to cutting the pattern of flowers in woodblocks used in fabric printing, and therefore, they possessed the skills required to cut the shapes of written Chinese characters; their work was then checked by a 'Chinese artist'.[12] The SMP also retained a further learned Chinese man, Kung-Lee,[13] to superintend the cutting of Chinese characters.[14] The size of the 'movable wood type' used in the *Works of Confucius* is around 1.6–1.8 cm^2.[15] According to Su Ching's research, because these 'wood movable types' were customised for this book, the method of producing these 'types' was to engrave the whole woodblock first and then saw it line by line into vertical bars. When typesetting in combination with Latin types, each Chinese character could match the corresponding transliterated English words previously prepared.[16]

The size of the wood types used in Marshman's *Dissertation on the Characters and Sounds of the Chinese Language* is 1 cm^2 each, which would be sawn into individual types after the whole woodblock had been engraved (figure 5.3). The style of the Chinese characters in two sizes maintains the traces of writing with a Chinese brush. For example, the shape of the strokes is round and smooth, and the joints of some strokes retain the continuous strokes in writing. Therefore, these two founts can be classified as Kai Ti style. However, the structure is skewed and unstable, especially in the small size. In 1808, *the First Serampore Memoir* mentioned:

> Printing in this language is very far from being impracticable with us; nor is the expense likely to be very great, especially if, as we have reason to expect, we should be favoured with a brother from England skilful at engraving in wood. The patterns of the letters can be given here with accuracy; and through the cheapness of labour in Bengal, it is probable that the Chinese Scriptures may in process of time be printed to nearly as great advantage at Serampore as at Canton or Pekin.[17]

It can be seen that the attempts at woodblock printing and movable wood type in Chinese characters provided the SMP with great confidence and the foundation for the later integration of Western typographic methods.[18]

11 Marshman, J., & others, 1809, *The Works of Confucius: Containing the Original Text, with a Translation*.

12 The artist mentioned here can be assumed to be a Chinese calligrapher, but no other information has been found.

13 Kung-Lee's Chinese name is '孔理'. He is the only Chinese assistant whose name is mentioned by Marshman. Marshman's Letter to BMS of 23 Oct 1807.

14 *Periodical Accounts Relative to the Baptist Missionary Society*, Vol. 4, (1817), p. 55, 'A Second Memoir of the State of the Translations in a Letter to the Society', (1808).

15 The measurement is from Su Ching. Su Ching, 2000, 马礼逊与中文印刷出版 [Robert Morrision and Chinese printing publishing], p. 144.

16 Ibid.

17 *Memoir Relative to the Translation of the Sacred Scriptures*, Dunstable: 1808, p. 15.

18 It should be noted that, on the production of Chinese founts, the younger missionaries commented that the founders of the Serampore Mission Press took much credit for works that were done by or assisted by others. Ross, 2009, *The printed Bengali character and its evolution*, p. 60.

Figure 5.2
A page of *the Works of Confucius* translated by Joshua Marshman printed by the Serampore Mission Press in 1809.
Source: <books.google. co.uk> (accessed on 22 Jan 2021)

CHAP. I.] LUN-GNEE. 11

27 之 chee[1] 21 而 gnee[1] *irr* 15 鮮 sin[2] *syan* 9 弟 ty[3] *tee*

28 有 yaou[2] *yeu* 22 好 hou[3] 16 矣 ee[2] 10 而 gnee[1] *irr*[2]

29 也 ya[2] 23 作 chok[4] *choh* 17 不 put[4] *pooh* 11 好 hou[3]

24 亂 lûen[3] *luan* 18 好 hou[3] 12 犯 fwan[3]

25 者 chea[2] 19 犯 fwan[3] 13 上 syong[3] *syang*

26 未 mee[3] *wye* 20 上 syong[3] *syang* 14 者 chea[2]

[1] [2] [3] [4] [5] [6]
Yaou-chee says, that is the man, (who possesses filial piety and fraternal respect.) Possessing

B 2

Figure 5.3
A page of *Dissertation on the Characters and Sounds of the Chinese Language: Including Tables of the Elementary Characters and of the Chinese Monosyllables* written by Joshua Marshman printed by the Serampore Mission Press in 1809.
Source: <books. google.co.uk> (accessed on 22 Jan 2021)

ON THE CHINESE LANGUAGE. xci

其 *Khee*, it has been already said, is often used as a relative. When this is the case however, it generally supplies also the place of the personal pronoun; as, *he who, they who*, &c. Instances of this will often occur to the reader in perusing this volume.

INTERROGATIVE PRONOUNS.

The Chinese have three characters which seem used almost exclusively as Interrogatives: they are 誰 *Soi*; 孰 *Sook*; and 何 *Ho*.

誰 *Soi* (*sooi*) Who? is much used in this volume; and generally, to denote persons. It occurs page 439, where *Chee-loo* somewhat vain of his courage, asks, "When Hoo-chee goes forth with an army

3 與 eu 2 誰 soi 1 則 Chuk

[2] [1] [3]
Who will be with him?"

孰 *Sook* (or *sooh*) is also used in the same sense. An instance among many others may be seen, page 194, where the sage, after exposing the silly vanity of *Koon-see*, adds,

7 不 put 4 知 chee 1 管 Koon

8 知 chee 5 禮 ly 2 氏 see

9 禮 ly 6 孰 *sook* 3 而 gnee

[3] [1] [2] [4] [5] [6] [7] [8] [9]
"If Koon-see understand propriety, *who* does not understand it?"

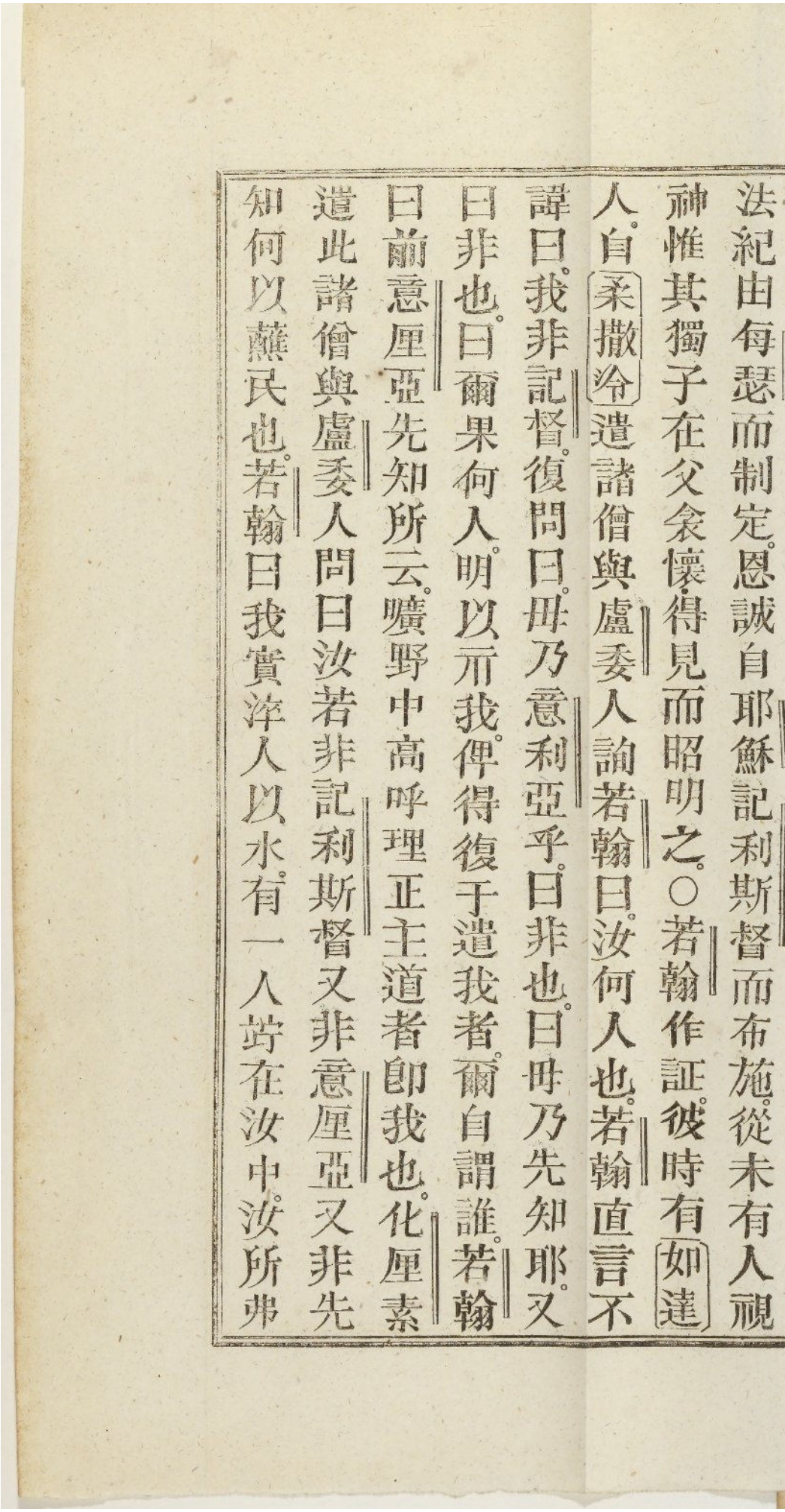
L 2

Because the SMP Chinese wood type tends to be large and easy to damage, it needed to be re-engraved frequently. Therefore, in 1811, Marshman decided to change over to metal type, which would allow fine engraving at a small size and which can be seen as the third stage of the evolution of printing Chinese at the SMP. Initially, there were two founts produced by the SMP, the sizes of which were 0.8 cm^2 (24-point) and 0.5 cm^2 (16-point). However, these two founts were destroyed in a fire at the Press in 1812. Fortunately, in the same year, the above mentioned 'brother from England skilful at engraving in wood', John Lawson, arrived at Serampore and assisted Marshman in making Chinese founts. The arrival of Lawson improved the production of Chinese founts and consequently the SMP succeeded in publishing the *Gospel of the Apostle John* in 1813 (figure 5.4). In 1813 and 1815, the Press published *Clavis Sinica* by Joshua Marshman and *A grammar of the Chinese language* by Robert Morrison, respectively (figure 5.5 & 6).[19]

Except for the different sizes of the two founts employed in the latter two publications, the structure and style are almost the same (figure 5.7 & 8). These two founts have thin horizontal strokes and thick vertical strokes, and distinct serifs at the stroke terminations. Therefore, the style of these two founts can be defined as Song Ti style. However, the structure of the characters is unbalanced.

19 Marshman, 1813, *Clavis Sinica, or Elements of Chinese Grammar*, with an Appendix containing *the Ta-Hyoh of Confucius, with a Translation*; Morrison, 1815, *A Grammar of the Chinese Language*.

Figure 5.4
The first page of *the Gospel of the Apostle John* printed by the Serampore Mission Press in 1813. (Exact measurements currently unknown.)
dSource: <shuge.org> (accessed on 23 Jan 2021).



法紀由每瑟而制定。恩誠自耶穌記利斯督而布施。從未有人視
神惟其獨子在父衾懷。得見而昭明之。○若翰作証。彼時有（如達）
人。自（柔撒泠）遣諸僧與盧委人詢若翰曰。汝何人也。若翰直言不
諱曰。我非記督。復問曰。毋乃意利亞乎。曰非也。曰毋乃先知耶。又
曰非也。曰爾果何人。明以示我。俾得復于遣我者。爾自謂誰。若翰
曰前意厘亞先知所云。曠野中高呼理正主道者即我也。化厘素
遣此諸僧與盧委人問曰汝若非記利斯督又非意厘亞又非先
知何以蘸民也。若翰曰我實洙人以水有一人苗在汝中汝所弗

0 1 cm

若翰所書之福音

第一章

原始維言。神同言。言卽神也。夫言本同神。萬物由他所造。非其造無一而成焉。且命在其中。命者人之光也。光照昏冥。昏冥者弗迎之矣。由神遣來一人名若翰。因來爲証以証光。使生民藉他而信。其本非此光。乃使爲光之証耳。照生民之光者卽眞光也。其居世上。世亦由他所造。而世不識之。其臨於事物而民弗迎之。凡迎他乃信他名者卽賜之德以爲神子。非肉產。非血產。又非人事。惟神而已。言者化體。居于我們之中。見其光榮。儼然乃父獨子之光榮

滿恩誠者也。若翰爲之作証。高呼曰。我前所言。其來我之後。尊舉在我之先。因其先我而有也。我們皆沾其厚澤。與恩上加恩矣。蓋

Figure 5.5
Page 10, *Clavis Sinica : containing a dissertation, I. On the Chinese characters, II. On the colloquial medium of the Chinese, and III. Elements of Chinese grammar,* printed by the Serampore Mission Press in 1813.
Source: British Library collection items digitised by Google.

10 THE ELEMENTS

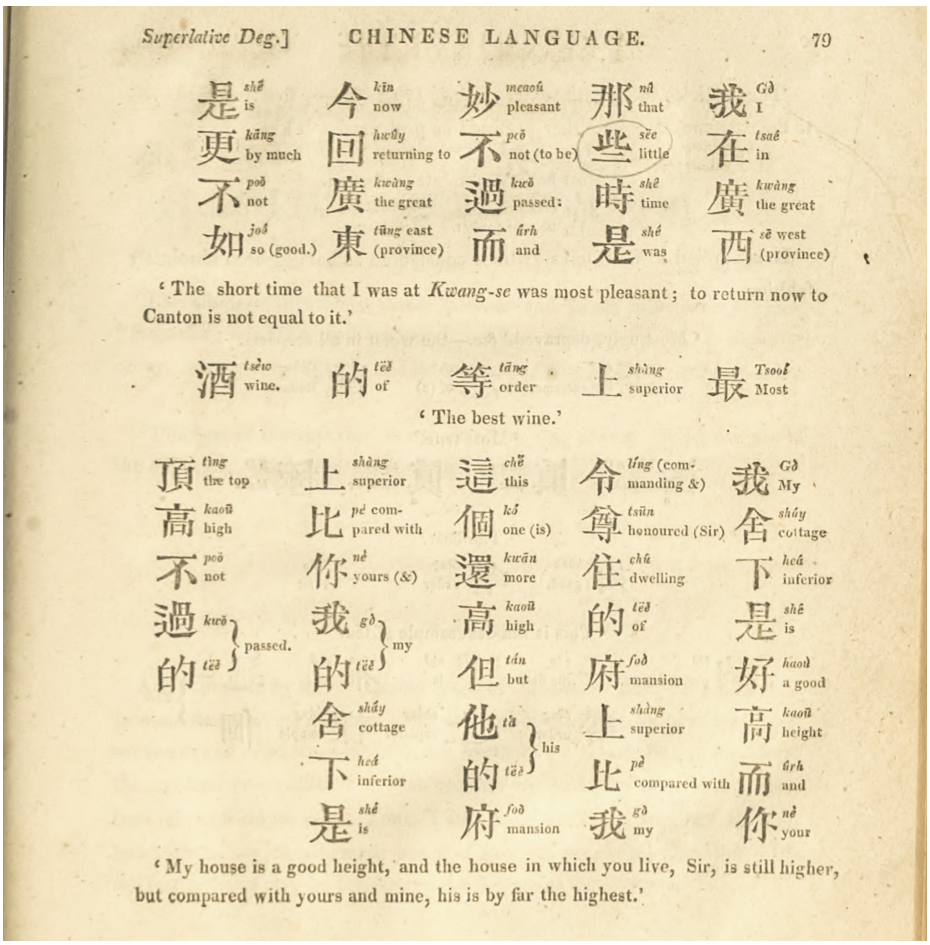
82 毛 *Mao.* The hair of the eyebrows and body; the hair of beasts, &c.
83 氏 *Sheé.* A stock or family; an ancestor.
84 气 *Khee.* Air, breath, vapor, exhalation.
85 水 *Shooí.* Water, the first element.
86 火 *Hó.* Fire, the third element.
87 爪 *Tchaó.* The nails of birds or beasts; to seize as with claws.
88 父 *Foò.* A father, the ruler of the house.
89 爻 *Hhyao.* To imitate, to associate with.
90 爿 *Ts'hwang.* Said to be a kind of seat on which to repose.
91 片 *P'hyen.* A piece of wood, &c. a numeral for the leaves of books, plants, &c.
92 牙 *Ya.* The lower teeth.
93 牛 *Nyeu.* A cow.
94 犬 *Khyuén.* A dog.

V Strokes.

95 亥 *Hhyuen.* A deep red, the colour of the sky in the evening.
96 玉 *Yŏh.* A gem; the beauty of a stone; precious stones in general.
97 瓜 *Kwa.* A melon, cucumber, &c.
98 瓦 *Ngwá.* Tiles; burnt earthen vessels, &c.
99 甘 *Kan.* Pleasant, sweet, one of the five tastes; pleasure, delight.
100 生 *Sung.* A producing; life; unripe, imperfect; production.
101 用 *Yŏong.* To use or employ; use; things capable of use.
102 田 *Thyen.* A cultivated field.
103 疋 *P'hĕh.* A piece of cloth, &c. Pronounced *sho*, it denotes the foot.
104 疒 *Tsĭh.* An ulcer, any cutaneous sore; sickness.
105 癶 *P'hee.* Skin; any skin with the hair.
106 白 *Pŭh.* White, the colour of the sky; pure, clear; open.
107 皮 *Pŏh.* To extend the two feet or throw them forward in walking.
108 皿 *Ming.* Utensils used for food; vessels in general.
109 目 *Mŏk.* The eye, to eye any one; a view.
110 矛 *Myeu.* A long and crooked kind of lance.

(85) In Comp. 氷 氵 (86) In Comp. 灬 (87 In Comp. 爫 (94) In Comp. 犭
(96) 王 (109) In Comp. 罒

Figure 5.6
Page 79, *The Grammar of the Chinese language* printed by the Serampore Mission Press in 1815.
Source: <books.google.co.uk> (accessed on 6 Dec 2022).



Superlative Deg.] CHINESE LANGUAGE. 79

是 *shĕ* is; 今 *kin* now; 妙 *meaoú* pleasant; 那 *nă* that; 我 *Gŏ* I
更 *kăng* by much; 回 *hwûy* returning to; 不 *pŏ* not (to be); 些 *sĕe* little; 在 *tsaé* in
不 *poŏ* not; 廣 *kwàng* the great; 過 *kwŏ* passed; 時 *shê* time; 廣 *kwàng* the great
如 *joŏ* so (good.); 東 *tūng* east (province); 而 *úrh* and; 是 *shé* was; 西 *sē* west (province)

'The short time that I was at *Kwang-se* was most pleasant; to return now to Canton is not equal to it.'

酒 *tsëo* wine.; 的 *tëĕ* of; 等 *tăng* order; 上 *shàng* superior; 最 *Tsooĭ* Most

'The best wine.'

頂 *tĭng* the top; 上 *shàng* superior; 這 *chĕ* this; 令 *lĭng* (commanding &c); 我 *Gŏ* My
高 *kaoū* high; 比 *pé* compared with; 個 *kŏ* one (is); 尊 *tsūn* honoured (Sir); 舍 *shăy* cottage
不 *poŏ* not; 你 *nè* yours (&); 還 *kwān* more; 住 *chŭ* dwelling; 下 *hoá* inferior
過 *kwŏ* } passed.; 我 *gŏ* } my; 高 *kaoū* high; 的 *tëĕ* of; 是 *shê* is
的 *tëĕ* }; 的 *tëĕ* }; 但 *tán* but; 府 *foŭ* mansion; 好 *haoū* a good
舍 *shăy* cottage; 他 *tă* } his; 上 *shàng* superior; 高 *kaoū* height
下 *hoá* inferior; 的 *tëĕ* }; 比 *pé* compared with; 而 *úrh* and
是 *shé* is; 府 *foŭ* mansion; 我 *gŏ* my; 你 *nè* your

'My house is a good height, and the house in which you live, Sir, is still higher, but compared with yours and mine, his is by far the highest.'

Figure 5.7
Specimen of 0.5 cm² (16-point) moveable metal type in the *Specimens of Editions of the Sacred Scriptures in the Eastern Languages*, printed by the Serampore Mission Press in 1813.
Source: Hiroshi Komiyama (private collection).


CHINESE VERSION.

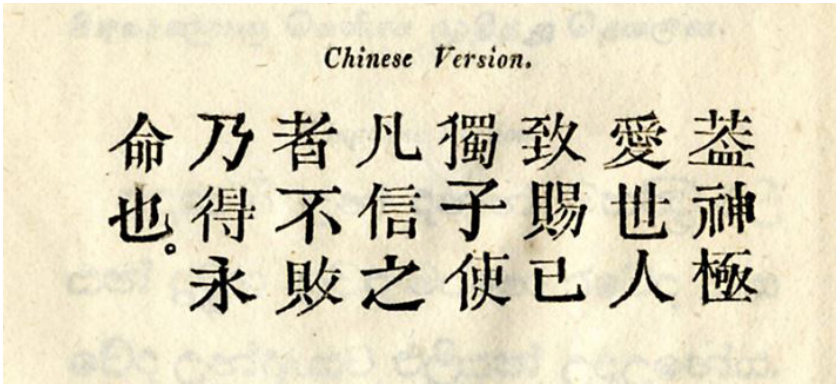
MOVEABLE METAL TYPES.

TEXT. "In the beginning God created the heavens and the earth. And the earth was without form and void, and darkness was upon the face of the deep: and the Spirit of God moved upon the face of the waters. And God said, Let there be light: and there was light." GEN. i. 1—3.

原始神創造天地。地未成形。陰氣蘊于空虛幽邃之內。神風運行水上。神曰光。而遂光

0 1 cm

Figure 5.8
Specimen of 0.8 cm² (24-point) moveable metal type in the *Facsimile of Specimens of the Versions of the Sacred Scriptures in the Eastern Languages* printed by the Serampore Mission Press in 1813.
Source: Hiroshi Komiyama (private collection).


Chinese Version.

蓋神極愛世人致賜已獨子使凡信之者不敗乃得永命也。

0 1 cm

Robert Morrison (*London Missionary Society*)

Robert Morrison, the London Missionary Society's first missionary to China and the founder of the Protestant Mission to the Chinese, was the first to employ Western typographic technology with the printing of Chinese characters in China. However, China, which had previously banned Christian religion for two hundred years, was unfavourable for missionary works. Therefore, when Morrison went to China in the early 19th century, the situation was difficult, and he could only carry out missionary works in secret.[20]

Morrison was ordained and sent to China by the London Missionary Society in 1807. He arrived in Portuguese Macau on September 4, reaching his destination of Canton three days later. In 1809, Morrison became a translator for the East India Company after gaining proficiency in the Chinese language. In addition to this work, he accomplished the translation of the Bible and the compilation of *A Dictionary of the Chinese Language*.

Morrison's attempts at printing Chinese are similar to those of Marshman in that his methods had also evolved from woodblock to printing with movable metal type. After coming to China, he began to pay attention to the traditional Chinese printing method, xylography. Subsequently, in the middle of 1808, Morrison had the idea of printing his texts and following enquiries into the printing market used the classical Chinese book specifications as the required standard.[21] Moreover, when he started to print his first Chinese book, the Chinese version of the *Acts of the Apostles*,[22] the conditions he agreed with the local printing house were that the woodblock, engraving, paper and binding should be of first-class quality. He therefore was confident that the first Chinese publication of Christianity was comparable to the best book in China.[23] Morrison then published six books of the same high quality that all conformed to the traditional Chinese xylography style. However, Morrison was not involved in the actual book printing production; rather, his native Chinese assistants arranged the printing. For example, Morrison's tutor and companion, Low Hëen[24] arranged to print the Chinese version of *the Acts of the Apostles*.[25]

Furthermore, Low Hëen's brother, Cai Gao, who was skilled at calligraphy, undertook the writing of the eight-volume *Sin E Chaou Shoo the New Testament* in Kai Ti style (figure 5.9). Morrison even attempted to learn Chinese xylography for the printing of the *Acts* around 1809. However, he soon abandoned this idea as he found the task too complicated and it would have taken him too long to undertake the printing. Therefore he left the printing to Low Hëen.[26]

20 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 4.

21 Ibid, p. 6.

22 The Chinese title of the Chinese version of the *Acts of the Apostle*s is '耶穌救世使徒行传真本'.

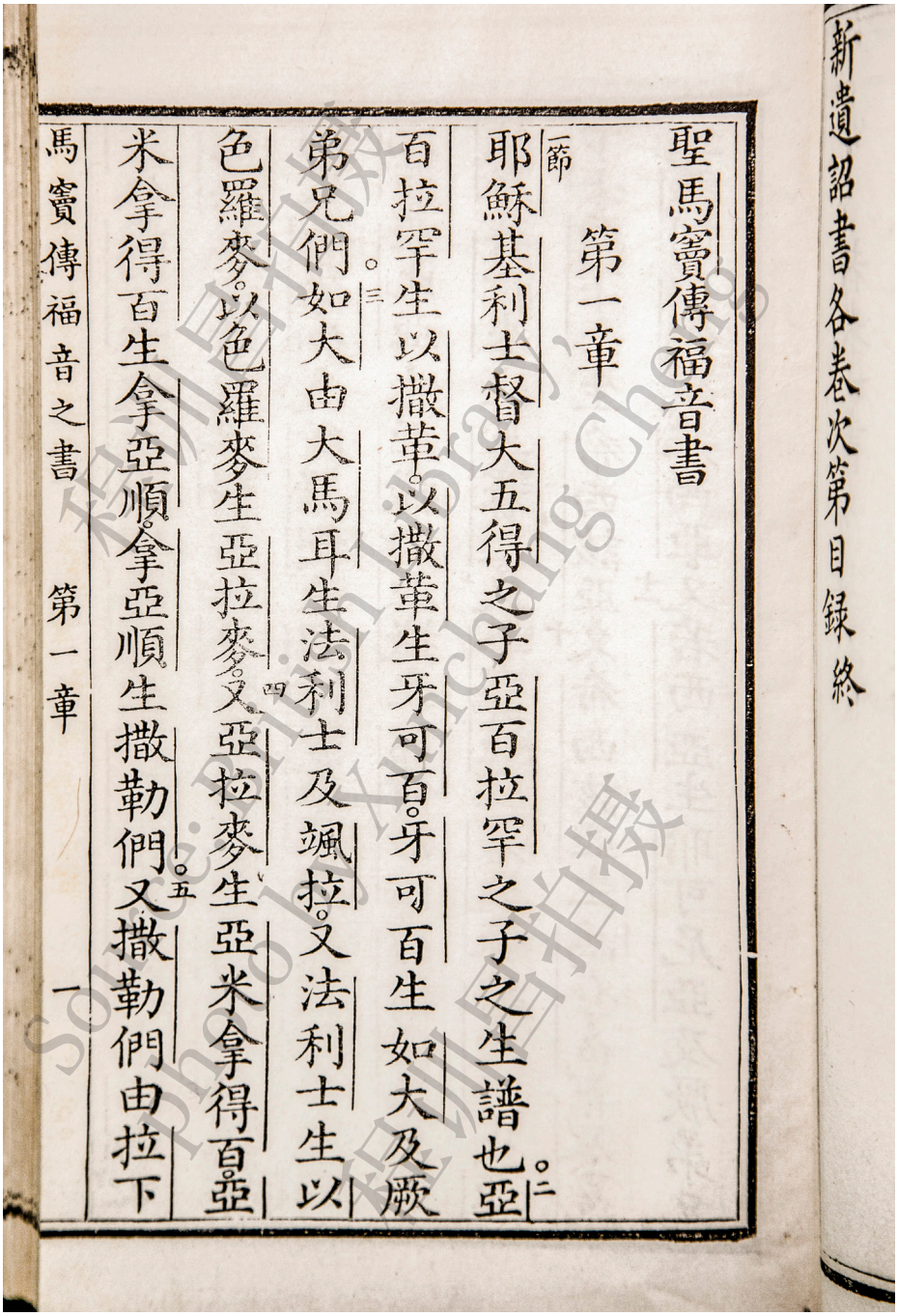
23 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 6.

24 Su Ching speculates Low Hëen's Chinese name is '蔡轩' by using Morrison's dictionary, and Low Hëen's brother, Cai Gao's Chinese name is '蔡高'.

25 Morrison & Kidd, 1839, *Memoirs of the life and labours of Robert Morrison*, p. 238; Daily, 2013, *Robert Morrison and the Protestant plan for China*, pp. 134–136.

26 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 49; Daily, 2013, *Robert Morrison and the Protestant plan for China*, p. 134.

Figure 5.9
A page of *Sin E Chaou Shoo the New Testament* published in 1813 by Robert Morrison.
Source: British Library, photo by the author.



0 1 cm

After 1813, Morrison's books underwent some changes. The style of printed Chinese characters was altered from Kai Ti to Song Ti, and the characters' size was decreased to reduce costs and make it easier to disseminate as demonstrated by the four-volume *Sin E Chaou Shoo the New Testament* which was a later version of the eight-volume text printed in 1813.[27]

Morrison's implementation of movable metal type in China originates from the Chinese-language dictionary he had been compiling since his arrival in the country. After Morrison applied and received permission from the East India Company to print his dictionary, the company's board of directors employed Peter Perring Thoms (1791–1855) to assist in printing Morrison's Chinese dictionary, *A Dictionary of the Chinese Language*. In 1814, Thoms arrived in Macau bringing a European press, movable type, blanks and other printing requisites from London.[28] To solve the challenge of mixing Chinese and English in the dictionary, Morrison and Thoms decided to produce blanks with the same composition and size as the Latin types for Chinese characters. Thoms then employed Chinese assistants to cut Chinese founts on prepared blanks. The Chinese and Latin types were therefore coordinated and could be mixed in typesetting.[29] From 1815, they began to produce a 36-point (two-line Great Primer) and a 14-point (English) fount for the dictionary in Macau. Black, Parbury, & Allen, the East India Company's booksellers, then published the dictionary's first volume in 1815, and republished in 1822 and 1823 (figure 5.10). Volumes II and III were published in 1820 and 1822 respectively.[30]

The style of the 36-point fount used in the dictionary is Kai Ti. The large size of the fount allowed the engravers to cut types paying attention to the finer details of the letterforms. This fount therefore attains a high quality, even maintaining the characteristics of continuous strokes. The style of the 14-point fount is Song Ti with concise strokes. Because the blanks' size is small, and engravers needed to engrave directly onto hard metal, it is more complicated than the engraving on wood. Moreover, some complex characters have many thin strokes. Therefore the quality of the 14-point size is lower than that of the 36-point.

In December 1823, Morrison returned to England for two years. In this period, he changed his attitude towards Chinese printing methods. Prior to his journey, Morrison had insisted on xylography as the mainstay with movable type printing as a supplement. However, during his time away, he revised his opinion to advocating vigorously for the production of Chinese founts based on Western metal movable type.

While in England, he participated in various activities that required using or displaying Chinese characters, but he had no other means of producing them except by handwriting. For example, in 1825 he published *The Chinese Miscellany* that introduced Chinese characters and literature. However, the Chinese characters in the book had to be handwritten and printed by lithography because of the lack of Chinese types in Britain at that time (figure 5.11). Therefore, Morrison called for the use of Chinese founts in the conclusion of *The Chinese Miscellany*:

27 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 7.
28 Reed & Boltz, 2005, *Gutenberg in Shanghai*, p. 36.
29 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 12.
30 Reed & Boltz, 2005, *Gutenberg in Shanghai*, p. 36.

Ke koo 密庫 'to send a treasury' to the invisible state; i. e. to burn a paper house filled with gold and silver leaf. Ke hëen chae tsă che 閒齋雜志 miscellaneous tales to amuse a leisure hour. 4 vols. colloquial.

Classical quotations including the word Ke 密 occur in the 79th vol. of 佩文 Pei-wăn, § 63, page 17.

寅 YIN.

An ancient punishment which consisted in taking off the kneepan; a horary character denoting from three to five P. M. Bold; strong; practiced; respectful. 同寅協恭 Tung yin hëĕ kung, The same reverence for each other, and united respect; expresses that Keun chin tang tung ke yin wei; hëĕ ke kung king 君臣當同其寅畏協其恭敬 prince and minister ought to cherish the same reverence and awe; and unite their veneration and respect so as to be one in all the acts of government. (Shoo-king.) Yin pin chŭh jĭh 寅賓出日 respectfully meet as a guest, the rising sun. (Shoo-king.) Sŭh yay wei yin 夙夜惟寅 morning and night only respectful, expresses Tsze tsaou che moo, woo she urh pŭh yin 自朝至暮無時而不寅 from morning to evening, never at any time without a feeling of respect. (Shoo-king.)

A few quotations under 寅 Yin, occur in the 5th vol. of 佩文 Pei wăn, page 210, and in the 13th vol. 104th page. Yin chuen she 寅傳氏 name of a commentator on the ancient classics.

密 MEIH.

Hills forming a kind of amphitheatre, or large hall; to stop; to rest; profound; still; silent; secret. Name of a state, and of a district; a surname. Pe meĭh 祕密 secret; hidden. Se meĭh 細密 small; delicate. Tsing meĭh 靜密 still; silent; close; secret. Ke meĭh 機密 a secret spring or moving cause. Chow meĭh 稠密 close; thick. Kin meĭh 近密 intimate; familiar. Meĭh how 密厚 close; intimate friendship or acquaintance. Meĭh shĭh 密室 a secret apartment. Meĭh yew 密友 an intimate friend.

Ke meĭh sze tsing 機密事情 a secret affair or transaction. Pŭh che she shĕ mo ke meĭh sze 不知是什麽機密事 I don't know what secret affair it is. Sze pŭh meĭh, tsĭh hae ching 事不密則害成 unless an affair be kept secret it's success will be injured. Tso sze ke meĭh 做事機密 to act secretly. Mow sze yaou pe meĭh 謀事要閉密 plans are required to be kept close and secret. Kin meĭh 近密, and Tsin meĭh 親密 denote familiarly acquainted; intimate with each other.

Wang yĭh shaou meĭh yen 罔亦少密焉 the net also is rather close—said metaphorically of the laws. (史記 She-ke, 4th vol. 18 §, page 1.) Che leu nae meĭh 止旅迺密 the resident strangers are thick; i. e. numerous. (She-king.) San 散 open, diffuse, and Meĭh 密 close, hidden, are applied to sounds in the 禮記 *Le-ke.*

Pŭh kwei meĭh; pŭh pang heă, pŭh taou kew koo, pŭh he sĭh 不窺密. 不旁狎. 不道舊故. 不戲色 do not pry into secrets; do not meddle with others familiarly; do not speak of people's past errors or faults, do not play and laugh—and thereby incur the contempt of others.

Meĭh jin pŭh kung 密人不恭 the men of Meĭh were insolent, 敢距大邦 and presumed to oppose a great nation, therefore 文王 Wăn-wang subjugated them. (She-king.)

Meĭh urh wang shĭh 密邇王室 near the royal domain. (Shoo-king.)

Meĭh yew 密祐 a military officer under the Sung 宋 dynasty who perished by the hands of the 元 Yuen Tartars. (姓譜 Sing-poo, 107th vol.) the same life is given in the 25th vol. of 名臣 Ming chin; and the name is written 密佑 Meĭh yew.

君不密則失臣. 臣不密則失身. 幾事不密則害成 Keun pŭh meĭh, tsĭh shĭh chin; chin pŭh meĭh, tsĭh shĭh shin; ke sze pŭh meĭh, tsĭh hae ching, If the prince do not keep secrets, he will lose his ministers; if a minister do not keep secrets he will lose his life; if plans are not kept secret, the success of the enterprize will be ruined. (Yĭh-king.) Shing jin e tsze se sin; tuy tsang yu meĭh 聖人以此洗心退藏於密 the sages by this wash

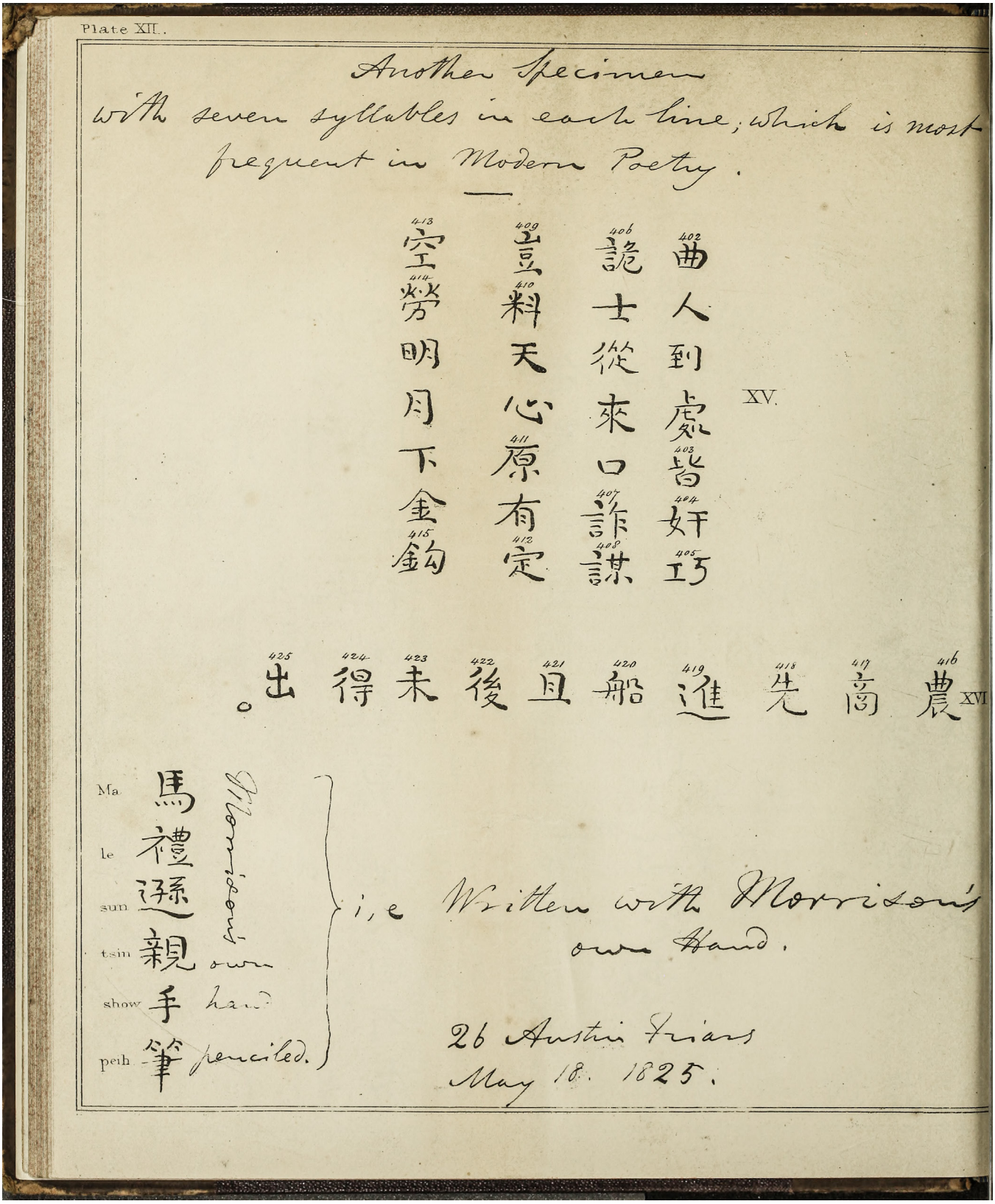


Figure 5.11
Plate XII of *The Chinese Miscellany* by Robert Morrison in 1825. The plate printed by lithography shows Morrison's Chinese handwriting with English notes.
Source: <wellcomecollection.org/works/vf5d3fxq> (accessed on 6 Dec 2022).

> We apprehend it will be necessary to form a separate type for each Chinese character, as indeed the Chinese themselves have done; and as is done in Bengal and Malacca, and at the Honourable East India Company's Press in China. Engraving each character is a tedious and expensive process. Punches must be made to cast them, before they can be generally introduced. We hope that either some munificent friends to the universal spread of the Christian Religion, or some Noble patrons of general literature, or both united, will give to our Country the honour of originating cast Founts of Types for the language of between two and three hundred millions of human beings; and which contains writings of nearly three thousand years' standing.[31]

The renowned British typefoundry, Vincent Figgins (1766–1884), responded to Morrison's call and asked Thoms to give instructions to his son, James Figgins (1811–1884). In 1826, James Figgins made some Chinese types and printed a specimen, the Lord's Prayer, with 53 Chinese characters (figure 5.12).[32] Morrison praised the printed Chinese characters as being correctly and elegantly cut, and he also thanked Figgins for having proved the practicability of casting beautiful Chinese types in England.[33] This is the first attempt to make Chinese types in Britain. Although Morrison hoped Figgins would continue, Figgins stated that he could not compete with the price quoted by Taw, the person mentioned by Morrison's correspondent, who would furnish matrices for 3,600 characters for the sum of 1,800 pounds.[34] Therefore, Figgins abandoned the idea of making a Chinese fount in Britain; however, the individual who provided a lower price for furnishing Chinese matrices never fulfilled the task.

In 1826, Morrison returned to China bringing a lithograph purchased when printing *The Chinese Miscellany*. At the end of the same year, he printed some missionary leaflets in Macau and became the first person to introduce the technology of lithography to China.[35] In 1831, Morrison's son, John R. Morrison (1814–1843) taught lithographic techniques to Liang Fa, Qu Ang and other Chinese printers.[36]

Regarding movable types, Morrison ordered an Albion Press and some Latin founts from Samuel Bagster (1772–1851) in 1831. When he received the press in September 1832, Morrison established the Morrison's Albion Press in Macau and began to produce Chinese founts. In 1833, Morrison's son, John R. Morrison, tried to make Chinese founts according to the Western metal type-making processes of using punches, matrices and casting types. In Morrison's letter to his son on 28 October 1833, he stated, 'type-founding I view of first-rate importance'.[37] However, Morrison died from an illness in the following year, and Morrison's Albion Press was also closed.

31 Morrison, R., 1825, *The Chinese Miscellany*, p. 52. Although Morrison intimated that the use of punches for Chinese, there is no other evidence to explain the process of making the Chinese matrix. Future research will investigate further to resolve this uncertainty.

32 *The Evangelical Magazine and Missionary Chronicle*, April 1826, pp. 144–145.

33 Although Morrison used words such as matrix, casting, Chinese types, there is not enough evidence to prove that early missionaries produced Chinese punches to make matrices. This will be investigated in subsequent studies.

34 *The Evangelical Magazine and Missionary Chronicle*, April 1826, pp. 144–145.

35 Morrison, E., & Kidd, S., 1839, *Memoirs of the Life and Labours of Robert Morrison*, vol. 2, p. 372.

36 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 18.

37 Ibid.

scribed, and soon recovered; but the several officers who had similar fevers, were first ordered to take the bark, and finding it at least harmless, he then ventured upon it himself. As ignorance is a crime in the eyes of the ignorant, it is more especially so at the court of China, and made capital in those to whom the life of the sovereign is entrusted. The three physicians were therefore delivered over to the criminal court, who condemned them to death; but Kaung-hee mitigated the punishment to that of exile, and rewarded the Jesuits with a house in Pekin, and contributed largely towards the building of a church. The Chinese are said to be very subject to leprosy and cutaneous diseases.

They are expert *engravers* on silver, copper, and wood; they are also good lapidaries; and carve beautifully on ivory. In silver fillagree, cabinets, lacquered and plain, tortoise-shell ornamented works, &c. they are nowhere surpassed. Their silk twisted-cords, tassels and embroidery, are also very superior, as well as their ink, paper, and printing. The last is exceedingly different from ours. The whole work which they intend to print, is engraved upon blocks of wood; and their method of proceeding is as follows: They first employ an excellent writer, who transcribes the whole on very thin paper. The engraver glues each of the leaves of the MS. upon a piece of plank of any hard wood: he then traces over with a graver the strokes of the writing, carves out the characters in relief, and cuts down the intermediate part of the wood. Thus each page of a book requires a separate plank; and the excessive multiplication of these is, no doubt, a very great inconvenience, one chamber being scarcely sufficient to contain those employed for a single book. But the advantages are, that the work is thus remarkably free from typographical errors, and the author (happy country!) has no occasion to correct the proofs. In this method the beauty of the work depends entirely on the skill of the writer previously employed. No press is used as in Europe, as neither their wooden planks nor their soft paper could sustain so much pressure. They first place the plank level and then fix it in that position. The printer is then provided with two brushes, and, with the hardest, covers the plank with ink; and one operation of this kind is sufficient for four or five leaves. After a leaf has been adjusted upon the plank, the workman takes the second brush

Dr. Marshman, at Serampore, first printed in this language with moveable types, which is a very great saving of expense, as compared with the Chinese method; and Dr. Morrison, during his late visit to England, was very laudably engaged in encouraging the type-founders of the metropolis to produce specimens of these difficult characters in the ordinary type metal. We are favoured by one of them (Mr. Figgins) with the following very successful attempt of this kind; and we have before us Dr. Morrison's own handsome acknowledgment of its elegance and correctness. The characters were cut by Mr. V. Figgins, jun. under the direction of Mr. Thoms, printer of Dr. Morrison's Chinese Dictionary.

THE LORD'S PRAYER.

吾父在天者、爾名成聖、爾王
至來、爾旨得成于地如在天
然。賜吾每日吾日用糧。免吾
罪、蓋吾亦免負我者。勿引吾
進誘惑。惟救我于凶惡。

In extracting *dyes* of various colors, particularly the brighter ones, from animal and mineral substances, no nation has equalled the Chinese. Their vermilion and blues are particularly brilliant; and their entire porcelain manufacture, it is well known, is unrivalled in Europe. The finest is made in a village called King-te-ching, in the province of Kiang-si. Manufactories have

0 1 cm

Figure 5.12
Page 620, Volume 5, The Lord's Prayer in Chinese printed with Chinese metal types cut by James Figgins under the direction of Thoms, from *A London Encyclopaedia* published in 1829. Source: University of California Libraries & Internet Archive.

Conclusion

Both Joshua Marshman and Robert Morrison travelled to Southeast Asia to spread the Bible to the Chinese according to the goals of their missions. In the process of preaching, they found that translating and printing the Chinese version of the Bible was a necessity for large-scale missionary work, as indicated by Morrison: 'In reference to China, the Press is almost the only Engine that can be employed'.[38] Striving to adapt to Chinese society's local book culture, Marshman and Morrison first chose traditional Chinese xylography to print the Chinese version of the Bible. Through the Chinese and some local resources and assistance, they carried out many attempts at woodblock printing. Morrison's attempts were very successful, and his Chinese publications reached a high standard that was comparable to contemporary high-quality local books.

However, the results of Marshman's attempts at Serampore were far from satisfactory because of the limited resources and lack of understanding of Chinese printing culture. He was not like Morrison, who had more favourable conditions to produce high-quality woodblock printing. Therefore, Marshman naturally chose movable metal type after several xylography attempts; he repeatedly claimed that the quality of metal type printing was superior, and the cost was lower than that of woodblock printing.[39] However, Morrison disagreed with Marshman's statements and pointed out in the *Evangelical Magazine and Missionary Chronicle* Marshman's cost calculation errors and indirect costs, such as not calculating the re-typesetting cost when reprinting and the shipping cost from India to China.[40] Moreover, Morrison suspected:

> The writer perhaps, does not know that moveable single types, made of various materials, have been known and used in China for centuries past; but that the 'old way,' as he has been pleased to call the wooden stereotype, has generally been preferred.

But Morrison also pointed out:

> If any real advantage shall be found to result from single moveable types, the Chinese mission will be able to avail itself of them.[41]

Furthermore, Morrison did not reject Chinese movable metal type and advocated that the Bible should use xylography to show solemnity. For other smaller missionary publications, he considered it to be sufficient to print with movable metal type.

After their experiments with Chinese xylography, both Marshman and Morrison realised the economic and practical necessity of Western metal movable type. As pioneers in developing Chinese movable metal type combined with Western typographic methods, they influenced Chinese typographers to accept the new printing methods. As a result, movable metal

38 LMS/CH/SC, 2.3.D., R. Morrison to W. Orme, Macau, 1 December 1829; Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 5.

39 *Periodical Accounts Relative to the Baptist Missionary Society*, Vol. 4, 1817, pp. 370–385, 'A Third Memoir of the translations Carrying on at Serampore, in a Letter addressed to the Society, Serampore. Aug. 20, 1811;' ibid., vol. 5, 1815, pp. 618–627, 'Memoir of the Translations for 1814;' *A Memoir of the Serampore Translations for 1813* (Kettering: J. G. Fuller, 1815), pp. 16–17, 32–39; *Brief View of the Baptist Missions and Translations*, 1815, pp. 29–30; Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 10.

40 *The Evangelical Magazine and Missionary Chronicle*, September 1816, pp. 352–353.

41 Ibid.

type finally replaced the thousand-year-old woodblock printing tradition as the mainstream method of printing in Chinese during the late 19th century.

In terms of typeface design in Marshman's and Morrison's works, the most significant impact is that the size of the Chinese characters was significantly reduced when they utilised Western technology to make Chinese metal movable type. This also caused difficulties in cutting metal types, and the resulting quality was not very high. Secondly, in selecting the style of Chinese characters, Marshman and Morrison used Kai Ti when applying xylography in order to cater to the Chinese aesthetics of writing. However, in their practice of using movable metal type, they both adopted the style of Song Ti: while on the one hand, this method has the limitation of material and type size; and on the other hand, the Song Ti style is simple and conducive to cutting types. Therefore, their practices reflected that the change of printing method has a certain degree of influence on selecting the style of Chinese characters. Similarly, this may also explain why Song Ti became the most common style of typeface in printing Chinese.

Figure 5.13
Samuel Dyer's portrait in the Portraits of Ultra Ganges Missionaries (1-8) published around 1814–1851. Source: <digital.soas.ac.uk/CW00000032/00001> (accessed on 28 Sep 2021).

5.2 Samuel Dyer

Historical context

Samuel Dyer (1804–1843) was a British Protestant Christian missionary from the London Missionary Society (LMS) to China (figure 5.13). He applied to the LMS in 1824 and had the opportunity to study Chinese from the large number of Chinese books stored in Morrison's mission house when he took lodgings in Islington. Unlike Robert Morrison and Joshua Marshman, Dyer had a background in typography that made him acquainted with the arts of printing, punch-cutting, and type-founding while in London.[42] During Morrison's stay in England (1823–1825), Morrison vigorously advocated using Chinese founts based on the Western metal movable type and called for Chinese fonts.[43] Therefore, the LMS decided to send three additional missionaries to the East, one of whom was Dyer.[44]

Early experiments

During his study of Chinese, Dyer noticed that cutting punches for thousands of Chinese characters was challenging. The production of Chinese founts would not only take a great deal of effort and time but would also require significant expenditure. Therefore, it was vital to determine the character set of Chinese characters. Around 1826, Dyer, in conjunction with two fellow students in the language, ascertained that Morrison's Chinese version of the Holy Scriptures contained about 3,600 characters in variety, and the New Testament alone about 2,600.[45] Moreover, Dyer also estimated the possible cost of cutting Chinese punches before his embarkation to India. The cost of each punch varied from ten shillings to two pounds, which meant cutting punches for a character set required by the Bible would cost a minimum of £1,800,[46] even before producing matrices and casting types.[47]

Before Dyer left England, he thought of a simple method for producing Chinese movable types of the same size. Inspired by coats of arms cast in metal from engravings on wood in England, an idea occurred to him:

> why may not metal type be cast from the wood engravings from which the Chinese are accustomed to print their books?[48]

Dyer realised the possibility of using the same method to produce Chinese types: preparing a set of blocks, and forming from them a set of stereotype plates, casting the common height of metal types, and then sawing the metal plates into pieces.[49] In this way, Dyer could produce metal type without cutting punches.[50]

42 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 42.
43 More details about Morrison referring to chapter 5.1.
44 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 192.
45 Dyer, 1834, *A selection of three thousand characters being the most important in the Chinese Language*, preface.
46 £1800 in 1830 was equivalent to roughly £120,000 in 2017.(Source: nationalarchives.gov.uk/currency-converter/#currency-result)
47 Dyer, 1834, *A selection of three thousand characters being the most important in the Chinese Language*, preface.
48 Ibid, p. 4.
49 Ibid. Regarding the separation of the metal plates, Samuel Bagster the Elder (1772–1851) intimated the practicability of the method and showed Dyer a very convenient lathe for dressing the pieces after the block should have been sawn into individual types of the same size.
50 Davies, 1846 , *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 88.

On August 8, 1827, Dyer arrived at Penang. Since the Chinese department of the Mission in Penang had fallen into disuse, and there were no missionaries to take charge of the Chinese Mission, Dyer found it was the 'path of his duty' to remain at Penang.[51] From 1828, Dyer experimented with the production method for Chinese movable types he had envisaged before leaving England. First, a variety of 700 Chinese characters were written with respect to their relative proportions of each by Dyer's Chinese teacher in Penang. Secondly, blocks were cut at Malacca by referring to the written characters and returned to Penang for reviewing. Thirdly, the blocks were sent to London for casting and sawing into individual types. Finally, Chinese types were sent back to Penang. The first five experimental blocks were sent out in January 1829. It was not until March 1831, two years later, that Dyer received the separated movable types.[52] Although the whole process took a great deal of time in transportation and most of the work was undertaken outside of Samuel Dyer's control, the success was beyond their most optimistic expectations.[53]

Calculation of Chinese character set

When Dyer achieved success in the experiment of producing Chinese types, he immediately began to calculate the Chinese character sets for a complete Chinese fount, or at least a fount containing sufficient characters for missionary operations. However, none of his predecessors had accurately calculated the necessary Chinese character set; therefore, there was no method other than simply calculating the characters used in books people read or used by people who had learned Chinese.

First of all, Dyer had to make a selection of works from which to calculate the character set. However, his ultimate goal and only guide were the compilation of Christian treatises and the revision of the Sacred Scriptures in Penang. In addition, he believed that he must choose the local works closest to the style and in sympathy with the content of the intended publication. Regarding the Chinese version of Christian works, he chose Morrison and Milne's version of the Scriptures and some tracts, as there were the only ones available in Chinese and easily accessible to him.

Moreover, Dyer also needed a sufficiently extensive and varied selection that would include characters never used in Christian treatises. Finally, Dyer decided on fourteen works based on the testimony of all those who expressed opinions on the matter; the Memoir records that Dyer was most satisfied with this choice.[54]

51 Ibid, pp. 58–59.

52 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p.194; LMS/UG/PN, 3.3.A., Dyer to the Directors, Malacca, 24 March 1831.

53 Dyer, 1834, *A selection of three thousand characters being the most important in the Chinese Language*, preface.

54 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, pp. 83–84.

Among the selected fourteen works, Dyer listed thirteen Chinese titles in his *A Selection of Three Thousand Characters*: Morrison and Milne's version of the *Scriptures,*[55] the *Analects,*[56] *San Guo,*[57] *Matthew's Gospel, Zhu Zi,*[58] *Guo Yu,*[59] *Ju Yue,*[60] *Li Ji,*[61] *Xi You,*[62] *Quan Shi Wen,*[63] *Ling Hun Pian,*[64] *Zhang Yuan Lun,*[65] *Xin Zeng Sheng Shu Jie Jie*[66] and *Shi Tiao Jie Zhu Ming.*[67] The books that Dyer selected include translated Chinese versions of Christian books, Chinese books written by missionaries, Confucian classics, and widely circulated Chinese novels. Among them, Confucian classics are the closest in thought to Christian books, and Chinese novels are similar in writing style.

Dyer's original purpose was to have a fount sufficient to set up five forms of octavo at once. After more than two years of calculation, it was determined that a character set consisting of fewer than 5,000 characters could effectively serve the vast majority of objectives pursued by Christian missionaries; a further increase of about 1800 characters would satisfy nearly any literary purpose.[68]

Moreover, to achieve a practical fount, alongside defining the character set, it was necessary to note the characters' relative frequencies. Regarding Dyer's precise calculations, he observed:

> By my notes I find that the variety of characters, near or about, for twenty pages, or two forms and a half, printers' sheets, of the four books, [of *Confucius*], is 703; of which 309 only occur once. The additional variety in twenty pages of the *San-Kok* [*San Guo*] (they contain a vast deal more matter than the same number of pages of the four books) is 929, of which 400 occur only once. And the still additional

55 Morrison and Milne's Chinese version of Scriptures (神圣天书) was first printed in 1823, in 21 volumes, on wood blocks, at Malacca.

56 The *Analects* (论语) is one of the essential Confucianism classics that records the sayings and deeds of Confucius and his disciples.

57 *San Guo* (三国) reminds Chinese scholars of two books, *Records of the Three Kingdoms* and *Romance of the Three Kingdoms*. The *Records of the Three Kingdoms* is a Chinese historical text written by Chen Shou in the third century. The *Romance of the Three Kingdoms* is a historical novel written by Luo GuanZhong in the fourteenth century drived from the history recorded in the *Records of the Three Kingdoms*. In Morrison's description in his letter dated April 2, 1812, the name of *San Guo* (*San-Kwo*, 三国) referred to the *Romance of the Three Kingdoms*. Morrison, 1839, *Memoirs of the life and labours of Robert Morrison*, p. 330.

58 Zhu Zi (朱子) refers to influential Neo-Confucian Zhu Xi (朱熹, 1130–1200). Dyer did not specify the title of Zhu Xi's works he used.

59 *Guo Yu* (国语), also often translated as *Discourses of the States*, is an ancient Chinese historical book.

60 *Ju Yue* (矩矱), its full name should be *Quan Ren Ju Yue* (全人矩矱); and Dyer probably used the version of Karl Friedrich August Gützlaff published in 1836 by Jian Xia Shu Yuan (坚夏书院), Singapore.

61 *Li Ji* (圣书人各合地号礼记) probably refers to the *Book of Rites*, another classic Confucian book.

62 *Xi You* (西游) refers to *A Tour round the World* (*Xi You Di Qiu Wen Jian Lue Zhuan*, 西游地球闻见略传) written by Robert Morrison in 1819. The book aimed to acquaint his Chinese readers with the customs and ideas of European nations and the benefits of Christianity.

63 *Quan Shi Wen* (劝世文) probably refers to the *Admonitions for the Age* published by William Milne at Malacca in 1832. The *Admonitions for the Age* contains *Tract on Idolatry, Tract on the Strait Gate,* the *Evils of Gambling* and On *Justice between Man and Man*.

64 *Ling Hun Pian* (灵魂篇) refers to *Treatise on the Soul* (灵魂篇大全) published by William Milne in the Singapore American Mission Press in 1824.

65 *Zhang Yuan Lun* (张远论) refers to *Zhang Yuan Liang You Xiang Lun* (*Dialogues between Chang and Yuen*, 张远两友相论) created by William Milne and published in Malacca in 1819.

66 *Xin Zeng Sheng Shu Jie Jie* (新增圣书节解) was published by William Milne in Singapore in 1825.

67 *Shi Tiao Jie Zhu Ming* (十条戒注明) probably refers to *Shen Tian Zhi Shi Tiao Jie Zhu Ming* (神天之十条戒注明) published by Walter Henry Medhurst in Singapore in 1832.

68 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 84.

> variety in twenty pages of *Matthew's Gospel* is 225, of which ninety-one occur only once. The still further additional variety of twenty pages from the works of *Choo-foo-tsze* [*Zhu Zi*] is not quite completed, but I expect it will be small; and it will dwindle to almost nothing after the calculations are made from ten distinct authors. I should almost be inclined to think that not more than 2,500 or 3,000 characters occur more than once, upon an average, in twenty pages, though several thousand more occur once.[69]

Through this process, the relative number of characters in a fount could be established, meaning Dyer could obtain the character set and frequency from the selected fourteen books. The result was that for most of the Chinese language only about 1,200 characters in variety were required; the rest only occurred occasionally, while the character set of a complete fount contained about 13,000–14,000 characters.[70]

While calculating the character set and frequency of Chinese characters, Dyer had tried to produce Chinese types without punches. Although the process succeeded by means of a late experiment on a small scale, there was a severe difficulty: a frequently used fount might last for five or seven years and then must be recast. Without a way to cast them in Asia, obtaining a new fount every seven years would be challenging and expensive. After six years of deep consideration, Dyer concluded that,

> however successful our present plan is, we ought to COMMENCE punch-cutting.[71]

To facilitate cutting punches, Dyer further grouped Chinese characters by their structure. There are 11 observations in the preface of *A Selection of Three Thousand Characters* on his selections that fully elaborate his ideas and merit quoting in full here:

> 1. This selection contains upwards of 3,000 characters being the principal characters in the language.
> 2. The first chapter contains such characters as cannot be cut in two or more pieces, without destroying the beauty of the character [figure 5.16].
> 3. The second and third chapters contain the parts of such characters as may easily be divided perpendicularly into two-thirds and one-third or three one-thirds [figure 5.17 & 18].
> 4. The fourth, such as may be divided perpendicularly into two halves [figure 5.19].
> 5. The fifth, such as may be divided horizontally into two halves: further division horizontally although practicable is deemed inadvisable [figure 5.20].
> 6. The sixth, such as may be divided perpendicularly and again horizontally into four quarters [figure 5.21].
> 7. When two or more characters are included in one space, they denote that the same punch may be used in striking all the matrices of the characters in that space: and the small characters on the left show which character is to be first cut and by a comparison of the characters, it will easily be perceived what alteration in the punch is neces-

69 Ibid, p. 94.
70 Dyer, 1834, *A selection of three thousand characters being the most important in the Chinese Language*, preface.
71 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 89.

Figure 5.14
Characters in black are characters, '一', '壬', '士' and '十', which share similar strokes and are therefore grouped together. Characters in red indicate the order in which the black characters are cut, for example, '先作' indicates that '壬' should be cut first because it has the most complex stroke, and removing the top stroke gives the character '士'. Characters in blue are Suzhou numerals which indicate the proportion of each black character in a fount of types. For example, the second character from top to bottom, similar in shape to the 'x', represents the Arabic numeral '4'.
Source: Column 6, first page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language*
(See figure 5.16).

sary for the second &c.–so by untempering, altering, and retempering the punch, one punch may after serve for 3, 4, or 5 characters [figure 5.14].
8. Occasionally, the punch is cut with slightly additions, which additions are to be removed in the tin, after type is cast: thus '太' is not a character of itself: but if a matrix of this kind is struck, one matrix does either for the characters '犬' or '太' by removing either of the dots in the type.
9. The small characters on the right denote the due proportion of each in a fount of types [figure 5.14].[72]
10. In casting the type, such characters as are divided horizontally are to be cast with a mould exactly one half the size of that required for those divided perpendicularly.
11. As the arrangement in the selection was made entirely by a native, some difference of opinion will no doubt occasionally arise as to the precise order and mode of cutting: but the arrangement as it now stands is considered as a fair guide for the engraver.[73]

Dyer divided Chinese characters into six main categories: 1. Inseparable characters; 2. Vertically divisible into two-thirds and one-third characters; 3. Vertically divisible into three one-thirds characters; 4. Vertically divisible into two halves characters; 5. Horizontally divisible into two halves characters; 6. Vertically and again horizontally divisible into four quarters characters. On this basis, he also subdivided similar Chinese characters together. Although his calculation scope is limited to parts of 14 selected books, the results were excellent reference value and laid the foundation for future missionaries to commence Chinese founts and related Chinese writing system studies.

In addition, Samuel Dyer grouped similar characters to save time in cutting punches. The characters with complex strokes are cut first, then the excess strokes are removed to obtain another character. For example, the character '大' can be obtained by subtracting the dot from '太' (figure 5.15). While this approach proves efficient, it presents a limitation when adjusting the stroke position to the strokes of a new character after some of the strokes have been removed. Consequently, the resulting new character may exhibit irregular 'white space' distribution, lacing uniformity in its overall appearance.[74]

72 The small characters on the right used a numeral system, Suzhou Numerlas, used in China before the introduction of Arabic numbers.

73 Dyer, 1834, *A selection of three thousand characters being the most important in the Chinese Language*, preface;

74 The strokes divide the space into white and black space, the black parts being the strokes, the white parts being white space. The position of the strokes affects the evenness of the white space cut out.

Figure 5.15
The red character '太' differs from the blue character '大' in the position of the strokes, except for the difference in the stroke 'dot'.
Font in use: Noto Serif CJK SC.

Figure 5.16
First page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the first chapter contains 'such characters as cannot be cut in two or more pieces', without destroying the beauty of the character.
Source: SOAS Library, photo by Joanne Ichimura.

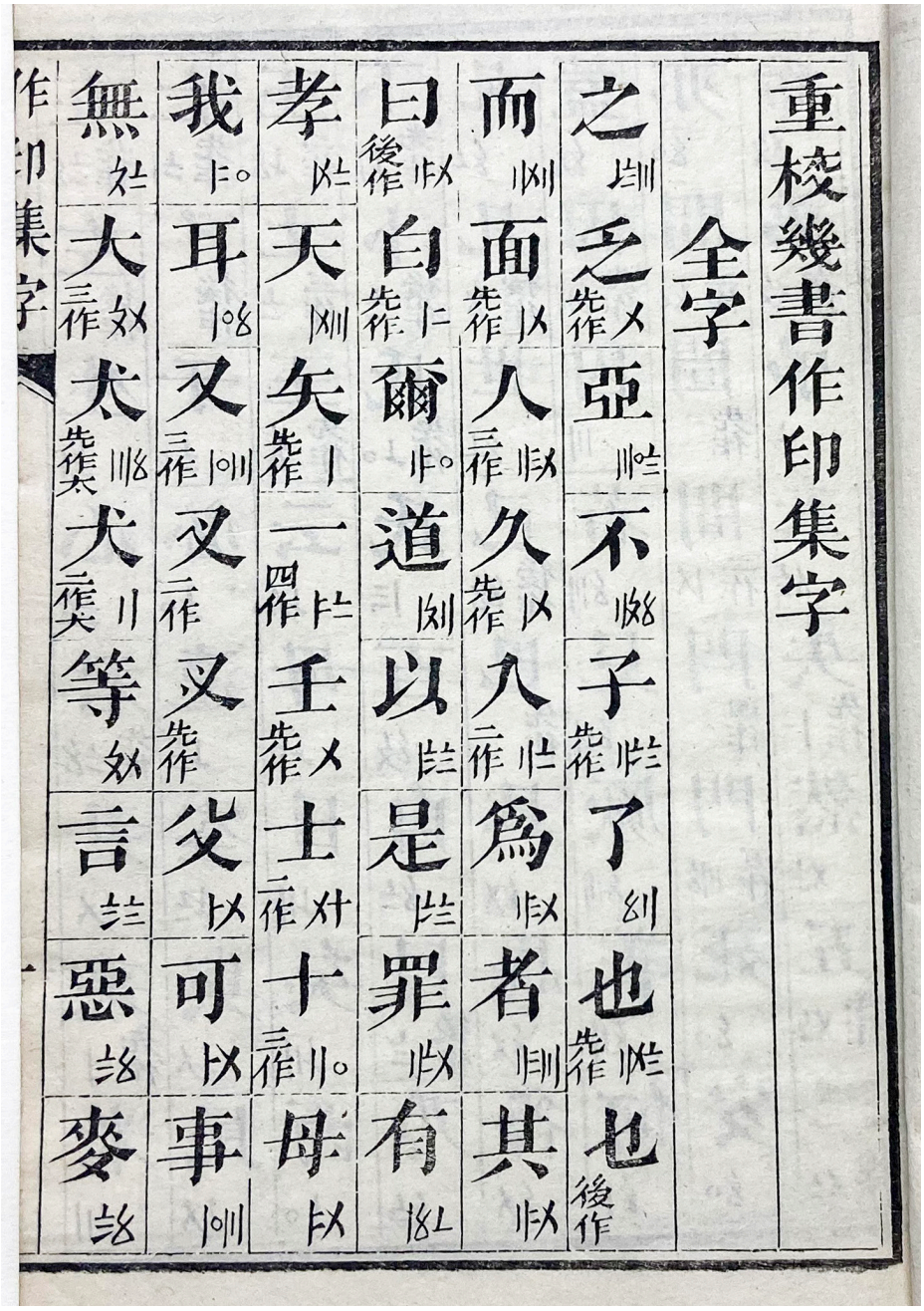


Figure 5.17
Tenth page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the second chapter contains the parts of 'such characters as may easily be divided perpendicularly into two-thirds'.

Figure 5.18
Sixteenth page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the third chapter contains the parts of 'such characters as may easily be divided perpendicularly into one-third'.

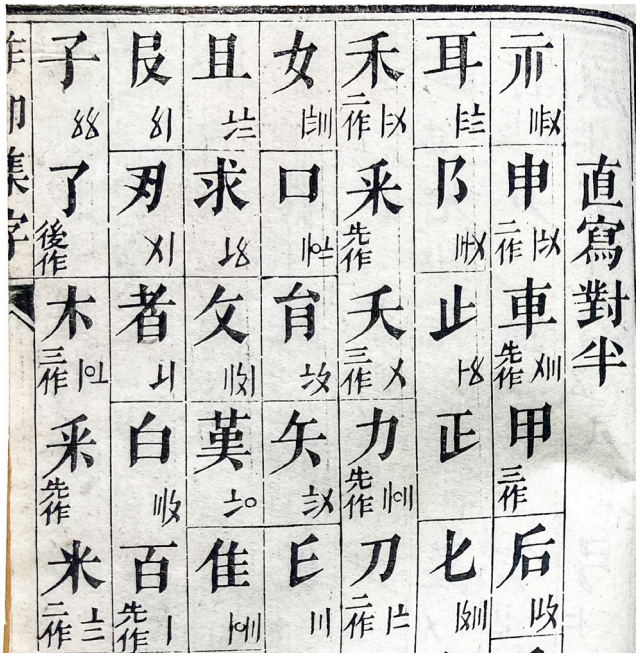


Figure 5.19
Eighteenth page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the fourth, 'such as may be divided perpendicularly into two halves'.

Figure 5.20
Twenty-first page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the fifth, 'such as may be divided horizontally into two halves': 'further division horizontally although practicable is deemed inadvisable.'

Figure 5.21
Twenty-third page of *A Selection of Three Thousand Characters Being the Most Important in the Chinese Language* shows the sixth, 'such as may be divided perpendicularly and again horizontally into four quarters'.

Founts

AT PENANG

Regarding the production of Chinese founts, Samuel Dyer set up two programmes to achieve Chinese metal types ,which he termed as 'temporary' founts and 'permanent' founts. The permanent fount was prepared after the temporary fount was exhausted through use.[75]

The metal types of the temporary fount were sawn from the metal plates cast from a set of stereotype plates formed from prepared woodblocks. As indicated above, Dyer succeeded in this plan on a small scale around 1831 without utilising punches and matrices..[76] However, the disadvantage was the requirement for the use of stereotype plates. Firstly, all the imperfections and unevenness of the woodblocks would be transmitted to the metal plates when cast; and many fine strokes in the middle of the characters were missing because of the soft texture of the woodblocks. Secondly, a fount in constant use would need to be recast after fives years or so, and then it would have to be recast. However, he had only obtained metal types by what he termed the 'temporary fount' method; and procuring a new 'temporary' one would be difficult and costly.[77]

Therefore experimenting with a temporary fount and calculating the number and frequency of Chinese characters, Dyer fully realised the significance of matrices and punches for Chinese founts. At the end of 1832 Dyer declared:

> A punch is the foundation of perpetuity; and a single punch for any character would furnish as many as are wanted of this character, in Malacca, Canton, England, or anywhere else; and so to any extent of variety.[78]

Moreover, James Figgins' attempts in 1826 made Dyer affirm the feasibility of using punches to produce Chinese types. Dyer asserted:

> There is no doubt but metal types may be made by means of punches, in the usual way. Mr. Figgins, a respectable type-founder in London, attempted it with great success.

However, because of the great variety of the Chinese character, Figgins' method involved immense expense and lengthy delay in the production of a fount: this was one of the reasons why Dyer commenced the temporary fount before the permanent fount.

Dyer's permanent founts consists of two founts, a larger fount (24-point) and a smaller fount (13.5-point). The type size of the smaller fount is a quarter of the larger fount.[79] Concerning the size of the larger fount, Dyer was aware that this was large after the workman had cut some types, but it was still smaller in size than the characters in Morrison's version of the Sacred Scriptures printed in Malacca. Moreover, when metal types were first made, it was thought expedient to select a size that presented little difficulty to the workmen employed in the task. When cutting types of the larger fount, the impediments in cutting smaller punches were

75 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 88.
76 More details see previous section *Early experiments*.
77 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, pp. 88–89.
78 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 88.
79 The Point size of founts in brackets was mentioned by Hiroshi Komiyama.

removed, and even the cost was less than for the larger fount.[80]

In 1833, Dyer used the Song Ti style of Chinese characters as a reference in the Chinese Bible printed by woodblock in Penang, and hired several Chinese workers to cut Chinese punches for the larger fount according to previous calculations for the character set.[81] Therefore, the most important characters in Chinese were cut first and then gradually those characters of less importance.[82] Then, occasional characters were cut on blank-type surfaces. This fount would only be useful when the number of punches reached 1,200.[83]

Regarding the cost, Dyer reported in the 'Brief statement relative to the information of metal types for the Chinese language' on 31st October 1833:

> The average price for which punches can be cut at Penang is not more than 68 cents; the copper matrices are struck from them for the additional sum of 2 1/2 cents each.

To reduce the cost, Dyer divided the characters perpendicularly into halves, thirds, and two-thirds; and horizontally into halves, where such division could be made without affecting the intrinsic aesthetics of the character. This method saved a large number of punches that gave credit to his previous calculation. Moreover, he realised that even when a punch was damaged in striking the matrix, it could be used again to strike matrices for a similar character of a fewer number of strokes after some dressing.[84]

In 1833, Dyer had received 400 rupees from donations and used this founding to cut nearly 200 punches. If five men were employed, each could cut four punches per day with the requisite funds. Although Dyer acknowledged that 400 pounds were sufficient to complete a set of 3,000 sorts, and only 100 pounds would be sufficient for casting each fount of 30,000 characters, he still could not afford to complete the project and lacked further financial support. Therefore, he raised funds from all who appeared to be interested in his project in China. Furthermore, the American Board of Foreign Missions donated 200 dollars for Dyer's type, and in 1835, the American Tract Society promised further support.[85]

It is worth noting that Dyer was keen to ensure the high quality of the punches and therefore scrutinised each character after receiving it from the punchcutter. If he was not satisfied, the punch would have to be re-cut. His principal guides for the best-formed characters were the *Kangxi Dictionary,* and Malacca cut characters.[86]

In contrast, Dyer noticed that the quality of the Paris Type by Pauthier and Legrand, while appearing to be exquisite, the characters were unsuitable for printing Chinese text with respect to their styling.[87] The Paris

80 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 101.

81 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 196; LMS/UG/PN, 3.5.A., Dyer to William Ellis, Penang, 7 and 16 September 1833.

82 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 89.

83 Dyer, 1834, 'Chinese Metal Type.' *Chinese Repository* 2 (Feb 1834). pp. 477–478.

84 Ibid. Also see the eighth group of Samuel Dyer's observations in the preface of *A Selection of Three Thousand Characters.*

85 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 119.

86 Ibid, p. 96. The *Kangxi Dictionary* also was the groundwork of Morrison's Dictionary. The *Kangxi Dictionary*, published in 1716, was the most authoritative dictionary of Chinese characters from the 18th century through the early 20th century. Since its publication, the *Kangxi Dictionary* has seen numerous versions, with over 100 different editions recorded according to incomplete statistics. Therefore, exactly which version Morrison and Dyer previously referenced is to be examined.

87 Paris Type refers to 15-point fount by Jean-Pierre Guillaume Pauthier and Marcellin Legrand. see

Type is inelegant, and the parts of Chinese characters are disproportionate. When Pauthier and Legrand added the system of divisible type, this created irregular forms in more than one-half of the Chinese characters in Paris Type. However, Paris Type was acceptable to European scholars and gained much admiration, but there was no regard for the aesthtics of Chinese characters (figure 5.22, 23 & 24). Dyer's Memoir states: 'The character is Chinese, no doubt, but the taste displayed in its execution is French'.[88] It can be said that, at the time of the early 19th century, Dyer's fount was authentically Chinese in the styling of each character, and there had been no other founts to approach it in quality.[89]

chapter 5.2 Divisible Chinese movable types.

88 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese,* p. 102.

89 Ibid, pp. 102–103.

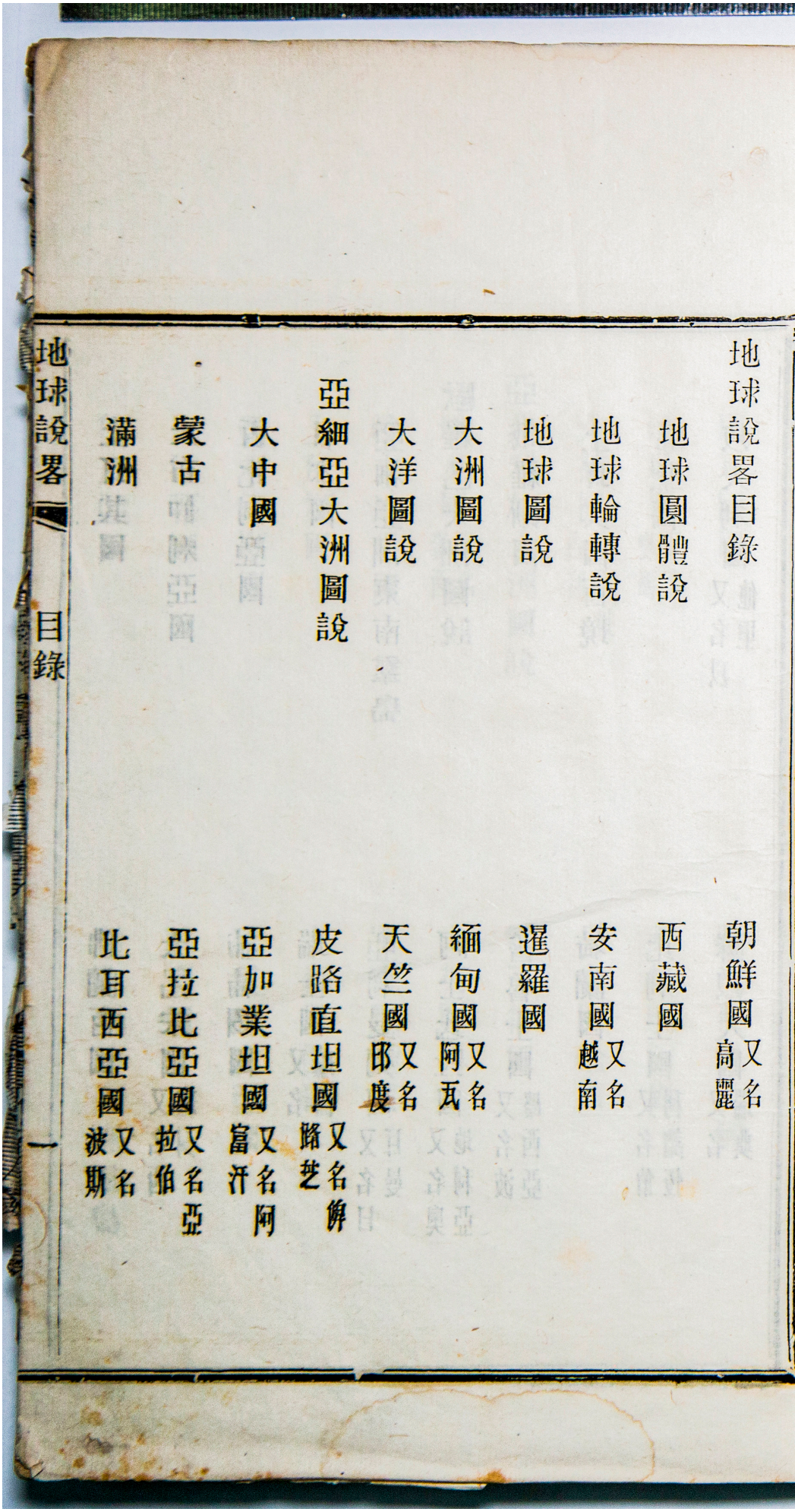

地球說畧目錄
地球圓體說
地球輪轉說
地球圖說
大洲圖說
大洋圖說
亞細亞大洲圖說
大中國
蒙古
滿洲
朝鮮國又名高麗
西藏國
安南國又名越南
暹羅國
緬甸國又名阿瓦
天竺國又名印度
皮路直坦國又名俾路芝
亞加業坦國又名阿富汗
亞拉比亞國又名亞拉伯
比耳西亞國又名波斯
地球說畧 目錄 一

Figure 5.22
Two pages from *Diqiu Shuolue* by Richard Quarterman Way, published at Ningbo in 1856. The right-hand page uses Dyer's 24-point fount (Hong Kong Type) and the left-hand page uses Legrand's 16-point divided type (Paris Type).
Source: Xing Li (private collection), photo by the author.

故此書之作、即曰遺漏尚多、而大畧瞭如指掌、閱之亦不無小補、且書中所誌、余與中華李先生、採輯群書、務求其實而筆之、臆度之見、初不敢妄參一說、又在諸君子鑒之、至各國人形地產、間有繪圖、非以悅目、欲以証實耳、今是書成、一則俾館中衆學者、得擴其見聞、二則還望博學之儒、同爲披覽云。

耶穌降世一千八百五十六年

合衆國士人韋理哲謹撰

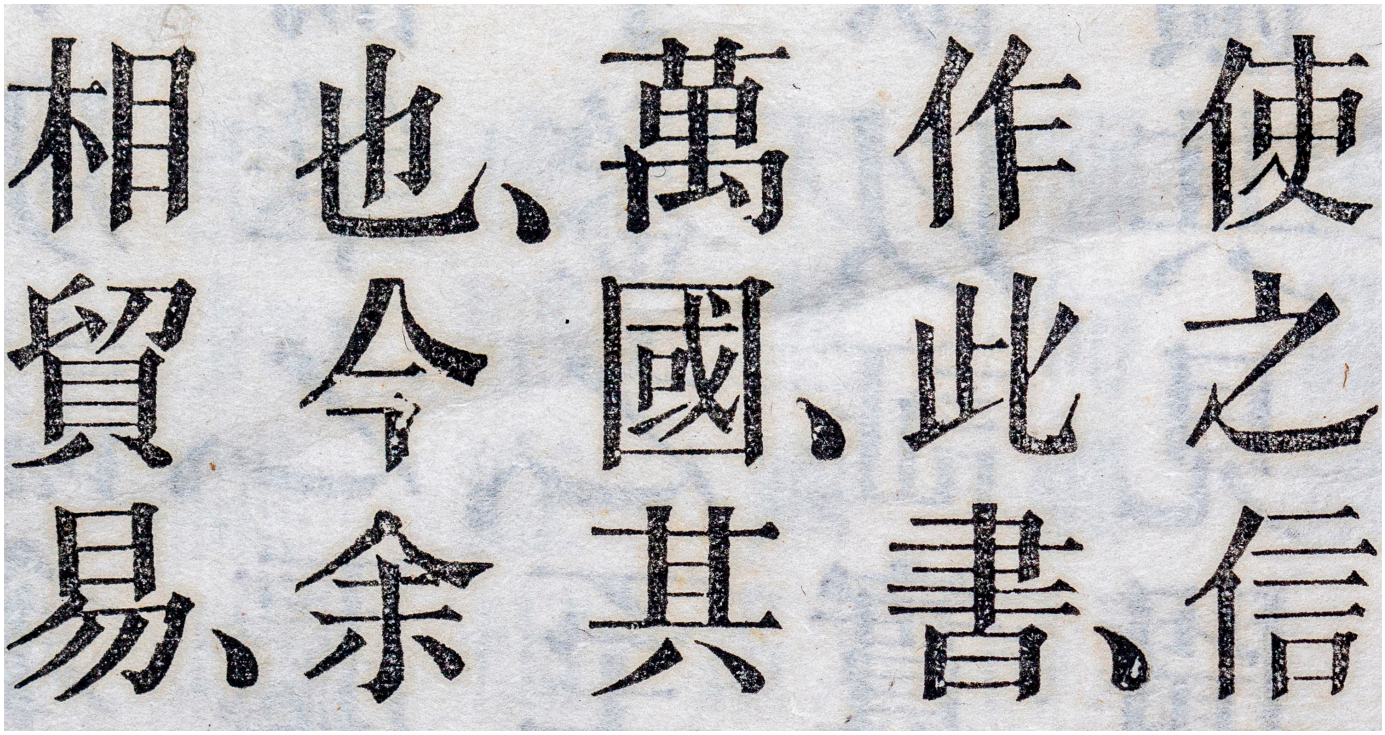


Figure 5.23
Enlarged printed Chinese characters using Dyer's 24-point fount from *Diqiu Shuolue* by Richard Quarterman Way, published at Ningbo in 1856.
Source: Xing Li (private collection), photo by the author.

0 0.333 cm

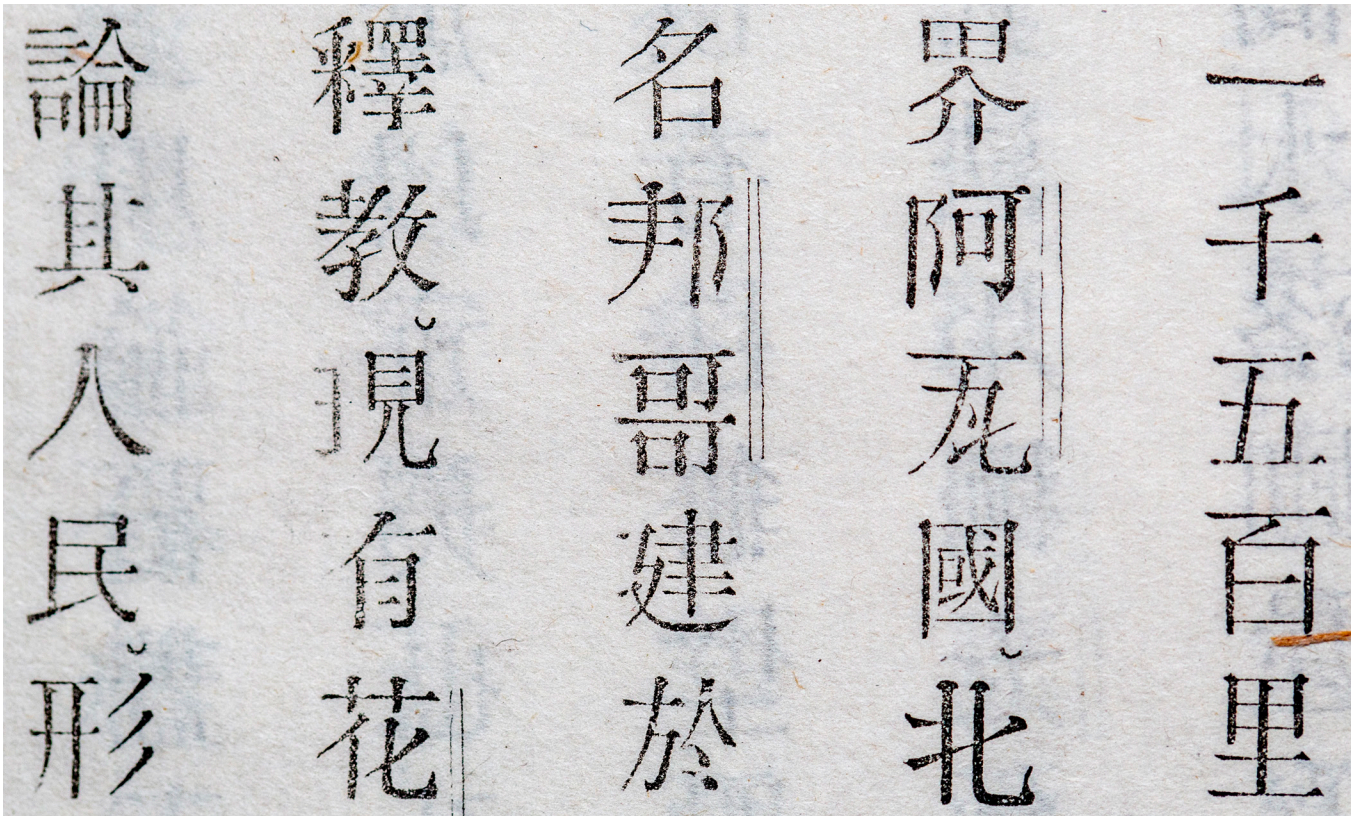


Figure 5.24
Enlarged printed Chinese characters using Legrand's 16-point fount from *Diqiu Shuolue* by Richard Quarterman Way, published at Ningbo in 1856.
Source: Xing Li (private collection), photo by the author.

0 0.333 cm

AT MALACCA

At the end of 1835, the LMS required Samuel Dyer to move from Penang to Malacca to take over the Chinese Mission and the Anglo-Chinese College: the directors wanted to improve the efficiency of the Anglo-Chinese College and augment their operations at Malacca. Dyer had the qualifications for that post; however, John Evans, a junior but the only missionary in the Malacca station, replaced the position of Jacob Tomlin(1793–1880)[90] in May 1834. Therefore, at the end of 1835, when Dyer arrived in Malacca, he took over only the printing department while leaving the College to Evans. His residence there lasted for only about four years as he returned to Europe with his wife on account of her poor health.[91] In these four years Dyer continued punch-cutting and type-founding in Penang. The specimen of Dyer's larger fount in figure 8 was sent by Dyer from Malacca in 1838 (figure 5.25 & 26).

During Dyer's stay in Malacca, the development of the Chinese metal movable type ushered in a significant turning point in Chinese printing. The LMS directors changed their attitude towards the Chinese metal type and actively asked Dyer to produce it. Their change in attitude can be credited to the Royal Imprimery's rivalry in producing Chinese type and the professional advice to Chinese Mission, given by the other missionary, Walter Henry Medhurst, who worked as compositor and printer.[92]

In 1834, under the direction of Jean-Pierre Guillaume Pauthier, Marcellin Legrand developed a 15-point Chinese fount by using divisible type in the Royal Imprimery. In 1837 and 1838, *Great Learning* and *Tao Te Ching* respectively untilised Legrand's fount. Moreover, the American Presbyterian Mission Press ordered a complete set of matrices as early as 1836. Therefore, the Chinese movable metal type developed in France to some extent aroused a sense of competition in the LMS.[93] Compared with Legrand's 15-point divisible type, Dyer's 24-point type was created character by character, which required more time and cost, because the type size was larger than Legrand's. However, the Chinese characters of Legrand's founts were stiff and disproportionate, and new misplacement problems occurred during the combination of divided parts. In contrast, Dyer's Chinese type was relatively more aesthetically pleasing and well-structured.

For the directors of the LMS, it was difficult to understand Chinese and its printing issues, but Medhurst's advice changed their views of Chinese types. From 1836 to 1838, during Medhurst's return to England, he explained to the LMS the strengths and weaknesses of the founts of Legrand and Dyer in detail. He also observed that Dyer's type-making skills were highly proficient, and he recommended that Dyer create another smaller size fount. Therefore, Dyer's fount could not only compete with Legrand's but also reduce typefounding and printing costs. In addition, the printed books would be smaller in size than before, easier to carry and store, and helpful to disseminate in an environment where missions were prohibit-

90 Jacob Tomlin was a Protestant Christian missionary from the London Missionary Society. Tomlin was appointed by the LMS to Malacca in 1826 and reached there in 1827. His relationship with the LMS was terminated in 1824. (source: roxborogh.com/Biographies/tomlin2.htm)

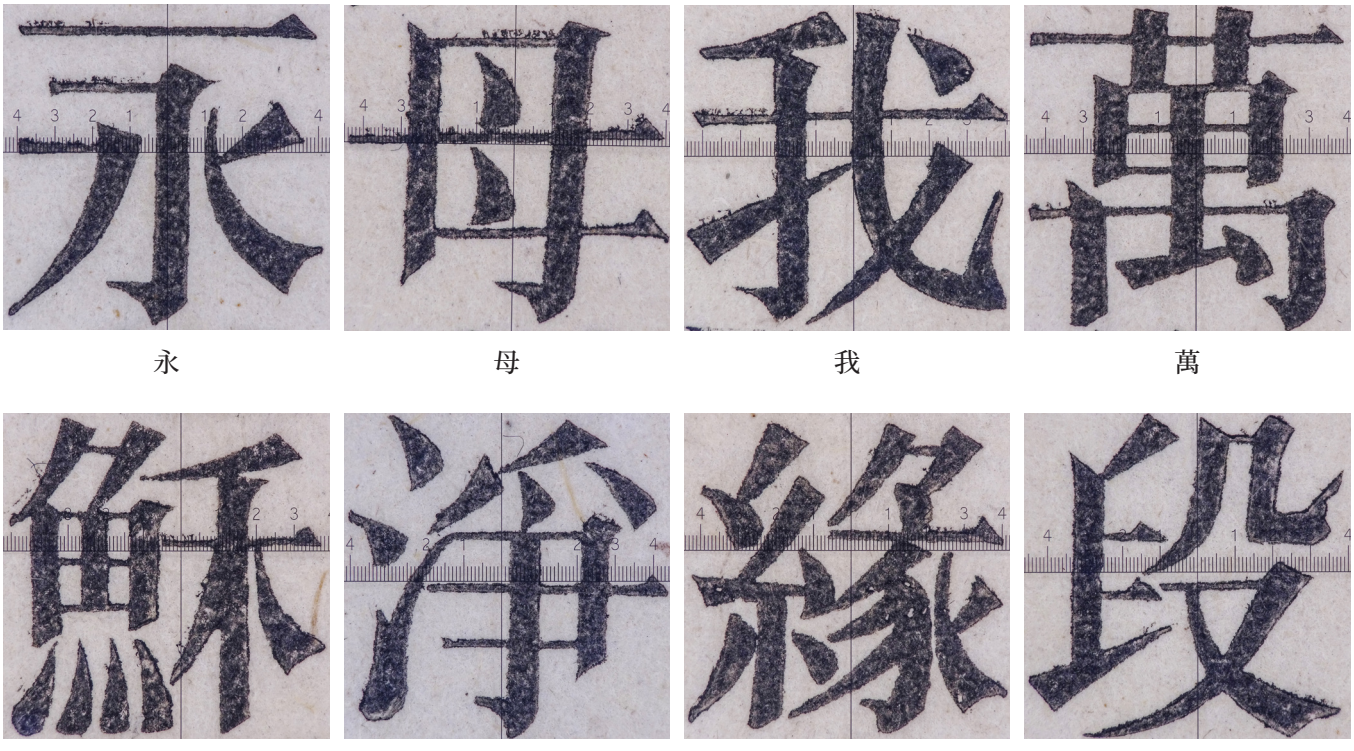
91 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, pp. 267–275; Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese,* p. 200.

92 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 198.

93 See chapter 4 Chinese movable type in Europe.

Figure 5.25
Specimen of Dyer's 24 Point large Chinese fount from a letter by Dyer dated Malacca, 24 March, 1838. (Original size)
Source: SOAS, LMS Archive, Malacca, 3.4.B., Dyer to the Directors, 24 March 1838.

0 1 cm



永 母 我 萬

穌 淨 緣 段

0 0.2 cm

Figure 5.26
Enlarged Chinese characters from the specimen of Dyer's 24 Point large Chinese fount from a letter by Dyer dated Malacca, 24 March, 1838. Some strokes may different from the reference characters because of the unification or simplification of Chinese characters, and current Chinese fonts follow the *Table of General Standard Chinese Characters* published by the government of the People's Republic of China and promulgated in June 2013. Source: SOAS, LMS Archive, Malacca, 3.4.B., Dyer to the Directors, 24 March 1838.

ed in China.[94] In the end, the directors accepted Medhurst's authoritative professional suggestions and took the initiative to ask Dyer to create the smaller size fount which he undertook.[95] After returning to the Europe in 1839, he also visited Paris to see Legrand's Chinese type, according to the memoir, he was fillled with confidence as to the quality of his founts.

AT SINGAPORE

In 1841, Samuel Dyer left the Britain again because the Battle of Chinhai had erupted, China was forced to become more open to outsiders; and the LMS thought that the time for missionaries to enter China was coming.[96] Therefore, Dyer was sent to Singapore in order to travel to China more quickly where he arrived in 1842.[97] As the Singapore station was fully equipped for type-founding, he began to produce Chinese punches, mainly in small sizes, with an average monthly output of 40 characters.[98] On 29th March 1842, Dyer sent a specimen of smaller size, 13.5-point fount to his father from Singapore (figure 5.27 & 28).

On 29 August 1842, the Qing Dynasty and the United Kingdom signed the Treaty of Nanking, which ended the First Opium War (1839–1842). The Qing government agreed to cede Hong Kong to the British Queen, and the treaty established five treaty ports opened for foreign trade at Canton (Guangzhou), Amoy (Xiamen), Foochow(Fuzhou), Ningpo (Ningbo) and Shanghai (figure 5.29).[99] The treaty of Nanking meant that the Qing Dynasty was forced to open up the country and enter an era of colonisation. At the same time, it marked a new era in the operations and history of the Protestant Mission to the Chinese people. Consequently, the LMS gathered missionaries to Hong Kong to discuss deployment in China.[100] When Dyer went to Hong Kong, the number of large size type reached 1,540, less than half of the estimated 3,232 characters, and only around 300 small size types, which was far from completion.[101]

94 LMS/BM, 12 Frbruary 1838.; LMS/CM, 19 September 1836, 5 February 1838; 21 August 1838.; LMS/UG/BA, 4.D., Medhurst to the Director, On board the George the Fourth of the North forelands, July 31, 1838.

95 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 199.

96 The Battle of Chinhai took place on 10 October 1841, during the First Opium War, in Chinhai (Zhenhai), Zhejiang province, China, and the opposing forces were the British and the Chinese. The British captured Chinhai, which consequently led to the unopposed seizure of Ningpo on 13 October.

97 Ibid.; LMS/CM/India Committee, 11 and 16 June 1841.

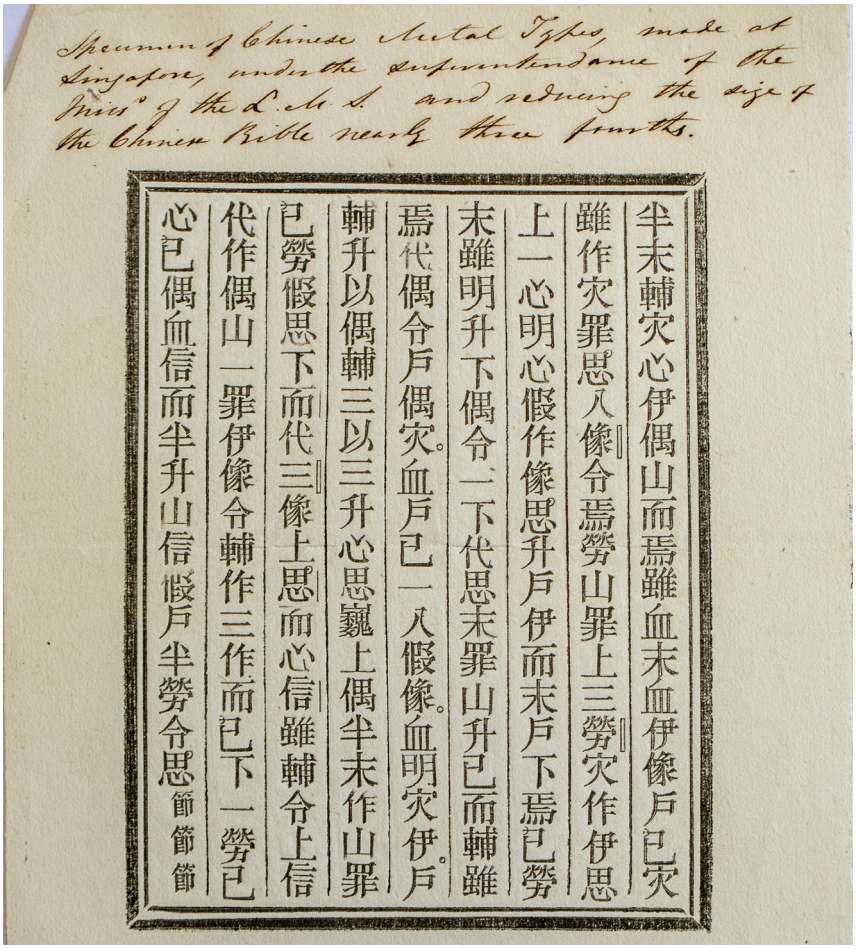
98 Ibid.; LMS/UG/SI, 2.2.c., Dyer to Arthur Tidman, Singapore, 15 October 1842.

99 Symington, D., & Symington, S. (n.d.). *The Treaty of Nanking* (1842).

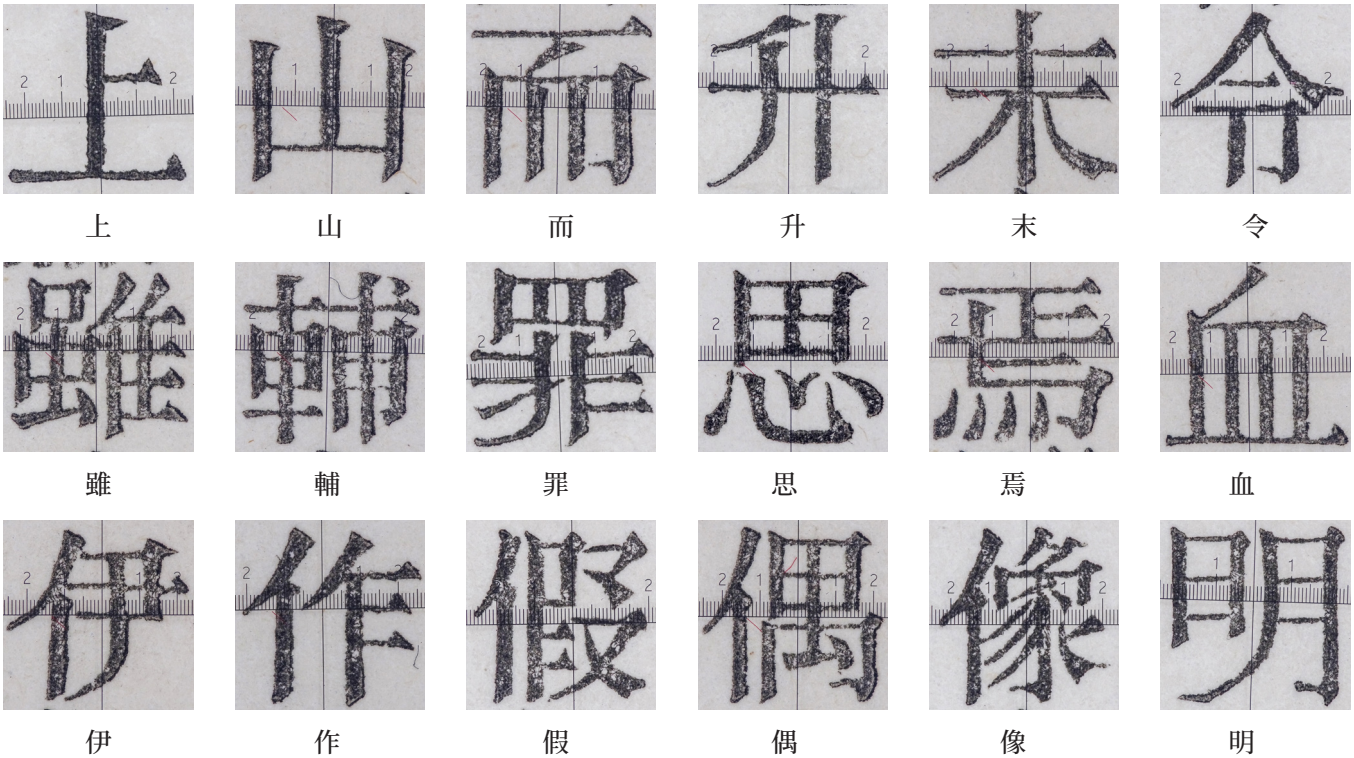
100 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 248.

101 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 201.

Figure 5.27
Specimen of Dyer's 13.5-point fount from a letter by Dyer dated Singapore, 29 March, 1842. (Original size)
Source: SOAS, LMS Archives, Singapore, 2.2.c., Dyer to his father, 29 March 1842. Photo by the author.



0 1 cm



0 0.2 cm

Figure 5.28
Enlarged Chinese characters from the specimen of Dyer's 13.5-point fount from a letter by Dyer dated Singapore, March 29, 1842.
Source: SOAS, LMS Archives, Singapore, 2.2.c., Dyer to his father, 29 March 1842. Photo by the author.

Figure 5.29
Five treaty ports in the red rectangle frame, from top to bottom, Shanghai, Ningpo (Ningbo), Foochow (Fuzhou), Amy (Xiamen) and Canton (Guangzhou) from the Commercial map of China in 1899.
Source: <digitalcommonwealth.org/search/commonwealth:9s161b95m> (accessed on 9 Nov 2021).

AT HONG KONG

On 18th of July 1843, Samuel Dyer in company with his colleague, John Stronach, left Singapore and arrived in Hong Kong on the 7th of August.[102] When the missionaries were assembled in conference, Dyer was appointed as their secretary.

During the meeting, the LMS society decided to establish new stations among the five treaty ports. Canton was out of the selection because of the dialect and fierce local anti-British sentiment, and because the missionaries of three American Boards had already settled in the city. Shanghai was the most suitable place for missionaries in terms of dialects. Regarding Ningpo, there was less information, and they therefore set up an investigation before choosing a place between Shanghai and Ningpo to settle themselves. Taking into consideration that Dyer had studied the Hokkien dialect,[103] the LMS society appointed him to go to Fuzhou in Fujian province to open a mission there.[104] Unfortunately, after the meeting, Dyer died of fever at Macao on the 24th of October, 1843, at the age of thirty-nine. His grave is situated next to Morrison's in the Macau Christian Cemetery.[105]

After Dyer's death, the brothers Alexander Stronach (1800–1879) and John Stronach (1810–1888) solicited those working in the typefoundry, decided to continue to produce Dyer's Chinese founts.[106] In a letter dated January 7, 1845, Alexander Stronach revealed that he had 370 new matrices and 1,226 punches that had not been made into matrices. These gave a total of 3,041 characters. He also mentioned that he had made some progress with the smaller size fount but was currently working on the larger fount and hoped to have it as complete as possible.[107] In 1846, When Alexander Stronach left Singapore for Xiamen, he followed the directions of the Mission headquarters and handed over all the founts and printing presses to the Hong Kong station. At that time, the number of sorts reached 3,891, including the types of the large and small founts.[108] At the end of 1846, William Gillespie, who was in charge of the printing establishment in Hong Kong, reported to Arthur Tidman (1792–1868), the Foreign Secretariat of the London Missionary Society, that the character set of the larger fount amounted to over 4,200, while the smaller fount had only 400.[109]

102 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 248.

103 In 1838, Dyer also published *Vocabulary of the Hokkien Dialect*.

104 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 285; LMS, SC, 4.3.B., Dyer to Tidman, Hong Kong, 26 August 1843.

105 Davies, 1846, *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*, p. 255.

106 In 1843, the type foundry had three workers, and by the time the foundry was transferred to Hong Kong in 1846, the number of workers had grown to five, Charles, Francis, John, Amok and Achao. The headman, Charles, a Portuguese recruited in Malacca in 1846, was highly skilled and engaged in infilling, dressing and tempering punches and striking the impression of punches on matrices. Punch-cutters Francis, John, Amok and Achao. Francis and John may also be from the Portuguese community in Malacca, employed at the same time as Charles. Amok and Achao are Chinese who worked for Dyer for many years in Malacca. Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 274; LMS, SI, 2.3.B., J. Stronach to Tidman & Freeman, Singapore, 2 January 1844.

107 1845, *The Chinese Repository*. Volume 14, pp.124–129.

108 Su Ching, 2000, [Robert Morrision and Chinese printing publishing], p. 201.

109 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 350; LMS, SC, 4.5.A., W. Gillespie to Tidman, Hong Kong, 29 September 1846 .

Dyer's legacy, inherited and completed by Richard Cole

In late February 1844, Walter M. Lowrie (1819–1847) established the American Presbyterian Mission Press at Macao, the third mission press which contributed significantly to the development of typography in China. In the same year, Richard Cole, a skilful printer and type-founder, took charge of press operations. Cole had remained in charge until 1847 and then transferred to the London Missionary Society Press in Hong Kong to continue Dyer's Chinese founts in the same year. At that time, the LMS missionaries at Hong Kong stated that in the production of metal types and presses, 'no man in China does that so well as Mr CoIe,'[110] and felt that Cole could effectively remedy the loss caused by Dyer's death. Cole had begun making Chinese types. In the same year, John Fullerton Cleland, one of the missionaries in the LMS, sent a review of the types to Cole:

> Upon an outright inspection of punches, it was found that there had been passed as good, many characters so irregularly formed, that it became imperative that if we desired to supply other missions with type and to produce ourselves a legible volume, to have them cut entirely over again. Indeed, with all the care that has been subsequently used we are continually hearing complaints as to the indifferent manner in which the work has been done.[111]

From Cleland's review, Cole probably re-cut Dyer's 'irregularly formed types' to support the missions and produce a legible volume. It is likely that Cole improved the quality of Dyer's founts. As the missionaries had expected, Cole's arrival significantly accelerated the production of Dyer's two Chinese founts. There were 2,410 punches of the 13.5-point smaller fount cut and 1,800 matrices struck in 1849.[112] In the same year, the British and American missionaries in China completed a new version of the Chinese Bible which provided an opportunity for the application of Dyer's founts. However, the character set of Dyer's two founts was insufficient to print the new version of the Chinese Bible. James Legge, the senior missionary of the mission, explained that:

> So many new Chinese punches have been required for the printing of the New Testament in the new version. Mr. Dyer's original lists of requisite characters for printing the Scriptures were made from Dr. Morrison's version. The brethren at Shanghai have used, or will use before they finish the Old Testament, at least, I should say, a thousand characters which Dr. Morrison never used.[113]

This meant that if the New Testament were to be printed, the character set needed to be increased by a thousand more. Under the auspices of the LMS, there were therefore 4,500 characters for each fount in 1850. By 1851, Cole had largely completed the two Chinese founts, both with a character set of 4,700, which was sufficient for printing common Chinese books.[114] A letter from John Chalmers (1825–1899) to Tidman in 1857 mentions the

110 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 351; LMS, SC, 5.0.A., Legge to Tidman, Hong Kong, 29 October 1849.

111 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 277; LMS, SC, 4.5.C., Cleland.

112 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 278; LMS, SC, 5.1.C., Legge to Tidman, Hong Kong, 28 January 1850.

113 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 279; LMS, SC, 5.0.A., Legge to Tidman, Hong Kong, 29 January 1852.

114 Williams, 1875, Movable Types for Printing Chinese, *The Chinese Recorder*, VI, p. 30.

exact character set of two founts, both amounting to 5,584. He also referred to another, Bourgeois type made specifically for marginal notes, with a character set of 328.[115] The character sets of both the large and small founts further advanced to 6,000 by 1865, and they remained in Hong Kong until 1873 (figure 5.30).[116]

Conclusion

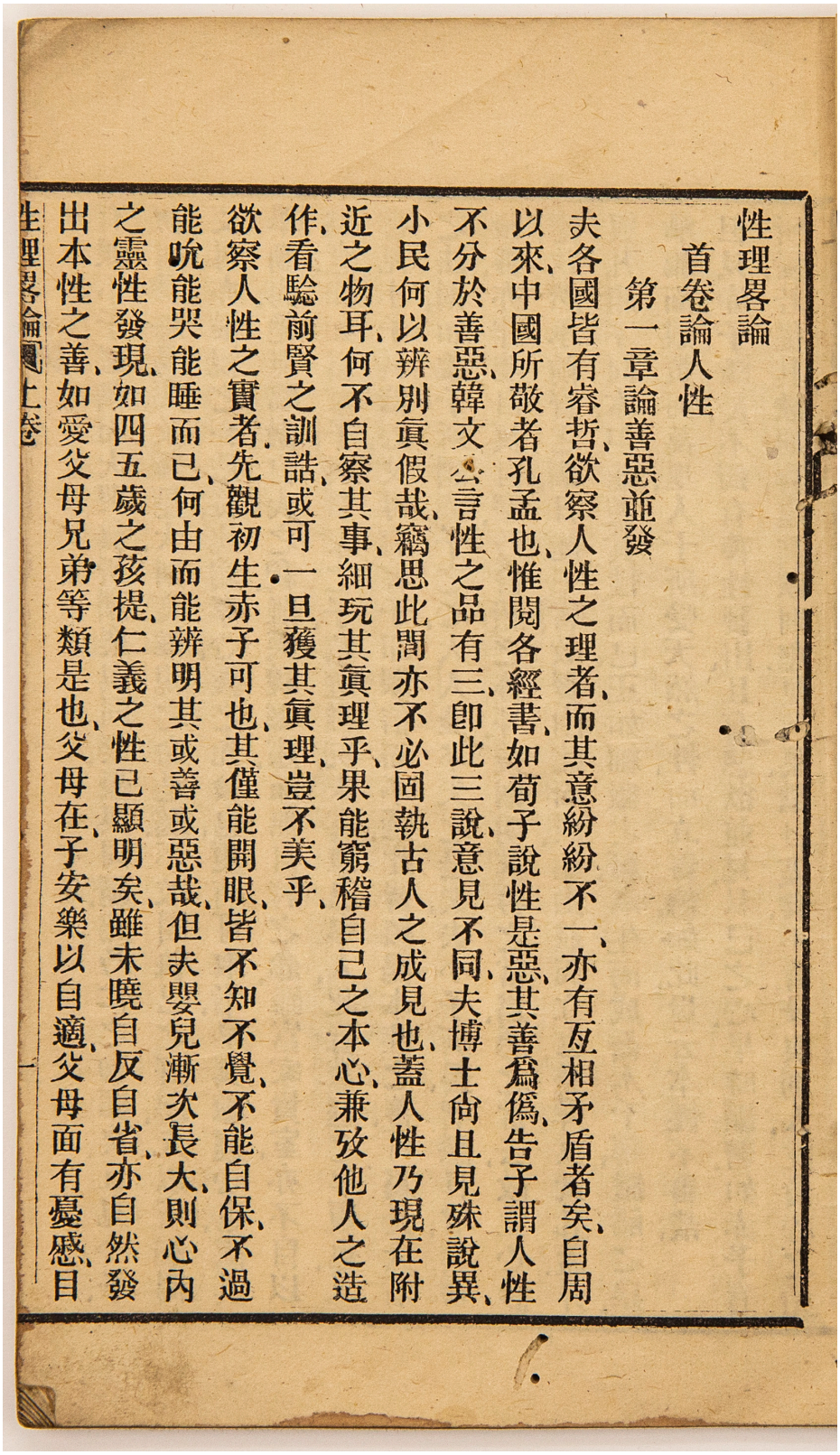
In summary, Dyer made a significant contribution to Chinese founts in two main aspects: one being the calculation of character sets and character frequencies, and the other being the practice of Chinese founts using European mechanical metal movable-type printing techniques. Because the books selected by Dyer for his character set and frequency calculations were mostly contemporaneous missionary texts written in Chinese, and the calculations were limited to 20 pages of 14 books, the character sets were ultimately inaccurate. It is worth noting, however, that Dyer's statistical range includes secular works, suggesting that he may have considered the use of his Chinese character founts for general purposes. In the end, Dyer's results were summarized in the book *A Selection of Three Thousand Characters*, which provided a reference for later missionaries and punchcutters. In this book, Dyer divides Chinese characters into radicals for the convenience of punchcutters. Some Chinese scholars called Dyer the designer of division type, but the idea of separating a single Chinese character into several radicals is in itself one of the characteristics of the Chinese writing system when Chinese characters were first formed.

Regarding the practice of Chinese founts, Dyer produced two kinds of Chinese founts, temporary and permanent. The temporary founts, which on the one hand served for temporary use and, on the other hand, can be seen as an experiment to produce the permanent founts, also allowed Dyer to fully understand the importance of punches and matrices for Chinese characters. Dyer's fount practice also shows that Chinese founts were in the process of being adapted to European metal movable type technology. The permanent founts consist of 24-point and 13.5-point founts. Before Dyer's death, the 24-point fount was largely completed, and Dyer made only a fraction of the 13.5-point fount. At a later stage, Cole upgraded the quality of the 13.5-point fount and the refinement of the character set so that some scholars attribute the 13.5-point to Cole and call it 'Cole Type.' It is also known as the 'Hong Kong Type' because the fount was completed in Hong Kong. These two founts were subsequently reproduced by the American Presbyterian Mission Press using the electrotyping method and became more widely used (figure 5.31 & 32)[117].

115 Bourgeois is a traditional point-size name equal to 9-point and around 3.175 mm. Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 282; Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 239; LMS, CH, SC, 6.1.A., J. Chalmers to A. Tidman, Hong Kong, 14 October 1857.

116 Su Ching, 1997, *The printing presses of the London Missionary Society among the Chinese*, p. 282.

117 See chapter 5.3 for more information about the electrotype method.



性理畧論

首卷論人性

第一章論善惡並發

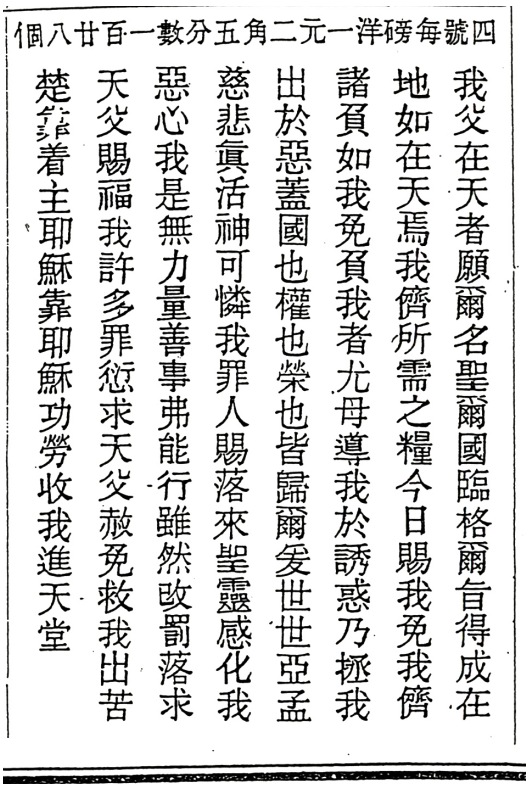
夫各國皆有睿哲、欲察人性之理者、而其意紛紛不一、亦有互相矛盾者矣、自周以來、中國所敬者孔孟也、惟閱各經書、如荀子說性是惡、其善爲僞、告子謂人性不分於善惡、韓文公言性之品有三、即此三說、意見不同、夫博士尚且見殊說異、小民何以辨別眞假哉、竊思此間亦不必固執古人之成見也、蓋人性乃現在附近之物耳、何不自察其事、細玩其眞理乎、果能窮稽自己之本心、兼攷他人之造作、看驗前賢之訓誥、或可一旦獲其眞理、豈不美乎、

欲察人性之實者、先觀初生赤子可也、其僅能開眼、皆不知不覺、不能自保、不過能吮能哭能睡而已、何由而能辨明其或善或惡哉、但夫嬰兒漸次長大、則心內之靈性發現、如四五歲之孩提、仁義之性已顯明矣、雖未曉自反自省、亦自然發出本性之善、如愛父母兄弟等類是也、父母在、子安樂以自適、父母面有憂感、目

生理畧論 上卷 一

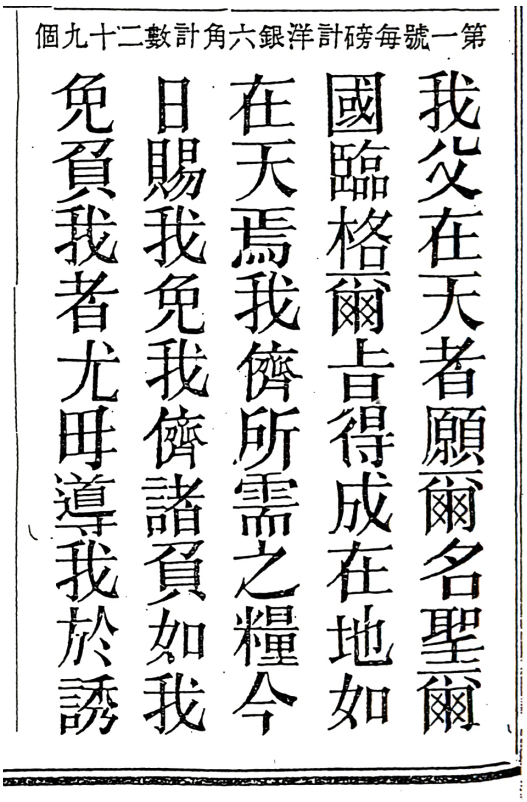
0 1 cm

Figure 5.30
First page of the *Xing Li Lue Lun* (性理略论) printed by Anglo-Chinese College Hong Kong in 1869. The fount in use is the 13.5-point fount by Dyer and Cole.
Source: Xing Li (private collection), photo by Zhou Bo.



0 1 cm

Figure 5.31
Specimen of Dyer's 13.5-point smaller fount from the fount sales advertisement from the American Presbyterian Mission Press (China), *Jiao Hui Xin Bao* (*Chiao-hui hsin-pao, The Church news*), issued in 19 Dec 1868.
Source: Hiroshi Komiyama (private collection).



0 1 cm

Figure 5.32
Specimen of Dyer's 24-point larger fount from the fount sales advertisement from the American Presbyterian Mission Press (China), *Jiao Hui Xin Bao* (*Chiao-hui hsin-pao, The Church news*), issued in 19 Dec 1868.
Source: Hiroshi Komiyama (private collection).

In addition, it is worth noting that, in recognition of Chinese radicals[118], Dyer did not apply the method of the divisible type proposed by the Paris scholars, Rémusat and Heinrich Julius Klaproth at the Imperial Imprimery-and and Royal Imprimery to his 'Hong Kong Type' founts. Dyer may have considered the approach of divisible type; however, he chose to make a full character for each sort probably because of the impact on the quality of Chinese characters. Chinese radicals need to adjust their proportions and the thickness of their strokes according to the complexity when they combine to form a complete Chinese character. The white space between radicals usually needs to be refined by adjusting the length and orientation of the strokes and even changing the forms of specific strokes.

Regarding the contributors to the development of Chinese typeforms, while the originators and leaders of these two founts were Samuel Dyer, Richard Cole and other missionaries, the founts cannot be entirely credited to them. The involvement of the native Chinese in character writing, punchcutting and type casting processes provided the typeface with its aesthetic properties; for example, Dyer had the assistance of an intelligent and well-informed writer, Leang-Afa.[119]

118 Following the Chinese normative documents, *the Table of Indexing Chinese Character Components* (GF 0011-2009 汉字部首表), Chinese radicals (piānpáng, 偏旁) are defined as any component of Chinese characters. In contrast, the 'radicals' in the '214 Kangxi radicals' should be described as 'indexing components' (bùshǒu, 部首) which were created to meet the needs of compiling Chinese dictionaries. In other words, all the indexing components are radicals, but radicals are not necessarily indexing components

119 Leang-Afa (梁发, 1789–1855) was the second Chinese Protestant convert ordained by Robert Morrison.

5.3 William Gamble

Historical context

William Gamble (William Dill Gamble, William Gamble III, 1830–1886) was an Irish American Presbyterian missionary printer sent to China in 1858 by the American Presbyterian Mission Press.[120] He was the head of the American Presbyterian Mission Press at Ningbo (1858–1860) and Shanghai (1860–1869).

On 23 February 1844, the Board of Foreign Missions of the Presbyterian Church in the United States of America[121] established the first American Presbyterian Mission Press in Macao (Hua Ying Xiao Shu Fang, 华英校书房), with Richard Cole at the helm.[122] The American Presbyterian Mission Press relocated to Ningbo in July 1845 and changed its name to the Chinese and American Holy Classic Book Establishment (Hua Hua Sheng Jing Shu Fang, 华花圣经书房).[123] In September 1847, Cole left, and Augustus W. Loomis (1816–1891) succeeded and took charge of the press.[124] In 1851, Moses Stanley Coulter (1824–1852) took over as the third Superintendent of the Press, with two pressmen and three compositors employed since the departure of Mr Loomis.[125] In mid-December 1852, Richard Quarterman Way (1819-1895) became the fourth superintendent of the press. Although the press had been efficiently run by Mr Way, it was considered crucial to send a skilled printer as soon as possible to continue the high-quality work.[126] Therefore, in October 1858, William Gamble took over as the fifth superintendent of the Press

120 Brown, 1997, *Earthen vessels and transcendent power: American Presbyterians in China, 1837–1952*, p. 341.

121 The Presbyterian Church in the U.S.A. organised the Western Foreign Missionary Society of the United States at the Synod of Pittsburgh in 1831 to 'increase the amount of missionary feeling and effort in the Presbyterian Church.' In June of the same year, the Western Foreign Missionary Society of the United States was renamed the Presbyterian Foreign Missionary Society. And on 26 October of the following year, it was reorganised as the Board of Foreign Missions of the Presbyterian Church in the United States of America. Mr Walter Lowrie (1784–1868) served as the first Corresponding Secretary of the Presbyterian Board of Foreign Missions, a position he held from its inception in 1837 until his retirement in 1865. McConaughy, 1908, *The world-call to men of to-day; addresses and proceedings of the Men's Missionary Convention, held in Philadelphia, February 11-13, 1908*, pp. 85–88; Lowrie, 1896, *Memoirs of the Hon. Walter Lowrie*, pp. 25, 182.

122 See chapter 5.2's last section on Richard Cole. According to the Vol. X of the Chinese Recorder: 'The Press arrived at Macao on the 23rd February, A. D. 1844, in the charge of Richard Cole.' McIntosh, 1895, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*. American Presbyterian Mission Press, p. 6.

123 Regarding the name of the American Presbyterian Mission Press in Ningpo, the Chinese and American Holy Classic Book Establishment, many articles misspell its name, especially in Chinese. Fung Kamwing listed all the errors in his essay, 'William Gamble and the Shanghai American Presbyterian Mission Press'. Fung Kamwing, 2009, 姜别利 (William Gamble, 1830–1886) 与上海美华书馆 [William Gamble and the Shanghai American Presbyterian Mission Press]. In: 复旦大学历史系 & 出版博物馆 编 (Fudan University Department of History & Publishing Museum of Shanghai) (Eds.), 历史上的中国出版与东亚文化交流 [Chinese publishing and East Asian cultural circulation in history], pp. 272–273; McIntosh, 1895, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*. American Presbyterian Mission Press, p. 10; Presbyterian Church in the U.S.A. ed., 1846, *The Ninth Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*, p. 30.

124 Presbyterian Church in the U.S.A. ed., 1848, *The Eleventh Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*, p. 39.

125 Presbyterian Church in the U.S.A. ed., 1851, *The Fourteenth Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*, p. 46.

126 Presbyterian Church in the U.S.A. ed., 1854, *The Seventeenth Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*, p. 51.

Figure 5.34
Chinese Type Case from page 21, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press,* written by McIntosh in 1895.
Source: Internet Archive.

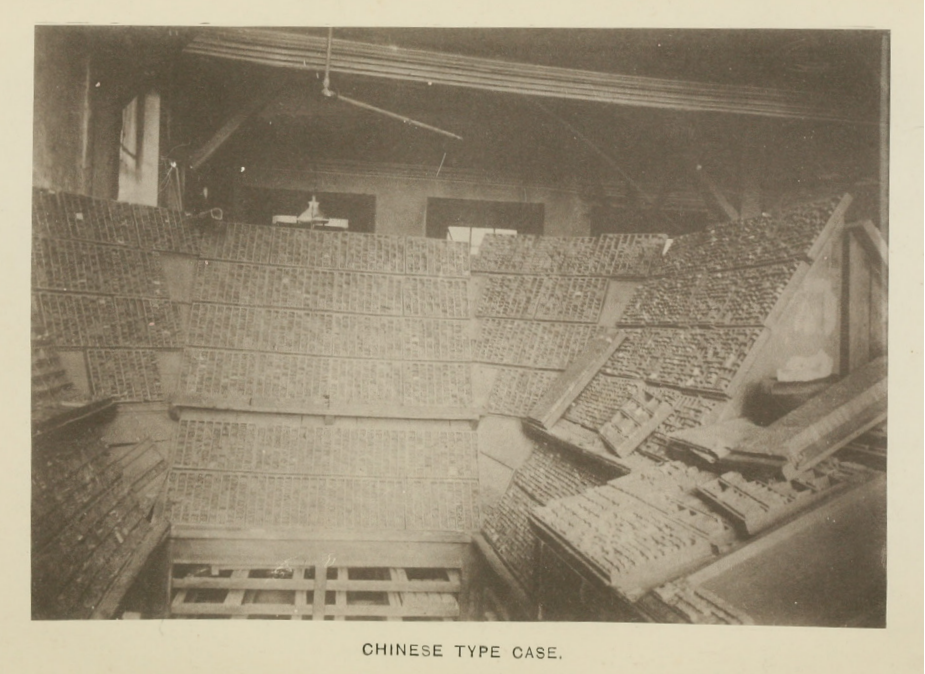


Figure 5.35
Photograph of compositors selecting types from Chinese type cases, *c.* 1895.
Source: Hiroshi Komiyama and Sun Mingyuan (private collection).

in Ningbo. In 1860, the press moved to Shanghai and operated as Mei Hua Shu Guan (美华书馆).

Calculating the relative frequency of Chinese characters and redesigning Chinese type cases

On 18 March 1858, William Gamble sailed from New York to China and arrived in Ningbo in October of the same year with a new fount of Berlin Type, its matrices and an electrotyping machine.[127] Immediately after arriving in Ningbo, William Gamble began a survey of the relative frequency of the occurrence of Chinese characters. He believed that typographers in Europe and America thoroughly understood the relative frequencies of Western letters since they had data on which letters should be cast more often and which should be cast less frequently. This data determined the placement of commonly used types to be more easily accessible to the compositor, directly affecting the speed of typesetting.[128] For thousands of Chinese characters, it is both essential and valuable because knowledge of such data dramatically reduces the range of types that would be chosen, thus increasing the speed of Chinese typesetting.

To determine how many characters were in common use, especially in Christian books, Gamble first hired two local Ningbo literati, Chin-Sin-Sang and Chah-Sin-Sang, to work on the preliminary calculation. Later, he engaged Tsing-Sin-Sang and Cü-Sin-Sang to carry out a more extensive calculation on the Bible and 27 other books printed at the Press, totalling 4,166 octavo pages.[129] The calculations were finished in 1861. In the same year, William Gamble wrote the investigation's report in the *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks* published in the American Presbyterian Mission Press Shanghai (figure 5.33).[130]

There are two lists of Chinese characters arranged in different sequences in Gamble's investigation. The first list was arranged by radicals and strokes, and contained every character which occurred in the 28 chosen books. In the 28 books, there were 1,166,335 printed Chinese characters while the character set was only 5,150, to which the 850 characters found in the list of characters from the London Missionary Society's fount were added, giving a total character set of 6,000.[131] The second list also included all the different characters but was arranged according to the frequency of each character. William Gamble further classified these 6,000 characters into 15 groups based on how frequently they were used (table. 1).[132]

127 Presbyterian Church in the U.S.A. ed., 1858, *The Twenty-first Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*, p. 80.

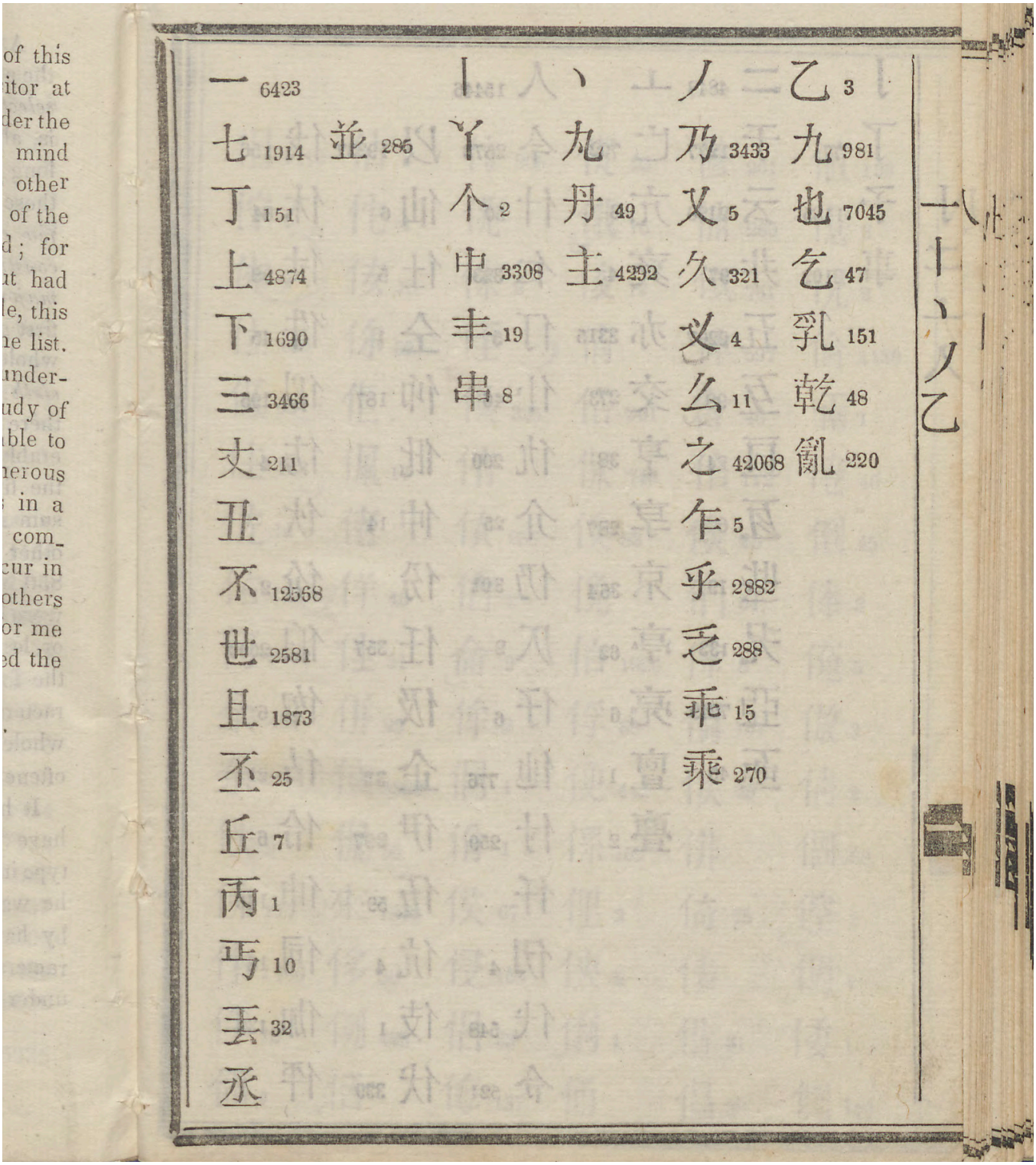
128 Gamble, 1861, *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks*, p. i; Fung Kamwing, 2009, [William Gamble and the Shanghai American Presbyterian Mission Press], p. 298.

129 Ibid. Sin-Sang refers to '先生', an honorific title for literati in China.

130 Gamble, 1861, *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks.*

131 Ibid, pp. 1–3; Mateer, 1873, *Lists of Chinese Characters in the Fonts of the Presbyterian Mission Press,* pp. 1–2; McIntosh, 1895, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*, p. 21–22; Fung Kamwing, 2009, [William Gamble and the Shanghai American Presbyterian Mission Press], p. 299. Fung Kamwing described the character set as a frequently used character set in Chinese, which was inaccurate.

132 Gamble, 1861, *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks,* p. iv.



0 1 cm

Figure 5.33
Page 1 of the *Two lists of selected characters containing all in the Bible and twenty seven other books : with introductory remarks* published in 1861.
Source: Leiden University Library.

Gamble eventually identified two critical facts for the printer from his investigations, which he expressed in the *Two Lists of Selected Characters*:

> First: that five or six thousand well selected characters are sufficient for all practical purposes; which is, about one-seventh of what is in the language.
> Second: that a very few characters, from the great frequency with which they occur, constitute the great body of those in a book, and that the great majority occur exceedingly seldom.[133]

Knowing these two facts and William Gamble's investigation of Chinese characters and their frequency of use, he created a new compact and efficient arrangement of an extensive collection of Chinese metal types by designing a new Chinese type case (figure 5.34). Firstly, he categorised Chinese types into three kinds, 'Common', 'Spare' and 'Rare' according to their frequency of use. Types of each part were rearranged according to the radicals used in the *Kangxi Dictionary*. Secondly, he made a wooden composing frame with 24 small cases for type placed centrally. The 'Common' used types are stored in the central eight cases, and 'Spare' types are stored in the upper eight and lower eight cases. The remaining 64 cases contained the 'Rare' used types on both sides. These type cases were organised in a 'U' shape, allowing the compositor to access any type with just one step in any direction (figure 5.35). By grouping the most commonly used characters together, numbering around five hundred, the compositor had easy access to more than three quarters of the characters used, similar to the convenience of having a fount of type found in an English printing office. The consequential outcome of this innovative arrangement was a significant enhancement of both speed and cost-effectiveness, with reported productivity gains of being three times faster than using previous typecase arrangements.[134]

133 Gamble, 1861, *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks*, p. v.

134 Ibid, p. vi.

Table 1. The chart has four columns, the first column is the 15 groups listed depending on the relative frequency of characters; the second column shows the interval of the number of occurrences of a single Chinese character; the third column shows the overall number of occurrences of each group of Chinese characters; and the fourth group is the number of different characters in each group.
The chart refers to the table on page iv of the *Two Lists of Selected Characters, Containing all in the Bible and Twenty Seven Other Books, with Introductory Remarks.*

Group	Number of repetitions / Min. & Max. times	Totals	Number of different characters
1st	More than 10,000	214,156	13
2nd	1,000–10,000	563,126	224
3rd	900–1000	15,150	16
4th	800–900	16,344	19
5th	700–800	32,757	44
6th	600–700	31,167	47
7th	500–600	32,116	59
8th	400–500	44,258	99
9th	300–400	38,024	112
10th	200–300	47,932	197
11th	100–200	56,627	400
12th	75–100	17,637	207
13th	50–75	18,508	301
14th	25–50	19,497	547
15th	1–25	19,036	3,715
Total		1,166,335	6,000

Electrotype

Electrotyping is a process of creating duplicate plates for relief or letterpress printing.[135] In 1838, Moritz von Jacobi, a German scientist in St. Petersburg, Russia, invented this method, which quickly gained widespread adoption in various fields, especially in printing.[136] In 1845, Thomas W. Starr of Philadelphia was granted U.S. Patent no. 4130 for 'improvement in preparing matrices for type by the electrotying process' (figure 5.36).[137] This technology enabled quick, easy and inexpensive reproduction of a metal fount purchased from a competitor. Electrotyping therefore caused a great deal of upheaval in the industry, leading to rampant piracy, advertising agencies, and price wars.[138]

During the period when electroplating was developing in America, a parallel phenomenon unfolded in China where missionaries undertook experimental investigations into the electrotyping method for Chinese characters. Notably, in 1846, Richard Cole initiated experiments with electrotyping in this context at the Chinese and American Holy Classic Book Establishment, Ningbo. Regrettably, despite early endeavours, no significant subsequent advancements in Chinese typefounding were achieved.[139]

William Gamble applied the electrotyping method in a practical way to the reproduction and production of Chinese founts. From 1850 to 1853, Gamble worked at Henry Altemus Company, a bookbindery in Philadelphia, and then went to work at the Bible House in New York until he left for Ningpo in 1858, a period during which electrotyping was gaining prominence in the United States.[140] Gamble's work experience therefore indicated that he was a printer and electrotyper who would be of great value and was welcomed by all the missionaries when he arrived in Ningpo.[141] It is reasonable to assume that Gamble planned to utilise electrotyping in producing Chinese founts before he departed for China, given that he brought an electrotyping machine from New York.

In 1858, William Gamble attempted to reproduce Dyer's 13.5-point Hong Kong Type using the electrotyping technique.[142] These particular types had been acquired during Gamble's travels in Hong Kong, and his experiment proved to be successful. Subsequently, Gamble proceeded to procure a single type of each character from the London Missionary Society Press

135 See: <britannica.com/technology/electroforming>.

136 Heinrich (1938, pp. 566–575). Heinrich, 1938, The discovery of galvanoplasty and electrotyping. *Journal of Chemical Education*, 15 (12), pp. 566–575.

137 Starr, T. W. (1845). *Improvement in preparing matrices for type by the electrotyping process* (United States Patent No. 4,130); Kelly, R. R., & Shields, D., 1969, *American Wood Type: 1828-1900,* p. 205.

138 Electrotyping casued near collapse of the U.S. metal type industry, and ultimately the self-preservation of the first 23 type foundries that united as the American Type Founders' Company in February 1892; Kelly, R. R., & Shields, D., 1969, *American Wood Type: 1828-1900,* p. 209; Type Heritage. 'Price Wars & Piracy.' Type Heritage, n.d., <history.typeheritage.com/price-wars/piracy/#easy-footnote-bottom-1-775>.

139 McIntosh, 1895, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*, p. 12;

140 Fung Kamwing, 2009, 姜别利 (William Gamble, 1830–1886) 与上海美华书馆 [William Gamble and the Shanghai American Presbyterian Mission Press], pp. 292–294; William Miller Gamble compiled, 1938, *The Brief Sketch of the Life and achievements of William Gamble (1830–1886)*, Unpublished manuscript, p.14.

141 Presbyterian Church in the U. S. A. (1859). *The Twenty-second Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*. New York: Publish for the Board. p. 80.

142 Samuel Dyer's founts were mentioned above.

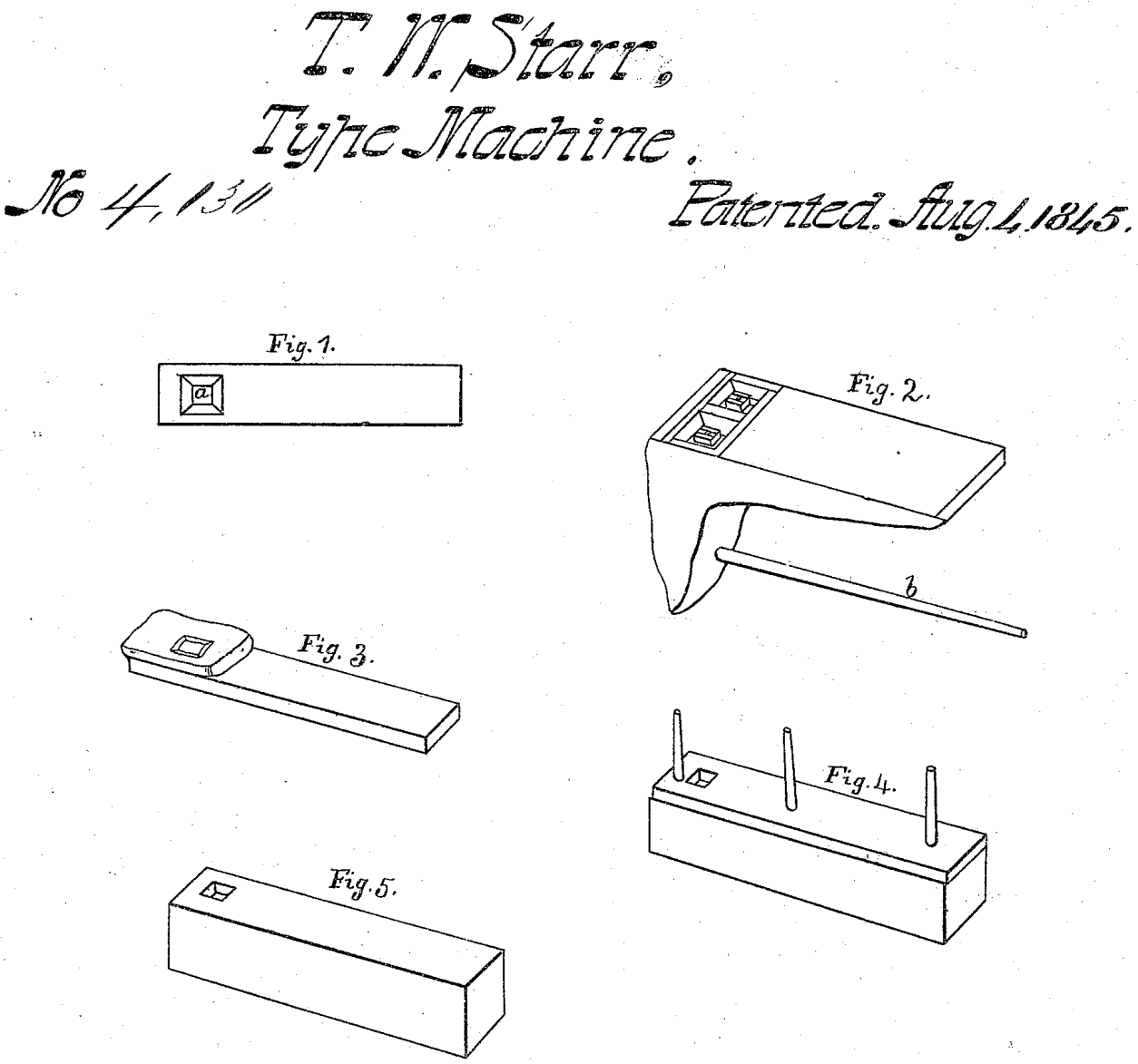


Figure 5.36
Drawing entitled 'Type Machine' by Thomas W. Starr explaining his improvement in preparing matrices for type through the electrotyping process.
Source: <www.galleyrack.com> (accessed on 9 Nov 2021).

located in Hong Kong. These types were then utilised in the reproduction of matrices for Hong Kong Type; and all the matrices were ultimately completed in Shanghai in 1863.[143]

In 1861, William began to apply electrotyping in the production of Chinese founts and developed a practical process described in a 1895 report:

> The character was first cut on such suitable material as boxwood. An electro was next taken from the character itself, or through the medium of a wax mould. This mould was next put into the depositing trough containing the copper solution. After several days, when the copper deposit was thick enough, it was trimmed and fixed in a brass holder. On account of the length of time allowed for depositing, the thickness of the copper rendered unnecessary the ordinary backing of the 'shell'. By this process the characters were more finished and possessed more of the calligraphic excellence prized by the Chinese than could be obtained by steel punches.[144]

The Chinese scholar He Shengnai, in his 'The Printing Techniques of China in the Past Thirty-Five Years', also described William Gamble's electrotyping method titled 'New Method Matrices', stating:

> Due to the intricate nature of Chinese characters, with their small size and complex strokes, it is indeed a challenging task, especially considering the large number of characters. When compared to Western matrices, the difference in simplicity is vast. It was in the year 1859 in Ningbo that the technique of electrotype Chinese matrices was first developed. His method: cutting the raised characters on boxwood, electrotyping the matrices with purple copper, and then embedding them into a brass shell. This innovative technique significantly reduced the difficulty of cutting intricate characters and made it possible to engrave even the tiniest characters, like the head of the fly.[145]

The process began by cutting Chinese characters on one end of oblong blocks of boxwood made in the same way as Chinese wood movable types and of the same material as woodblocks. Chinese engravers were, therefore, better able to express the calligraphic excellence of Chinese characters in familiar materials.

Moreover, the electrotyping method preserves the original engraved typeforms perfectly, making it possible to be produced en masse. Compared to the previous method of the punch-matrix system, electrotyping significantly reduced labour while allowing the casting of matrices with a completely flat surface. In other words, Gamble's electrotyping method continued the traditional Chinese movable wood type into the age of hot metal, and cleared technical hurdles for the economic and efficiency-oriented movable type industry. This method was influential and widely

143 BFMPC (Board of Foreign Missions of the Presbyterian Church in the U.S.A.) /MCR (Missions Correspondence and Reports Microfilm Series, 1837-1911) / CH (China Letters), reel 199 / vol. 8 / no. 54, Annual Report of the Press for the Year ending October 1, 1863; Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], pp. 370–371.

144 McIntosh, 1895, *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*, p. 20.

145 Original Chinese text: '因鉴华文字模镌刻阴文，字体细小，笔画复杂，诚非易事，况字数众多，一副之成，及淹岁月，较诸西文字模，其简易有霄壤之别。乃于一八五九年在宁波始创制电镀华文字模。其法：以黄杨刻阳文字，镀制紫铜阴文，镶入黄铜壳子，雕镌之工，于是大减，蝇头小字，亦得镌刻.' He Shengnai, 1931, 三十五年来中国之印刷术 [The printing techniques of China in the past thirty-five years]. In: 最近三十五年之中国教育 [Chinese education in the last thirty-five years], pp. 173–258.

adopted in China prior to the computer age. In 1934, the Commercial Press even published a book, *Simple Electrotype*, for primary school students, highlighting the application of the electrotyping method in printing at the end of the book (figure 5.37 & 38).[146]

Founts

By 1860, there were four Chinese founts available: Samuel Dyer's 24-point and 13.5-point Hong Kong Type, Marcellin Legrand's 16-point Paris Type;[147] and Auguste Beyerhaus' 22-point Berlin Type. When the first American Presbyterian Mission Press was established in Macao in 1844, the Press used Paris Type for printing Chinese texts, for which they ordered a complete set of matrices as early as 1836. In 1845, Samuel Wells Williams met Walter Lowrie in New York, and together they ordered 3,200 Chinese punches of 22-point Berlin Type.[148] William Gamble then brought the matrices of Berlin Type to China in 1858, and in July of 1859, he cast the complete set of Berlin Type for the press. In 1864, Gamble improved the Berlin Type by recasting some low-quality divisible types and adding full-body types. This project was completed around 1869, and the number of full-body types significantly increased from 2,711 to 6,664. Therefore, the quality of the Berlin Type was improved considerably.[149] Because of the superior printed quality of the Berlin Type compared to the Paris Type and its compatibility with literary Chinese, the American Presbyterian Mission Press adopted the Berlin Type as its primary fount during the 1860s.

Regarding Hong Kong Type, Walter Lowrie from the Presbyterian Church in the U.S.A., Board of Foreign Missions, ordered Samuel Dyer's 24-point fount from Alexander and John Stronach of the London Missionary Society in 1843.[150] The American Presbyterian Mission Press at Ningbo received part of the cast type in June 1846. As mentioned above, Gamble ordered the entire 13.5-point Hong Kong Type, ordering only one type per character, specifically for electrotyping reproduction. In March 1859, the first batch of type was received from Hong Kong, and Gamble completed the reproduction of the 13.5-point Hong Kong Type in 1863 in Shanghai.[151] In 1864, Gamble added another 800 characters to the 13.5-point Hong Kong Type, bringing the final character set to 6,000.[152] At this point, the American Presbyterian Mission Press Shanghai was the only press with four Chinese founts.

While replicating and perfecting those four Chinese founts from other missionaries, Gamble was also conceptualising the creation of a new fount, the Shanghai Font (figure 5.39), with detailed preparations: calculating the relative frequency of Chinese characters, redesigning Chinese type cases

146 Lin Lvbin (Ed.), 1934, 简易的电镀 [Sample Electrotype], p. 42.
147 See chapter 4.2 Divisible Chinese movable types for the Paris Type.
148 See chapter 4.2 Divisible Chinese movable types for the 22-point fount (Berlin Type) by Auguste Beyerhaus.
149 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 475.
150 See chapter 5.2 for Samuel Dyer's Chinese founts; Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 367; BFMPC/MCR/CH, 189/1/438, W. M. Lowrie, Annual Report of the Chinese Mission for the Year Ending October 1843, Macao, 24 October 1843.
151 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 371; BFMPC/MCR/CH, 199/8/54, Annual Report of the Press for the Year Ending October, 1, 1863.
152 Su Ching, 2015, [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century], p. 474; BFMPC/MCR/CH, 199/8/58, W. Gamble to W. Lowrie, Shanghai, 21 July 1861.

Figure 5.37
Cover of the *Sample Electrotype* published by the Commercial Press in 1934.
Source: Author (private collection).

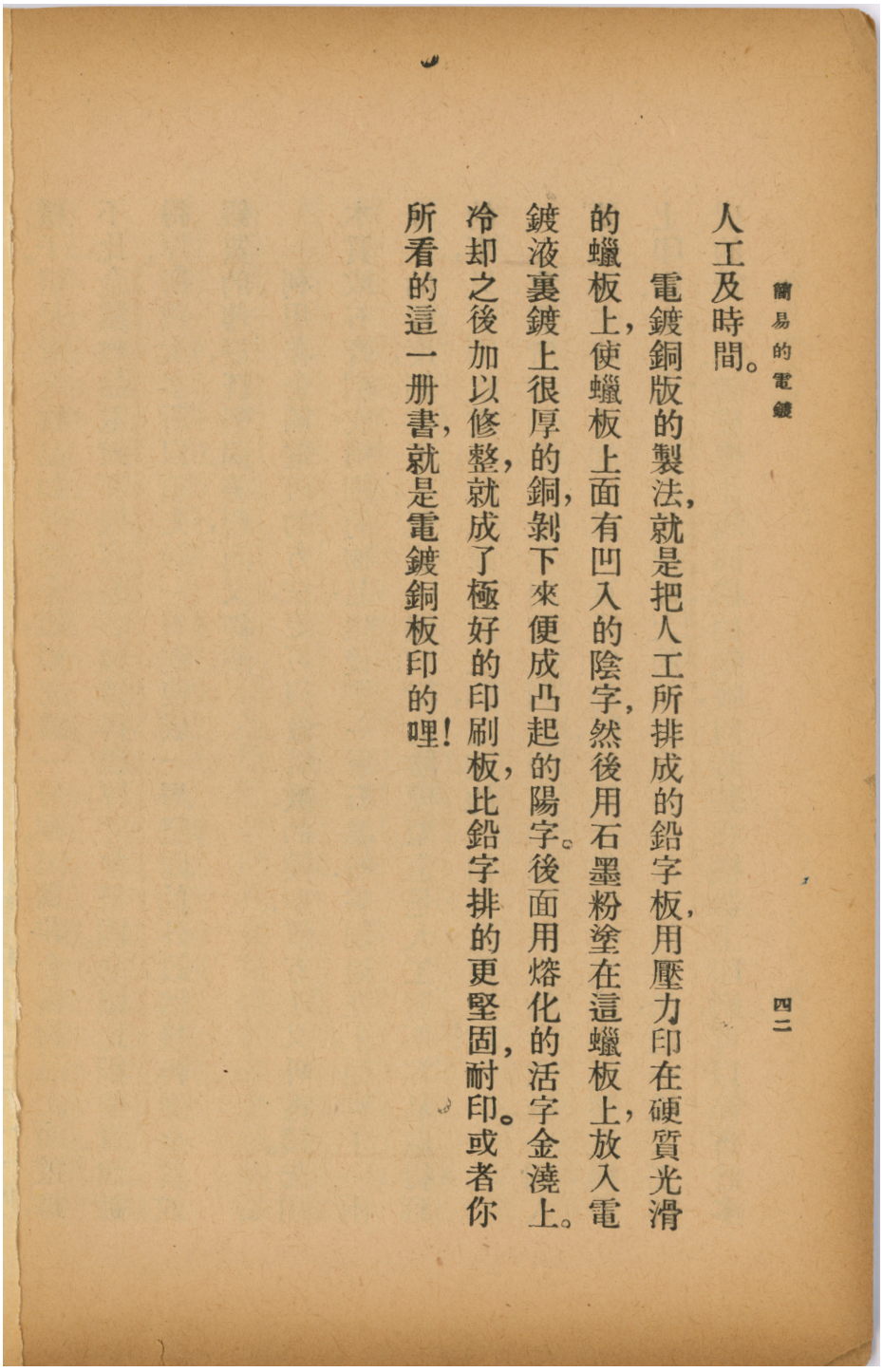


Figure 5.38
Page 42 of the *Sample Electrotype* published by the Commercial Press in 1934.
Source: Author (private collection).

and inventing a new method for producing matrices.[153] His initial plan was to print the Scriptures in the smallest possible publication; he therefore aimed to make 8-point (Brevier, 0.28 cm^2) fount. Although he had already produced some samples, he realised that this size was too small for the Chinese reading habits. He then enlarged the size to 11-point (Small Pica, 0.372 cm^2).[154] This size was also suitable for print books that require a mixture of Chinese characters and Roman letters, making it exceptionally valuable to scholars.[155]

To make the typeforms of the Shanghai Font more in keeping with the Chinese aesthetic, Gamble hired a highly skilled Chinese engraver, Wang Feijia (王凤甲, Wong Feng-dzia), in Ningbo in 1859. Under Gamble's guidance, Wang Fengjia learned to cut punches. However, the Shanghai Font was produced using his new method of electrotyping, meaning that Wang Fengjia cut the type on his more specialised boxwood and then used the electrotype method to obtain the matrices.[156]

At the end of December 1860, the American Presbyterian Mission Press moved from Ningbo to Shanghai, changing its name from the Chinese and American Holy Classic Book Establishment to Mei Hua Shu Guan. Wang Fengjia also moved to the Press in Shanghai in September 1861 and started to cut wood type for the Shanghai Font. Gamble has reported on Wang Fengjia's outstanding engraving skills, producing small and beautiful punches for Shanghai Type that surpassed all previous Chinese founts in terms of their typeforms.[157]

On 20 July 1865, Gamble reported that all of the Shanghai Font matrices had been completed.[158] This fount consists of 7,400 Matrices, with 6,000 of them having a full body, each representing complete characters. Among the remaining matrices, 1,291 have a two-third body, and 109 have a one-third body. These matrices are used to cast the individual primitives and radicals, which are combined in printing to form complete characters. The Shanghai Font can produce approximately 25,000 characters, more than the character set of any other contemporaneous fount.[159]

In order to make it easier for Chinese clients to buy founts from the American Presbyterian Mission Press Shanghai, Gamble arranged their Chinese founts in a numbered arrangement from No.1 to No.6, depending on their size (figure 5.40 & 41).[160] The Shanghai Font thus became the No.5

153 In the letter of 21 May 1864, Gamble mentioned that this new fount had been named the 'Shanghai Font' by the secretary and that this fount was given equal recognition with Paris Type, Berlin Type and Hong Kong Type. BFMPC/MCR/CH, W. Gamble to W. Lowrie, Shanghai, 21 May 1864; *Journal of the North China Branch of the Royal Asiatic Society*, new series, No. 1, December 1864, p. 174.

154 Su Ching, 2022, 小刻工、大成就: 王凤甲的故事 (Small carvings, great achievements: the story of Wong Feng-Dzia). In: 艺术与设计 (Art and Design), 2022:6, pp. 171–174.

155 *Journal of the North China Branch of the Royal Asiatic Society*, new series, No. 1, December 1864, p. 174.

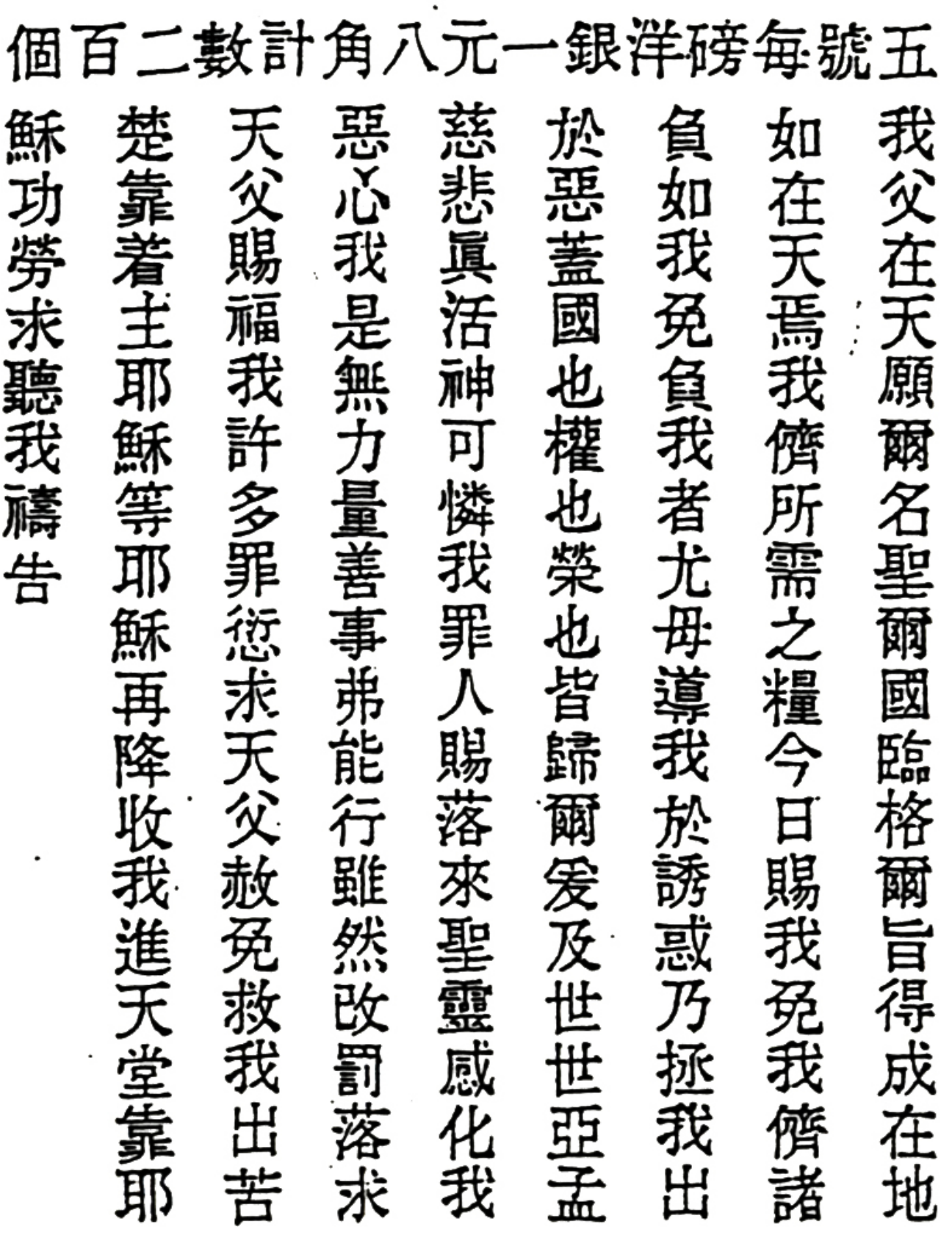
156 Su Ching, 2022, 小刻工、大成就: 王凤甲的故事 (Small carvings, great achievements: the story of Wong Feng-Dzia). In: 艺术与设计 (Art and Design), 2022:6, pp. 171–174.

157 Ibid; BFMPC/MCR/CH, 191/5/217, W. Gamble to W. Lowrie, Shanghai, 4 october 1861.

158 Su Ching, 2022, 小刻工、大成就: 王凤甲的故事 (Small carvings, great achievements: the story of Wong Feng-Dzia). In: 艺术与设计 (Art and Design), 2022:6, pp. 171–174; BFMPC/MCR/CH, 196/7/169, W. Gamble to W. Lowrie, Shanghai, 20 July 1865.

159 *Journal of the North China Branch of the Royal Asiatic Society*, new series, No. 1, December 1864, p. 174.

160 In the English context, the name of these founts' names mainly based on the traditional point-size names (Double Pica, Small Double Pica, Two-line Brevier, Three-line Diamond, Small Pica and Ruby) (figure 5.42) or the names of major contributors or production locations (Dyer's Font, Byerhaus' Font, Paris Font, Cole's Font and Gamble's Font) (figure 5.43). Sun Mingyuan, 2021, [A study on



0 0.333 cm

Figure 5.39
No.5 Shanghai Font, cropped and enlarged from figure 5.23.
Source: Hiroshi Komiyama and Sun Mingyuan (private collection).

fount. After completing the Shanghai Font, Gamble then gave Wang Fengjia the task of cutting 500 5.5-point (Ruby, 0.194 cm^2) matrices of the most commonly used Chinese characters, a quarter of the size of the Shanghai Font. This fount became the sixth fount (No. 6) of the American Presbyterian Mission Press in Shanghai.[161]

The Shanghai Font was widely used because of its large character set and high quality. Gamble used the Shanghai Font for printing the New Testament from 1864, and he was confident that in terms of quality it was far superior to those used in printing all previous Chinese Bibles.[162] In 1866, Gamble printed *A Japanese and English Dictionary* using the Shanghai Font in the American Presbyterian Mission Press Shanghai and completed printing the following year (figure 5.44).[163] James Curtis Hepburn (1815–1911), a medical missionary in Japan, had spent seven years compiling this dictionary. The Shanghai Font was also used to print *A Syllabic Dictionary of the Chinese Language*, a bilingual dictionary compiled by Samuel Wells Williams, was published by the American Presbyterian Mission Press Shanghai in 1874 (figure 5.45).

The completion of the Shanghai Font caused a rush of orders from customers in China and abroad. In the process, Gamble wrote proactively to the director of the Royal Imprimery in France in June and July 1865 to promote the Shanghai Font, and he in turn expressed his willingness to order it. The Shanghai Font was eventually delivered in 1868.[164] In 1866, the Inspector-General of Chinese Maritime Customs Service ordered two Chinese founts from the American Presbyterian Mission Press Shanghai, one of which included the Shanghai Font.[165] This is further evidence of the popularity and widespread use of the Shanghai Font in the printing market of the time.

The Shanghai Font was produced using the electrotyping method, although some characters use the divisible type method, resulting in an unbalanced structure for some characters. However, the full-body character set covers 6,000 commonly used characters, and the overall quality of the fount was much higher than that of the previous divisible types. In addition, the Shanghai Font came from the hand of Wang Fengjia, a very skilled Chinese engraver, who used the wood type process that the Chinese were so adept at, so the glyphs were of very high quality. The Shanghai Font is arguably the smallest and most adroitly executed Chinese metal type of its time.

the historical development of graphic design and typography in China: 1805–1949], p. 26.

161 Su Ching, 2022, 小刻工、大成就: 王凤甲的故事 (Small carvings, great achievements: the story of Wong Feng-Dzia). In: 艺术与设计 (Art and Design), 2022:6, pp. 171–174.

162 Ibid.

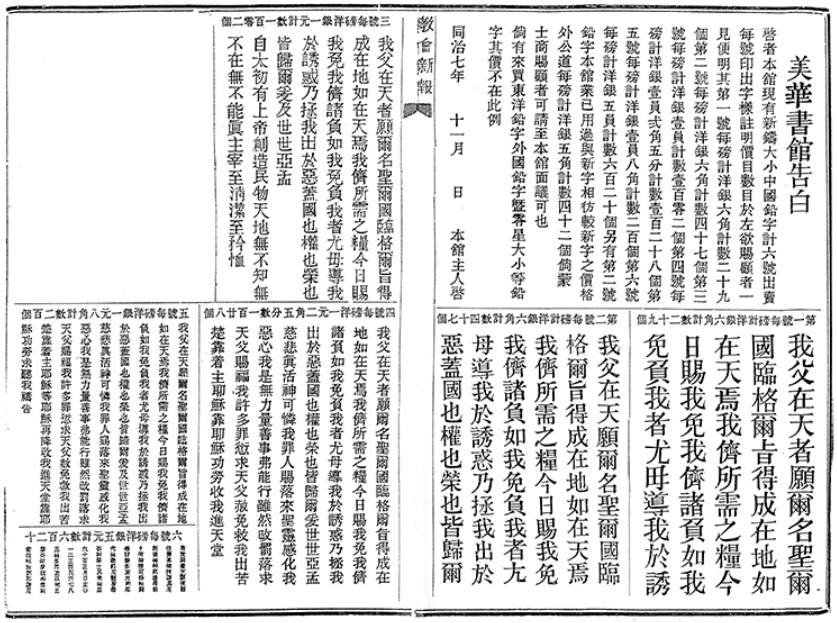
163 Hepburn, 1867, *A Japanese and English Dictionary: with an English and Japanese Index*. Shanghai: The American Presbyterian Mission Press.

164 Ibid; BFMPC/MCR/CH, 196/7/169, W. Gamble to W. Lowrie, Shanghai, 20 July 1865.

165 Presbyterian Church in the U. S. A. (1866). *The Twenty-Ninth Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*. New York: Publish for the Board. p. 36.

Figure 5.40
Jiao Hui Xin Bao (*Chiao-hui hsin-pao, The Church news*) issued in 19 Dec 1868. Advertisement selling founts from the American Presbyterian Mission Press, Shanghai.
Source: Hiroshi Komiyama and Sun Mingyuan (private collection).

Number	Pica	Point	Size (mm²)	Contributor
No. 1	Double Pica	24	8.55	Samuel Dyer
No. 2	Small Double Pica	22	7.6	Auguste Beyerhaus
No. 2	Small Double Pica	22	7.6	William Gamble
No. 3	Two-line Brevier	16	5.6	Marcellin Legrand
No. 4	Three-Line Diamond	13.5	4.85	Samuel Dyer & Richard Cole
No. 5	Small Pica	11	3.72	William Gamble
No. 6	Ruby	5.5	1.9	William Gamble



美華書館告白

啓者本館現有新鑄大小中國鉛字計六號出賣每號印出字樣註明價目數目於左欲賜顧者一見便明其第一號每磅計洋銀六角計數二十九個第二號每磅計洋銀六角計數四十七個第三號每磅計洋銀壹員計數壹百零二個第四號每磅計洋銀壹員貳角五分計數壹百二十八個第五號每磅計洋銀壹員八角計數二百個第六號每磅計洋銀五員計數六百二十個另有第二號鉛字本館業已用過與新字相仿較新字之價格外公道每磅計洋銀五角計數四十二個倘蒙士商賜顧者可請至本館面議可也倘有來買東洋鉛字暨零星大小等鉛字其價不在此例

同治七年　十一月　日　本館主人啓

第一號每磅計洋銀六角計數二十九個

我父在天者願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘

第二號每磅計洋銀六角計數四十七個

我父在天願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘惑乃拯我出於惡蓋國也權也榮也皆歸爾爰世世亞孟

第三號每磅計洋銀一元計數一百零二個

我父在天者願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘惑乃拯我出於惡蓋國也權也榮也皆歸爾爰世世亞孟慈悲眞活神可憐我罪人賜落來聖靈感化我惡心我是無力量善事弗能行雖然改圖落求天父賜福我許多罪愆求天父赦免救出苦楚靠着主耶穌功勞收我進天堂

第四號每磅計洋銀一元二角五分計數一百廿八個

我父在天者願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘惑乃拯我出於惡蓋國也權也榮也皆歸爾爰世世亞孟慈悲眞活神可憐我罪人賜落來聖靈感化我惡心我是無力量善事弗能行雖然改圖落求天父賜福我許多罪愆求天父赦免救出苦楚靠着主耶穌功勞收我進天堂

第五號每磅計洋銀一元八角計數二百個

我父在天願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘惑乃拯我出於惡蓋國也權也榮也皆歸爾爰世世亞孟慈悲眞活神可憐我罪人賜落來聖靈感化我惡心我是無力量善事弗能行雖然改圖落求天父賜福我許多罪愆求天父赦免救出苦楚靠着主耶穌功勞收我進天堂

第六號每磅計洋銀二元計數六百二十個

我父在天願爾名聖爾國臨格爾旨得成在地如在天焉我儕所需之糧今日賜我免我儕諸負如我免負我者尤毋導我於誘惑乃拯我出於惡蓋國也權也榮也皆歸爾爰世世亞孟慈悲眞活神可憐我罪人賜落來聖靈感化我惡心我是無力量善事弗能行雖然改圖落求天父賜福我許多罪愆求天父赦免救出苦楚靠着主耶穌功勞收我進天堂

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另有二

我父在天願爾名聖爾國臨

Figure 5.41
Jiao Hui Xin Bao (*Chiao-hui hsin-pao, The Church news*) issued in 3 July 1869 (Vol. 43) & 4 September 1869 (Vol. 51). Advertisement selling founts from the American Presbyterian Mission Press, Shanghai. This advertisement removed fount No.2 seen in the lower-left corner of the right page and replaced it with the original fount No.2, which had slightly thicker strokes, seen in the upper-right corner of the second page. Fount No.3 was moved to the position of fount No.2 with thicker strokes, while the original layout of the movable type No. 3 became blank.
Source: Hiroshi Komiyama and Sun Mingyuan (private collection).

Figure 5.42
Specimen of Chinese founts from the *Specimens of Chinese, Manchu, Japanese and English type, from the type foundry of the American Presbyterian Mission Press* published in Shanghai in 1871.
Source: Google Books (accessed on 25 June 2023).

Figure 5.43
Specimen of Chinese founts by the American Presbyterian Mission Press Shanghai from page 30 of *the Chinese Recorder*, volume 6 published in 1875.
Source: Internet Archive (accessed on 25 June 2023)

JAPANESE AND ENGLISH DICTIONARY.

ABA

Ā, アア, 嗚呼. An exclamation or sigh expressive of grief, concern, pity, contempt, or admiration.=Ah! alas! oh! Ā *dō itashimashō*. Ah! what shall I do. Ā *kanashii kana*, alas! how sad. Ā *nasake nai*, oh! how unkind. Syn. SATEMO-SATEMO.

Ā, アア, 彼, *adv.* In that way, so, that. Ā *szru* to do in that way. Ā *shite iru to h'to ni togamerareru*, if you do so you will be blamed.

ABAI.–*au*,–*atta*, アハフ, *t.v.* To shield or screen from danger, to protect or defend. Syn. KABAU.

ABAKE,–*ru*,–*ta*, アハケル, 發, *i. v.* To break open of itself. fig. divulged, made public.

ABAKI,–*ku*,–*ita*, アハク, 發, *t. v.* To break or dig open that which confines or covers something else. fig. to expose or divulge a secret. *Tszka wo abaku*, to dig open a grave. *Hara wo* —, to cut open the belly. *Kōdzi ga dote wo abaita*, the inundation has broken open the dike. *Inji wo* —, to divulge a secret. Syn. HIRAKU.

ABARA, アハラ, 肋, *n.* The side of the chest.

ABARA-BONE, アハラボネ, 肋骨, *n.* A rib.

ABARA-YA, アハラヤ, 敗宅, *n.* A dilapidated house.

ABARE,–*ru*,–*ta*, アハレル, 暴亂, *i. v.* To act in a wild, violent, turbulent or destructive manner; to be mischievous, riotous. *Sake ni yotte abareru*, to be drunk and violent. Syn. RAMBŌ SZRU.

ABARE-MONO, アハレモノ, *n.* A riotous mischievous fellow.

ABARI, アハリ, 網針, *n.* A bamboo needle used for making nets.

ABATA, アハタ, 痘斑, *n.* Pock-marks. Syn. JANKO, MITCHA.

ABU

ABATA-DZRA, アハタヅラ, 麻臉, *n.* Pock-marked face.

ABAYO, アハヨ, *interj.* Good bye (used only to children.)

ABEKOBE-NI, アベコベニ, *adv.* In a contrary or reversed manner, inside out, upside down. *Hashi wo* — *motsz*, to hold the chopsticks upside down, *Kimono wo* — *kiru*, to wear the coat inside out. Syn. ACHI-KOCHI, SAKA-SAMA.

ABI,–*ru*,–*ta*, アビル, 浴, *t. v.* To bathe by pouring water over one's self. *midz wo* —, to bathe with cold water. *Yu abi wo szru*, to bathe with warm water.

ABI-JIGOKU, アビヂゴク, 阿鼻地獄, *n.* The lowest of the eight hells of the Buddhists.

ABIKO, アビコ, 石龍, *n.* A kind of lizard.

ABISE,–*ru*–*ta*, アビセル, 澆, *t. v.* To pour water over or bathe another. *H'to ni midz wo abiseru*, to pour water over a person.

ABU, アブ, 虻, *n.* A horse-fly.

ABUKU, アブク, 泡, *n.* Bubbles, froth, foam. *coll.* for *Awa.*

ABUMI, アブミ, 鐙, *n.* A stirrup. — *wo fumbaru*, to stand on the stirrups, (in the manner of the Japanese.)

ABUMI-SHI, アブミシ, 鐙工, *n.* A stirrup-maker.

ABUNAGARI,–*ru*–*ta*, アブナガル, *i.v.* Timid, fearful, apprehensive of danger. Syn. AYABUMU.

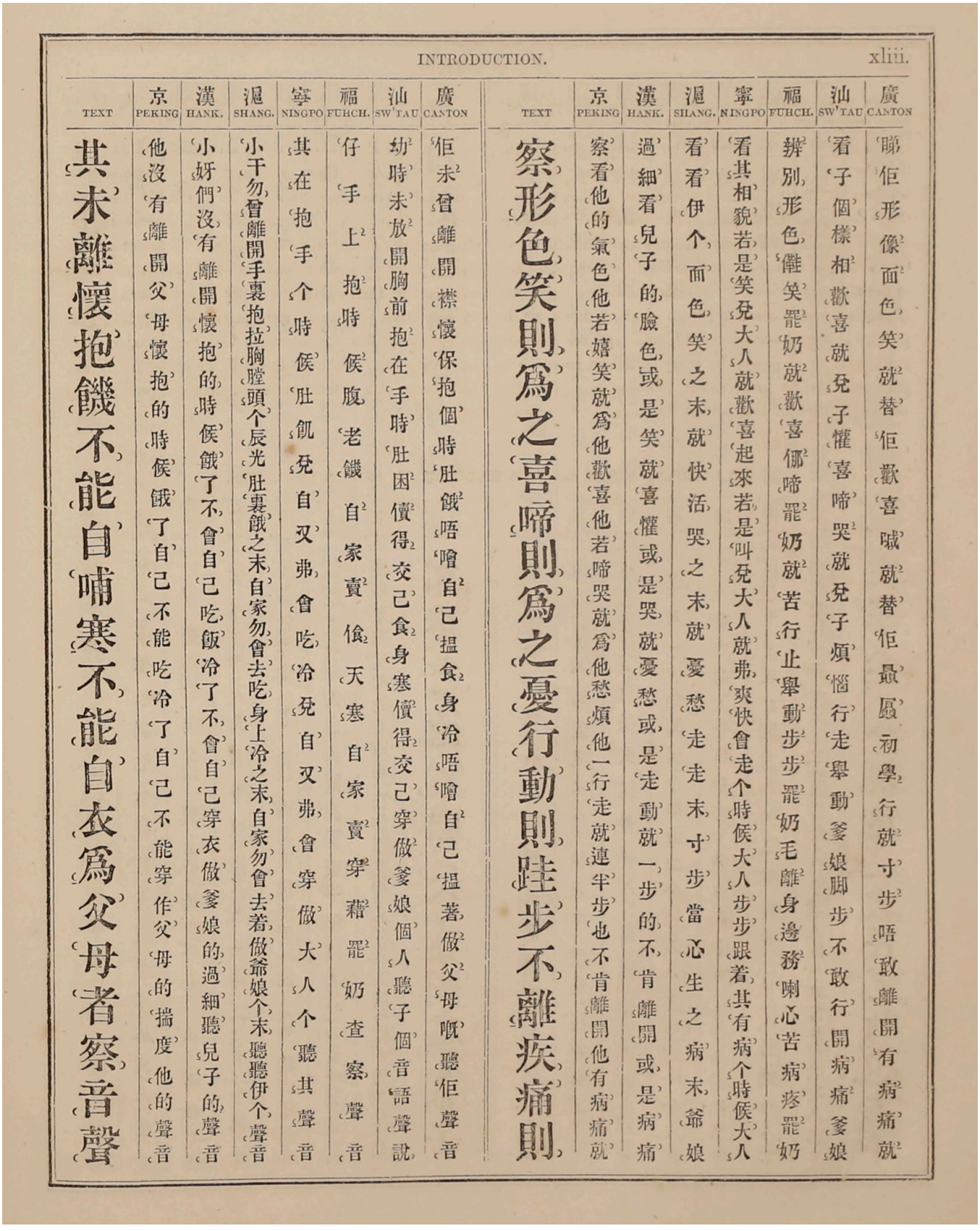
ABUNAI,-KI,-SHI, アブナイ, 浮雲. *a.* Dangerous. *Abunai*, take care. *Abunai koto*, a dangerous thing. Syn. AYAUI, KENNON.

ABUNAKU, or ABUNŌ, アブナク, 浮雲, *adv. idem.* *Abunaku nai*, no danger.

ABUNASA, アブナサ, 浮雲, *n.* The dangerousness.

0 1 cm

Figure 5.44
A page of *A Japanese and English dictionary : with and English and Japanese index* compiled by James Curtis Hepburn and printed by William Gamble in the American Presbyterian Mission Press Shanghai in 1867.
Source: Internet Archive (accessed on 25 June 2023).



0 1 cm

Figure 5.45
A page of *A Syllabic Dictionary of the Chinese Language,* a bilingual dictionary, printed with 22-point No.2 Berlin Font and 11-point No.5 Shanghai Font, compiled by Samuel Wells Williams, and published by the American Presbyterian Mission Press Shanghai in 1874. This dictionary was arranged according to the 1874 *Wu-Fang Yuen Yin*, with the pronunciation of the characters as heard in Peking, Canton, Amoy, and Shanghai.
Source: Xing Li (private collection), photo by Zhou Bo.

Introducing Chinese founts to Japan

In 1869, after resigning from the American Presbyterian Mission Press Shanghai, William Gamble was invited by Motoki Shōzō (本木昌造, 1824–1875), as known as 'the Gutenberg of Japan', a Dutch interpreter at the Nagasaki magistrate's office, to bring various equipment and Chinese founts with him to Nagasaki, Japan, for a four-month seminar to teach techniques of type-making and printing.[166] After the seminar, Motoki Shōzō successfully manufactured moveable metal types.

The results of Motoki Shōzō's type-founding learned from Gamble were shown in the specimen of Sakiyo Private School Movable Type Manufacture, which was published in February 1872 as an advertisement in the *Shinmachi Private School* (新街私塾余谈) Part 1. The advertisement featured six sizes of founts, ranging from No.1 to No.5. Among these sizes, only size No.3 was available in three different founts with distinct styles: Mincho, Kai Ti, and Cursive (figure 5.46). Furthermore, the Kiyō Shinjuku Foundry Moveable Type Category (崎阳新塾制造活字目录), included in the appendix of *Shinbun zasshi* (新闻杂志) No. 66, published in October of the same year, introduced the addition of the No.7 Furigana. Because the printed characters in size No. Initial have a horizontal fine grain on the surface, Komiyama concluded that the No. Initial fount was not made of metal type but rather wood type (figure 5.48).[167]

The entire process, from Gamble's visit to Japan to the publication of the specimen of seven founts by Motoki Shōzō, spanned a total of three years, indicating that it would have been impossible to complete such a task within such a short timeframe. Following in-depth research, the Japanese scholar Hiroshi Komiyama concluded that Motoki Shōzō directly duplicated the No.1 to No.5 Mincho style founts shown in the Kiyō Shinjuku Foundry Moveable Type Category from the American Presbyterian Mission Press Shanghai using the electrotyping method he learned from William Gamble (figure 5.47).

When Shozo Motoki's trusted pupil, Tomiji Hirano (1842–1892), established the Tokyo Tsukiji Type Foundry, he immediately began the process of refining the electrotyped founts from the American Presbyterian Mission Press Shanghai. Hirano successfully completed the Tsukiji Mincho fount family, undergoing five major revisions between 1879 and 1903 (figure 5.49 & 50). Subsequently, from 1907 to 1912, the Shueisha type foundry also completed the Shuei Ming-cho fount family through three major revisions based on the size No. 4 Tsukiji Mincho (figure 5.51). These two typefaces defined the typical appearance of Japanese Min-cho style typefaces.[168]

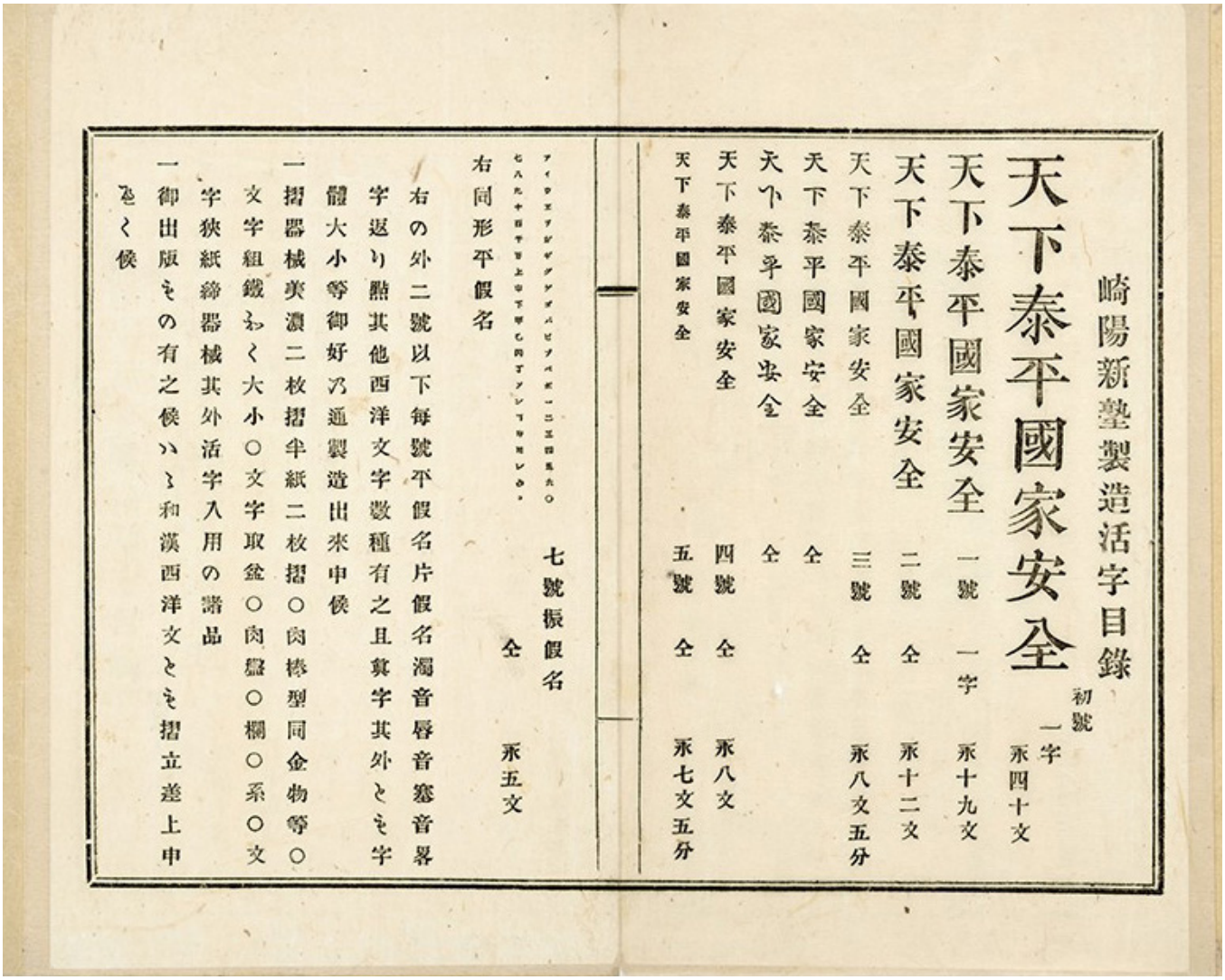
The Min-cho style founts developed by the Japanese were exported into China in the 1880s through the Xiuwen Library (修文书馆), Shanghai branch of the Tokyo Tsukiji Type Foundry. These two typefaces dominated the Chinese printing and publishing industry until the development of new Chinese founts within China.[169]

166 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 27.

167 Hiroshi Komiyama, 2023, 19世纪欧洲·中国的明朝体金属活字开发及其向日本的传播 [The development of the Mincho Ti movable metal type in the 19th century European, China and its dissemination to China], pp. 1–37.

168 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 29.

169 Ibid, p. 30.


崎陽新塾製造活字目錄

天下泰平國家安全　初號　一字　永四十文

天下泰平國家安全　一號　一字　永十九文

天下泰平國家安全　二號　全　永十二文

天下泰平國家安全　三號　全　永八文五分

天下泰平國家安全　全

天下泰平國家安全　全

天下泰平國家安全　四號　全　永八文

天下泰平國家安全　全

天下泰平國家安全　五號　全　永七文五分

アイウエオカキクケコサシスセソタチツテトナニヌネノハヒフヘホマミムメモヤユヨラリルレロワヰヱヲンガギグゲゴザジズゼゾダヂヅデドバビブベボパピプペポ一二三四五六七八九十百千万上中下学仁四子アレヨヲヤヒヘホ

七號振假名　全　永五文

右同形平假名

右の外二號以下每號平假名片假名濁音唇音塞音拗字返り點其他西洋文字數種有之且異字其外とも字體大小等御好乃通製造出來申候

一摺器械美濃二枚摺半紙二枚摺○肉棒型同金物等○文字組鐵わく大小○文字取盆○肉盤○欄○系○文字狹紙締器械其外活字入用の諸品

一御出版その有之候ハヽ和漢西洋文とも摺立差上申候

Figure 5.46
Specimen of Sakiyo private school movable type manufacture published in February 1872 as an advertisement in the *Shinmachi Private School* Part 1.
Source: Hiroshi Komiyama (private collection).

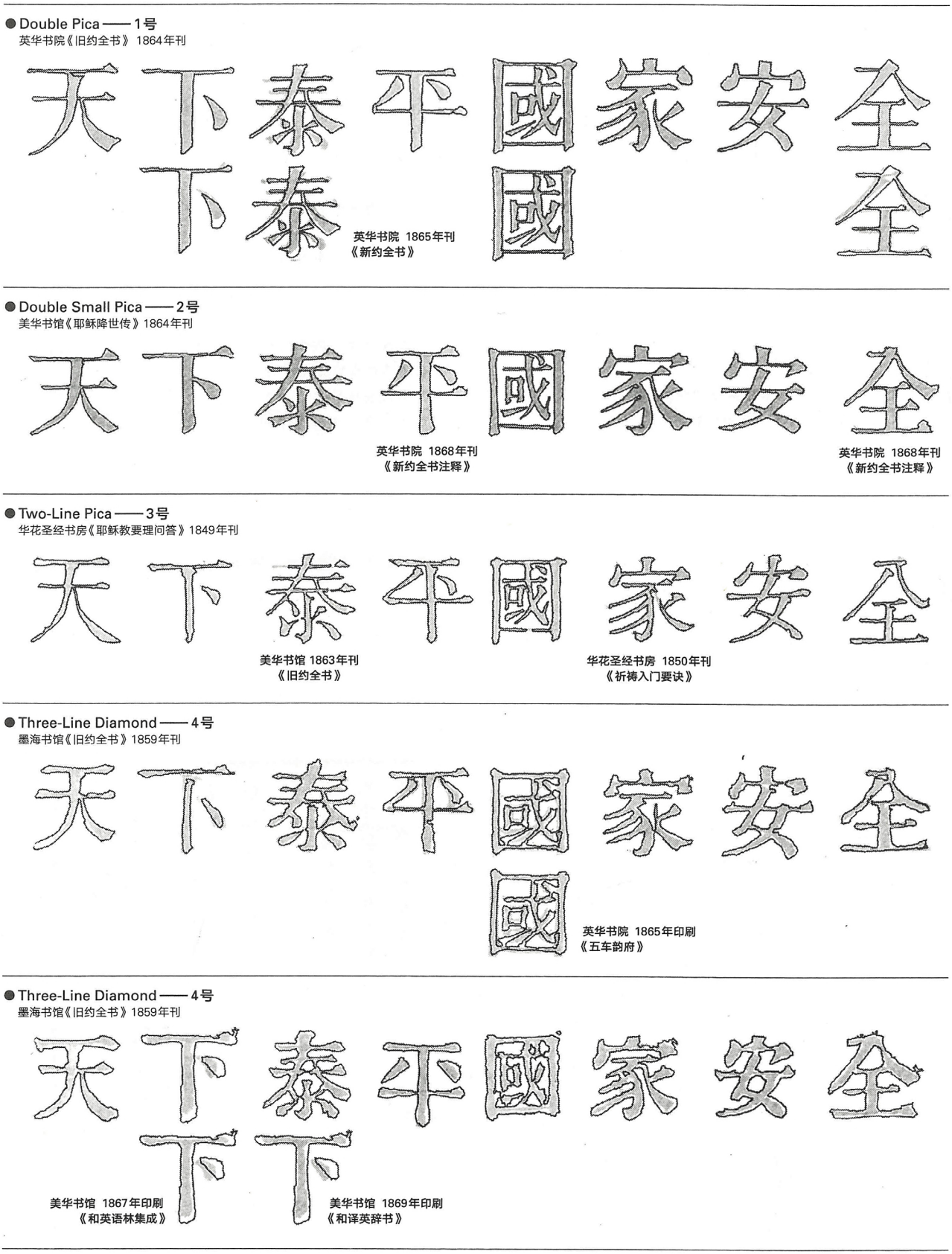
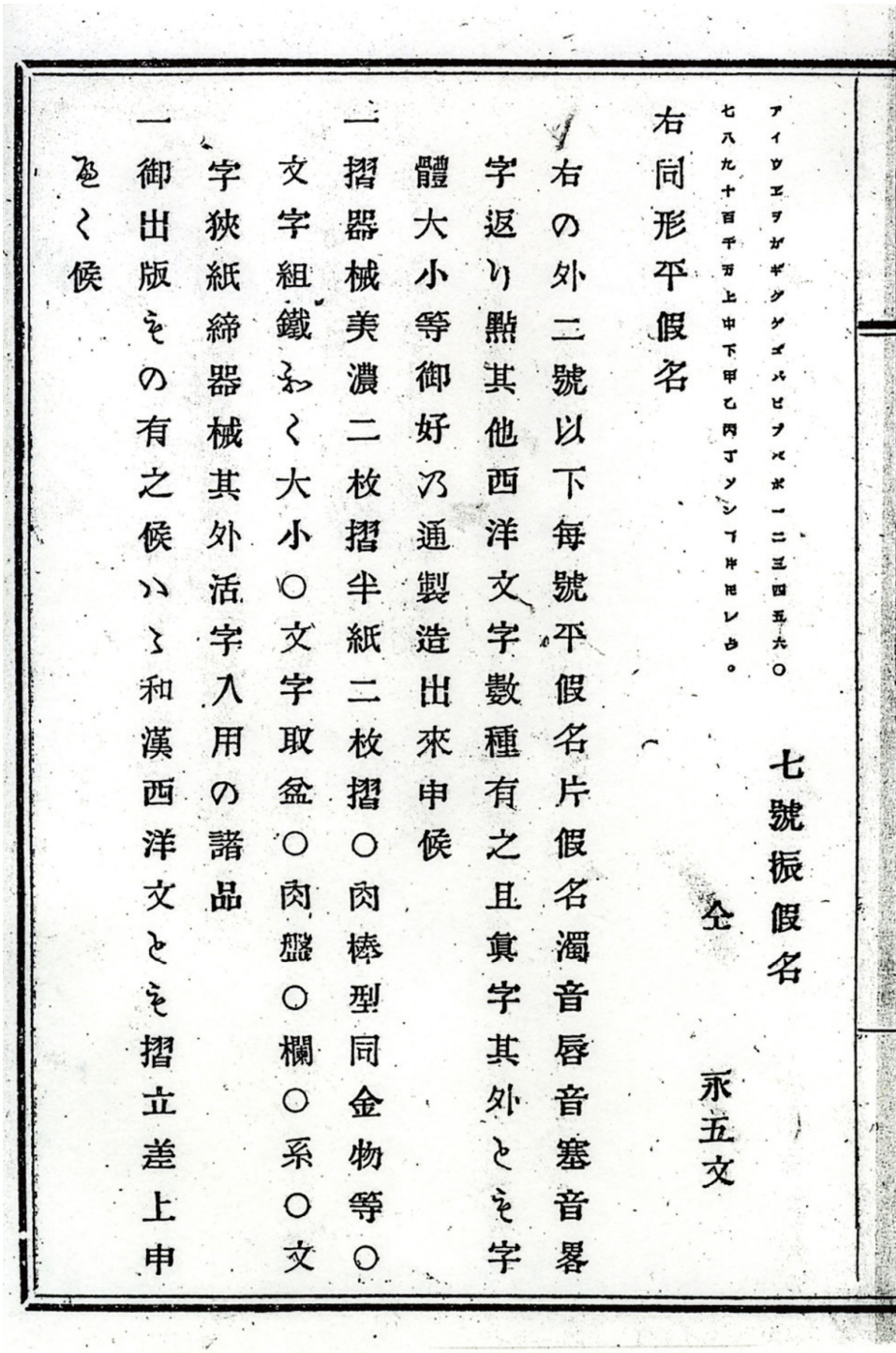


Figure 5.47
Comparison of the printed Chinese characters between founts from the Kiyō Shinjuku Foundry (black outline) and the American Presbyterian Mission Press Shanghai (grey colour) by Hiroshi Komiyama.
Source: *Chinese Typography Anthology*, p. 28.



アイウエヲガギグゲゴバビブベボ一二三四五六〇
七八九十百千万上中下甲乙丙丁メシテキヒレゟ。

七號振假名

永五文

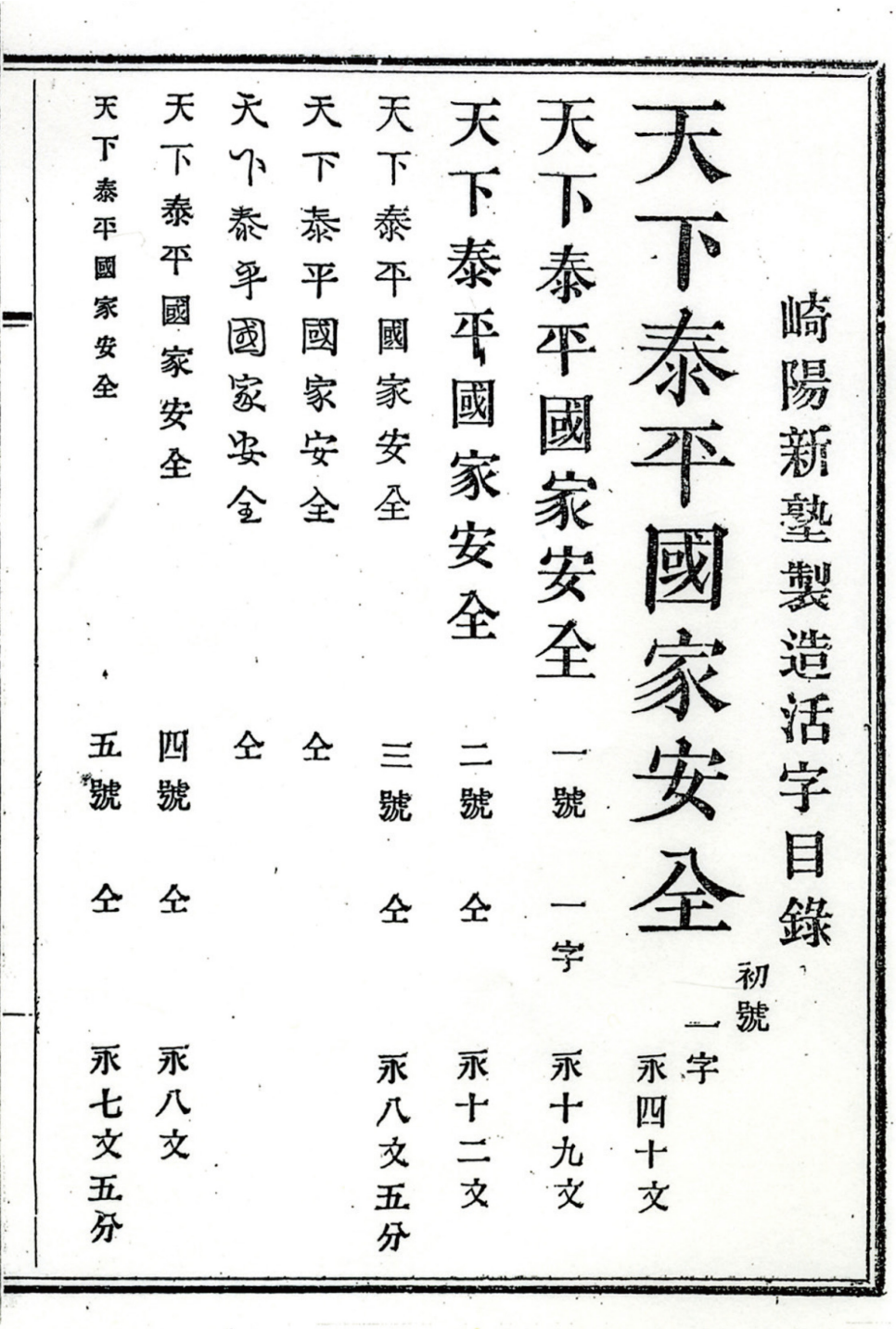
右同形平假名

右の外二號以下每號平假名片假名濁音唇音塞音畧字返り點其他西洋文字數種有之且眞字其外とを字體大小等御好次第通製造出來申候

一摺器械美濃二枚摺半紙二枚摺〇肉棒型同金物等〇文字組鐵わく大小〇文字取盆〇肉盤〇欄〇系〇文字狹紙締器械其外活字入用の諸品

一御出版その有之候ハゝ和漢西洋文とを摺立差上申べく候

0 1 cm


崎陽新塾製造活字目錄

天下泰平國家安全　初號　一字　永四十文

天下泰平國家安全　一號　一字　永十九文

天下泰平國家安全　二號　全　永十二文

天下泰平國家安全　三號　全　永八文五分

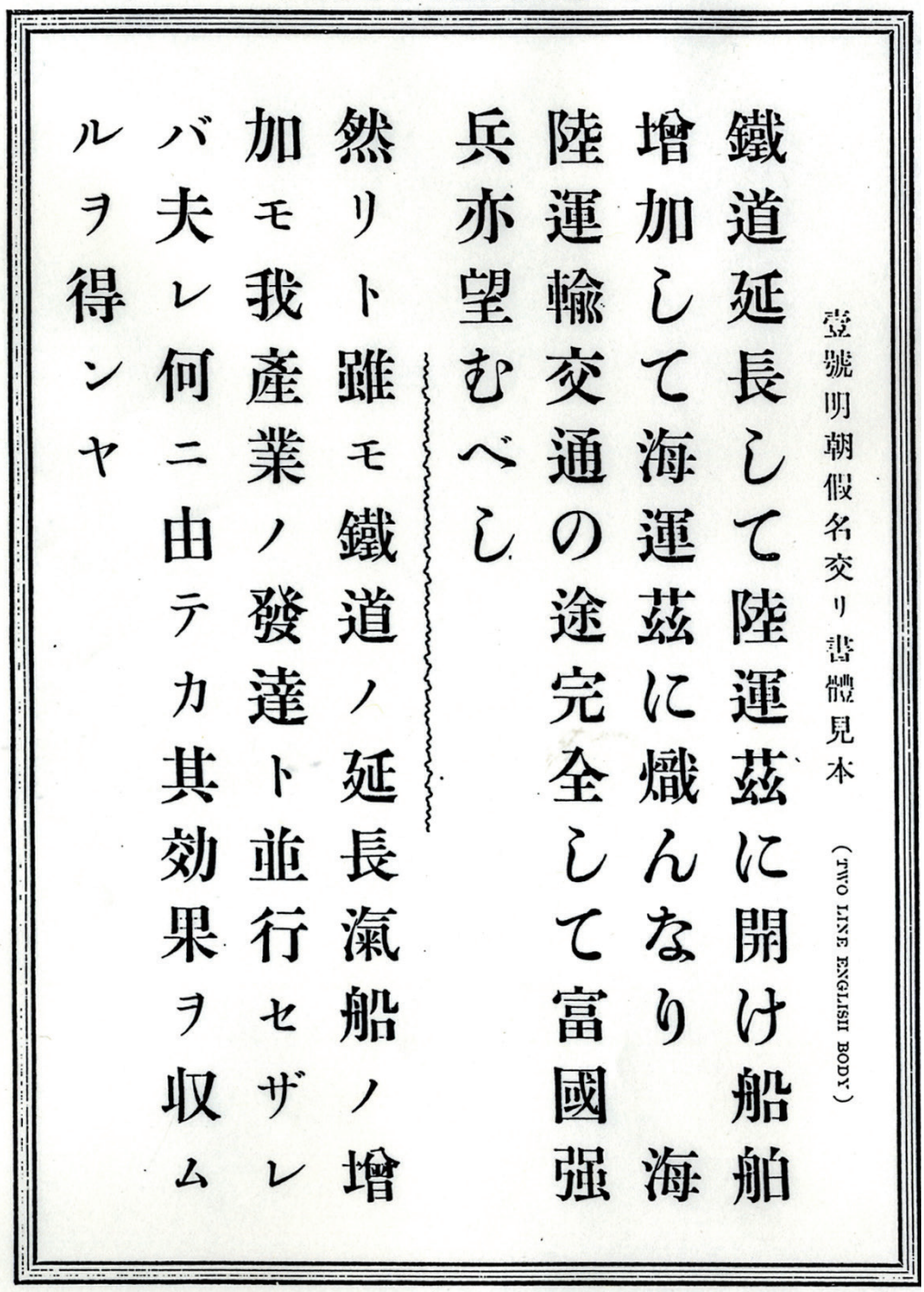
天下泰平國家安全　全

天下泰平國家安全　全

天下泰平國家安全　四號　全　永八文

天下泰平國家安全　五號　全　永七文五分

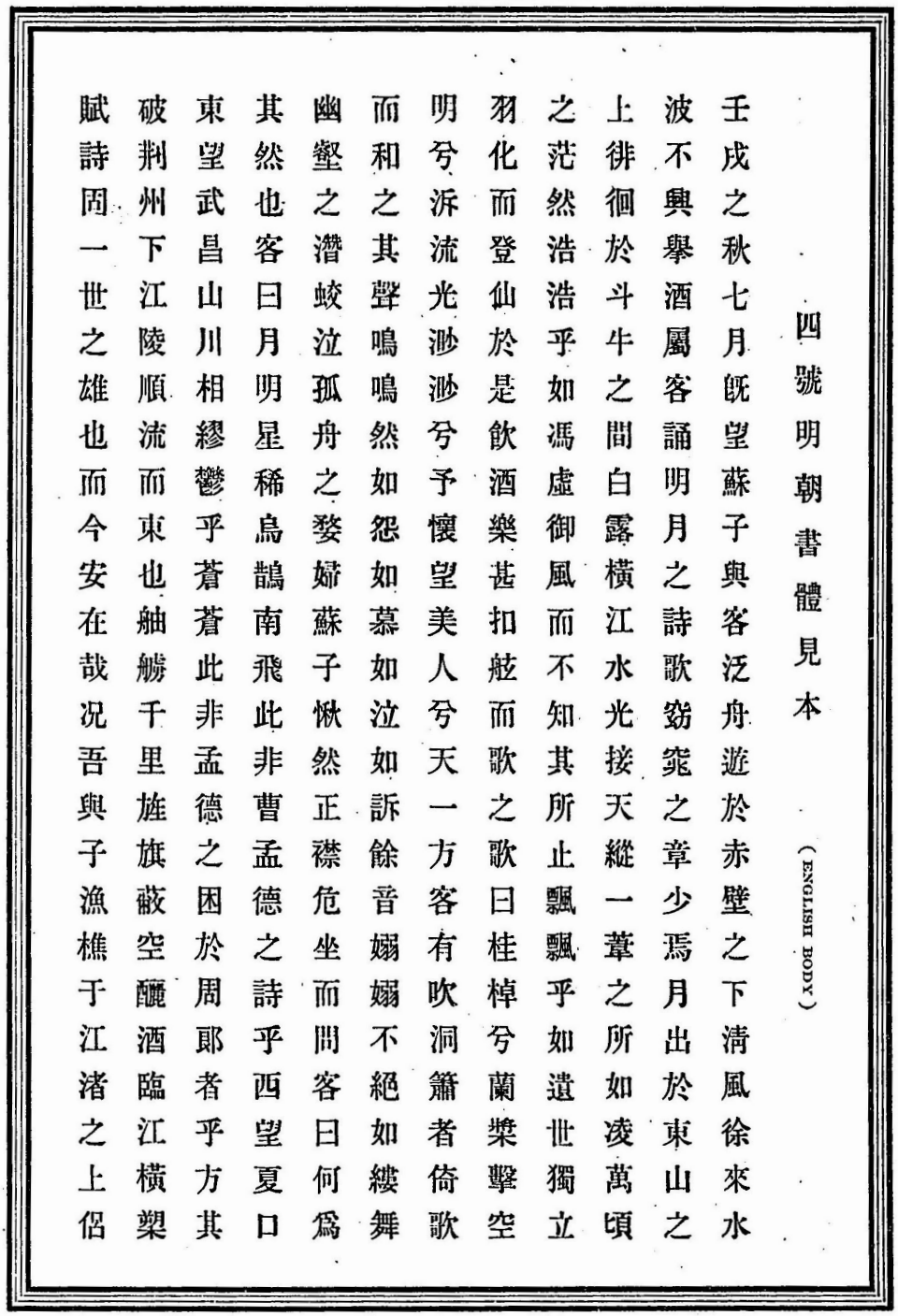
Figure 5.48
Kiyō Shinjuku Foundry Moveable Type Category, included in the appendix of *Shinbun zasshi* No. 66, published in October 1872.
Source: Hiroshi Komiyama (private collection).


壹號明朝假名交リ書體見本 (TWO LINE ENGLISH BODY)

鐵道延長して陸運茲に開け船舶
增加して海運茲に熾んなり 海
陸運輸交通の途完全して富國强
兵亦望むべし

然リト雖モ鐵道ノ延長濫船ノ增
加モ我產業ノ發達ト並行セザレ
バ夫レ何ニ由テカ其効果ヲ收ム
ルヲ得ンヤ

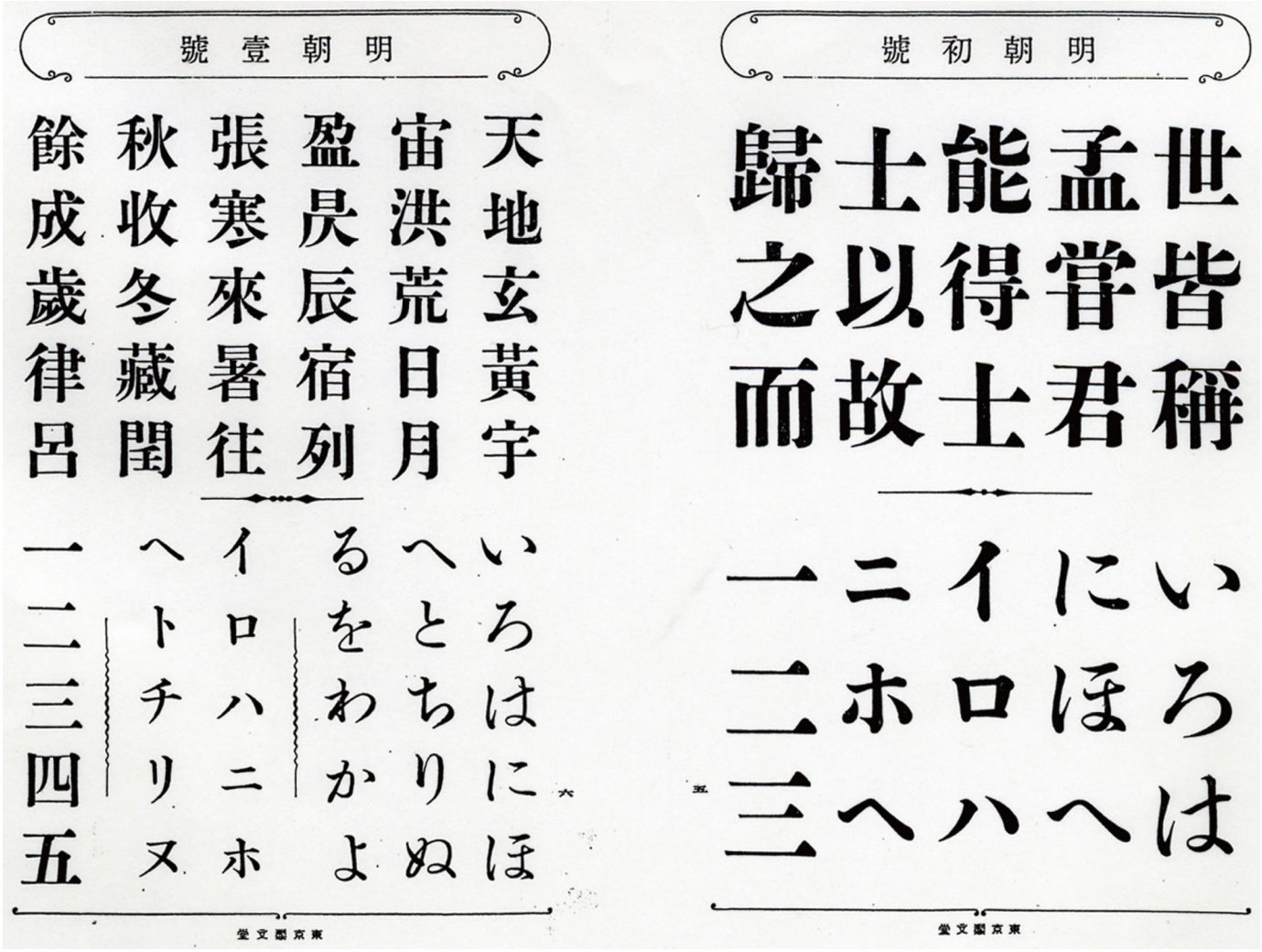
Figure 5.49
Specimen of the Tsukiji Mincho size No. 1.
Source: Hiroshi Komiyama (private collection).



四號明朝書體見本 (ENGLISH BODY)

壬戌之秋七月既望蘇子與客泛舟遊於赤壁之下清風徐來水
波不興擧酒屬客誦明月之詩歌窈窕之章少焉月出於東山之
上徘徊於斗牛之間白露橫江水光接天縱一葦之所如凌萬頃
之茫然浩浩乎如馮虛御風而不知其所止飄飄乎如遺世獨立
羽化而登仙於是飲酒樂甚扣舷而歌之歌曰桂棹兮蘭槳擊空
明兮泝流光渺渺兮予懷望美人兮天一方客有吹洞簫者倚歌
而和之其聲嗚嗚然如怨如慕如泣如訴餘音嫋嫋不絕如縷舞
幽壑之潛蛟泣孤舟之嫠婦蘇子愀然正襟危坐而問客曰何爲
其然也客曰月明星稀烏鵲南飛此非曹孟德之詩乎西望夏口
東望武昌山川相繆鬱乎蒼蒼此非孟德之困於周郎者乎方其
破荆州下江陵順流而東也舳艫千里旌旗蔽空釃酒臨江橫槊
賦詩固一世之雄也而今安在哉况吾與子漁樵于江渚之上侶

Figure 5.50
Specimen of the Tsukiji Mincho size No. 4.
Source: NDL Digital Collection.



0 1 cm

Figure 5.51
Specimen of the Shuei Ming-cho size No. 1 and No. Initial.
Source: Hiroshi Komiyama (private collection).

Conclusion

After William Gamble's departure, the American Presbyterian Mission Shanghai continued to develop based on the foundations he had laid. When Gamble died in the United States in 1886, *North China Herald*, a Newspaper in Shanghai, published a memorial essay on 13 August 1886, written by his previous colleague William Alexander Parsons Martin, entitled 'A Pioneer Printer',[170] in which he listed six critical contributions made by William Gamble:

> 1. He was the chief agency in establishing in Shanghai the American Mission Press, which is now situated in Peking Road.
> 2. He was the first to introduce into China the arts of electrotyping and stereotyping.
> 3. By the first named process he made two new fonts of Chinese type, and improved, I might say completed, all existing fonts.
> 4. By a stereotyping process, he greatly reduced the cost of printing.
> 5. By ascertaining, with a view to printing, the relative frequency of Chinese characters, he has enabled students of Chinese to diminish the labour of acquiring the language.
> 6. Mr. Gamble invented a circular frame for Chinese types, which enables the printer to reach them by simply turning from side to side, instead of walking back and forth as before.

William Gamble made significant contributions to the development of Chinese typeface design. As outlined by Martin, Gamble's contributions included calculating the relative frequency of Chinese characters, redesigning Chinese type cases, introducing electrotype technology, and producing two Chinese founts. These efforts led to notable advancements in the development of Chinese fonts.

Regarding Chinese typeforms, Gamble employed native Chinese engravers to improve the existing Paris Font, Berlin Font, and Hong Kong Font and produced the No.5 Shanghai Font and No.6 fount. However, combining small size type and divisible type resulted in unbalanced characters. Despite this, the Shanghai Font remained functional and highly readable.

Regarding aesthetics, although Wang Fengjia, a highly skilled engraver, incorporated traditional Chinese wood type, the Shanghai Font still followed the missionary style of imitating printed Chinese characters through woodblock printing. It is possible that Wang Fengjia may not have been particularly adept at working with small-sized characters.

170 Martin, 13 August 1886, 'A Pioneer Printer', *North China Herald*, pp. 172–173.

5.4 Ernest Major

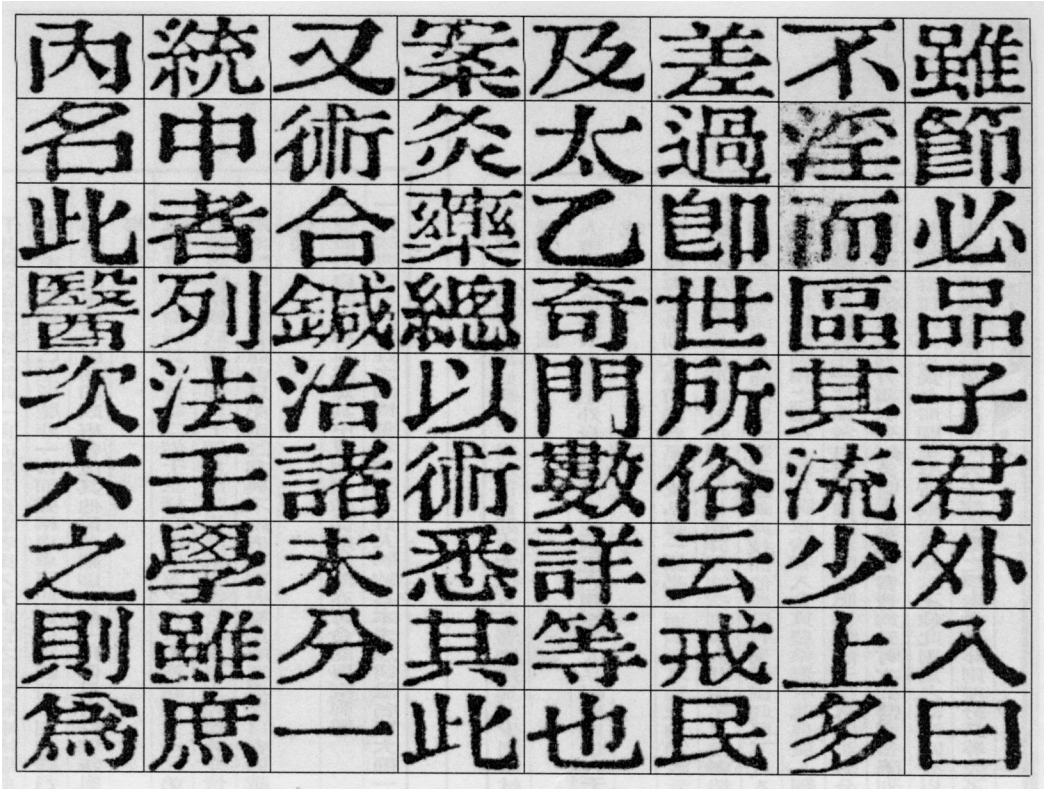
The development of the Chinese founts described earlier in chapter 6 was essentially for religious purposes, led by missionaries. However, foreign capital printing enterprises also began to develop Chinese founts in the late 19th century. After the signing of the Treaty of Nanjing in 1842, the Chinese were required to allow trade at Five Treaty Ports (figure 5.29). Foreign commercial capital entered China in large numbers, especially in printing and publishing. Between the 1870s and the 1920s, foreign business people established dozens of printing establishments in China, including more enterprises with British, German, Japanese, Russian and Spanish capital. [171] The most influential and accomplished of these was Ernest Major (1841–1908), a British businessman. In 1861, Major arrived in China, where he first took up employment in Hong Kong, then moved to Ningbo to set up his business before moving to Shanghai. In 1872, Ernest Major and his twin brother, Frederic Major, founded *Shen Bao* (known in English as the Chinese Daily News), one of the first modern Chinese newspapers in Shanghai.[172]

In 1884, Major founded Book Publishing House (图书集成局), one of the printing institutions under *Shen Bao* and developed an expanded No. 3 fount, which is often referred to as Major's fount (美查字) in China (figure 5.52). Because of its expanded style, Major's fount is ideally suited to vertical typography, as it allows more types to be set in each vertical line, thus saving space on the page. The type size of Major's fount is approximately 16-point (5.62 mm) wide and 10.5-point (3.67 mm) high, and is the only known Chinese metal type developed by a foreign capital printing enterprise.[173] The Book Publishing House used Major's fount to published books such as the *Twenty-four Histories* (二十四史) in 1888 and *Gujin Tushu Jicheng* (古今图书集成) in 1889 (figure 5.53).

171 See the 'List of printing establishments established by foreign businessmen in China'; Zhang Shudong, Pang Duoyi & Zheng Rusi, 1998, 中华印刷通史 [Zhonghua yin shua tong shi], pp. 483–484.

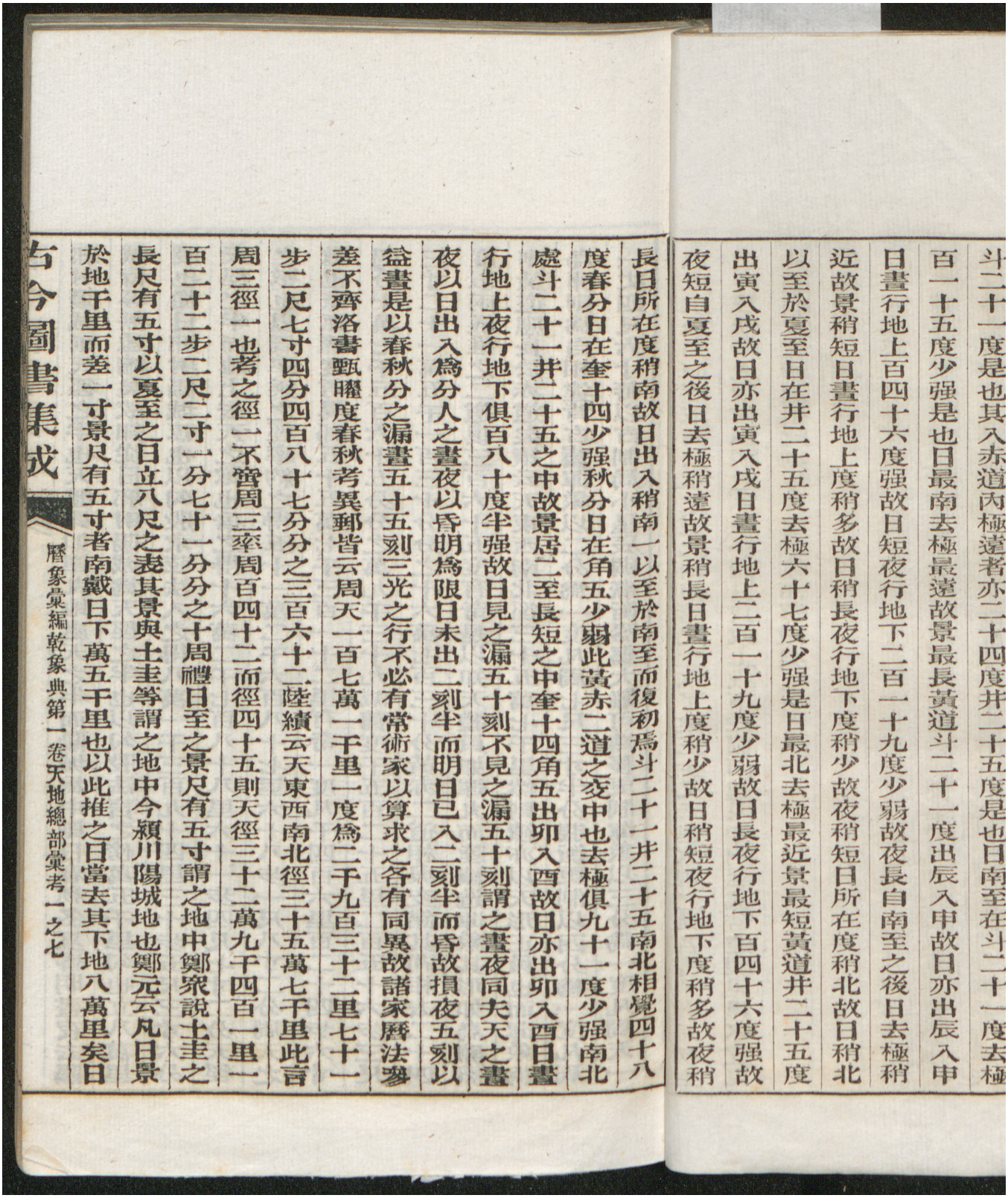
172 Yeh, 2015, Recasting the Chinese Novel: Ernest Major's Shenbao Publishing House (1872–1890). *The Journal of Transcultural Studies*, *6*(1), pp. 171–289

173 The designer, engraver, and production method of Major's fount are unknown due to a lack of information. Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 40–41; Zhang Shudong, Pang Duoyi & Zheng Rusi, 1998, [Zhonghua yin shua tong shi], pp. 483–484.



0 0.333 cm

Figure 5.52
Enlarged Major's No.3 expanded fount.
Source: Sun Mingyuan (private collection).



0 1 cm

Figure 5.53
A page of *The Gujin Tushu Jicheng* printed with Major's No.3 expanded fount.
Source: National Library of China.

Conclusion

In conclusion, the activities of Western missionaries played a significant role in disseminating Western typography in China. As these missionaries ventured into unfamiliar territories to spread Christianity, they began to explore the use of Chinese characters and evaluate different printing methods, leading to the introduction of movable metal type technology in China. This marked a significant precursor to the eventual shift from traditional xylography to movable type printing as the dominant method in China.

During the 19th century, missionaries successfully addressed the technical challenges of Chinese type making, particularly with the introduction of the electrotyping method by William Gamble, which defined the technology for producing Chinese matrices. However, the production of Chinese founts was primarily dominated by missionaries and foreign business people, with limited involvement from Chinese participants. The technology of type-making remained mainly in the hands of foreigners and was not fully localised in China. Furthermore, the production and use of Chinese founts were concentrated in coastal areas such as Guangzhou, Hong Kong, Macao, Ningbo, and Shanghai.

Regarding the evaluation of missionaries' founts, it is essential to note that these founts primarily focused on functional aspects due to technical limitations and the dominance of the missionaries. While some missionaries, like Samuel Dyer, were aware of the aesthetic aspects of Chinese characters and involved Chinese engravers such as Wang Fengjia, the final quality of the founts did not fully meet aesthetic standards or adhere to Chinese conventions. From a type design perspective, the Chinese founts produced by the missionaries imitated and simplified the shape of printed Chinese characters found in contemporaneous woodblock printing. However, after being introduced to Japan by William Gamble, these founts underwent further improvement and were later exported back to China, eventually forming a distinct style, Song Ti style. Therefore, the founts created by the missionaries can be seen, to some extent, as laying the foundation for the development of Song Ti style typefaces.

Chapter 6. Chinese founts in the early 20th century (1909–1937)

After the Opium War of 1840, China gradually descended into a semi-colonial and semi-feudal society.[1] Concurrently, European and American missionaries, through extensive missionary activities, introduced Western movable type printing technology to China, as discussed in Chapters 5 and 6. Notably, William Gamble's utilisation of the electrotyping method on Chinese matrices defined the technology of Chinese type-founding. However, despite some Chinese involvement in the production of the missionaries' founts, the core technology remained in the hands of the missionaries and lacked localisation.[2]

By the 1880s, privately-held Chinese enterprises ventured into the printing and publishing industry. Although Chinese type-founding had been established, the primary focus of these enterprises during this period revolved around reproducing Chinese classics for imperial examinations.[3] Consequently, private printing establishments in China primarily specialised in lithography, a more cost-effective and suitable method for reproducing books compared to movable type printing. As a result, lithography flourished for a period of approximately thirty years in China until the Qing government discontinued the imperial examination system in 1905 (figure 6.1).[4] The technology of movable type printing gradually started to become localised and gain popularity as lithography, which was primarily involved in reproducing classics, began to decline.

After the establishment of the Republic of China in 1912, Chinese privately-held printing and publishing enterprises surpassed foreign enterprises and dominated the market in both number and scale, the Chinese type-founding and movable type printing was finally popularised.[5] The Chinese therefore had the ability to develop Chinese founts independently, which gradually led to the development of four main styles of Chinese typeface: Song Ti, Fang-song Ti, Kai Ti and Hei Ti. This chapter traces the formation of these four text typeface styles and describes the development of the Chinese type size system.

1 A semi-colonial and semi-feudal society refers to a social and economic system where a country, though formally independent, is heavily influenced and exploited by foreign powers while also experiencing remnants of feudalism alongside emerging capitalist forces.

2 See chapter 5.3 William Gamble.

3 The imperial examination was a system of civil service examinations in Imperial China established during the Sui dynasty (581–618 AD).

4 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 50; Castrillón, 2012, *The abolition of the Imperial Examination System and the Xinhai Revolution of 1911*.

5 Ibid.

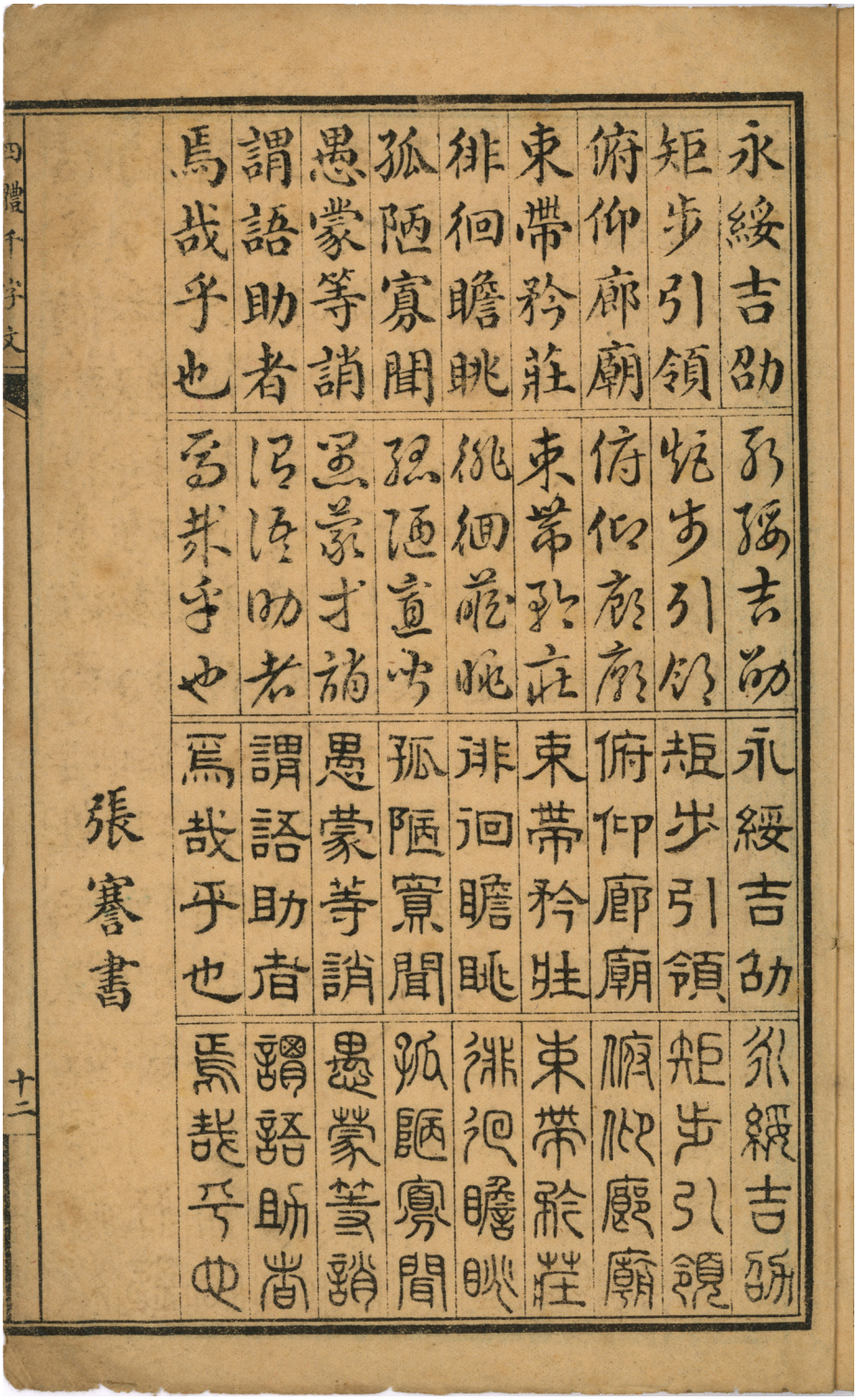


Figure 6.1
Thousand Character Classic in Four Styles printed with lithography and published *c.* 1912.
Source: Author (private collection).

6.1 Development of Chinese type size system

Fount number system and the Point system

After the invention of movable type printing, there was no unified size system for Chinese movable type until the introduction of Western typography in the 19th century. In 1777, Jin Jian developed the technical standards for wood type printing approved by the Qianlong Emperor (1711–1799) in the *Qin Ding Wu Ying Dian Juzhen Ban Cheng Shi*, which included a standard for the size of wood type. The dimensions of wood types specified in this standard included the square type with a length of 2 Fen 8 Li (≈ 0.9 cm), width of 3 Fen (≈ 0.96 cm), and height of 7 Fen (≈ 2.24 cm), as well as the condensed type with the same length and height but a width of 2 Fen (≈ 0.64 cm).[6] After the announcement of this standardisation, official wood type printed books were mainly printed in this size.[7] However, this standard only applied to a fixed format and did not form a comprehensive size system for printed Chinese characters.

Moreover, traditional printed Chinese books were primarily based on manuscripts, where the style and standard of writing played a central role in determining the quality of the printed book.[8] Consequently, prior to the missionaries' efforts to produce Chinese founts that corresponded to Latin script, printed Chinese characters did not have a standardised size system, and their size was predominantly controlled by the transcriber. It is crucial to note that Chinese characters, being 'Square-Block Characters,' can be arranged both horizontally and vertically. Consequently, the definition of type size for each fount is not solely determined by height, as it is in Latin. Instead, it is ascertained by both the height and the width. In other words, Chinese founts of the same height can vary in size according to their width.

In the 1860s, William Gamble implemented a numbering system based on the type size to facilitate the purchase of founts by Chinese customers from the American Presbyterian Mission Press Shanghai. However, it is essential to note that there was no direct multiplicative relationship between the type sizes of numbered Chinese founts. Instead, the sizing was aligned with Latin founts using the Fournier point system and the American system of traditional point-size names. This numbering arrangement from No. 1 to No. 6, with a disproportionate decrease in size, was simply for easier identification and selection of founts based on Chinese clients' preferences.[9]

Around 1872, Motoki Shōzō formulated a new system for numbering type sizes based on the numbering sequence of William Gamble. Shōzō introduced a new type size larger than No. 1 and named it No. Initial. Additionally, he added another new size situated between No. 5 and original

6 Refer to the figures 3.5, 3.6 and 3.18 in chapter 3; Hu Xiongwei, 2009, 清朝木活字印刷标准——解读《钦定武英殿聚珍版程式》(Standards of wooden movable type printing in the Qing dynasty: Interpreting 'Qin Ding Wu Ying Dian Juzhen Ban Cheng Shi'). In: 标准科学 (Standard Science), 2009:4, p. 4; Chinese traditional units of length in the Qing dynasty were converted to centimetres using the conversion tool provided by <thdl.ntu.edu.tw/thdl_tool/weight_measure/transformation8.php>.

7 Hu Xiongwei, 2009, (Standards of wooden movable type printing in the Qing dynasty: Interpreting 'Qin Ding Wu Ying Dian Juzhen Ban Cheng Shi'). In: (Standard Science), 2009:4, pp. 4–11.

8 Zhao Jian, 2011, 范式革命 (中国现代书籍设计的发端1862-1937) [The beginning of Chinese modern Book design paradigm (1862–1937)], p. 58.

9 Refer to the figure 5.40 with a table in chapter 5.

No. 6, renaming this new addition as No. 6 and subsequently renaming the original No. 6 as No. 7. In this way the type sizes represented by No. Initial to No. 7 appear to be progressively smaller in relative proportion which formed the basis of type size system for Chinese founts. Later, through the efforts of Japanese typographers, a multiplicative relationship was established between the numbers, which became the standard for the Chinese type size-system in the Chinese character cultural sphere. This standard then, in turn, further influenced the system used in China. At the end of the 19th century and the beginning of the 20th century, Chinese founts directly referred to Japan's type-size system, consisting of seven sizes from No. 1 to No. 7. In 1931, He Shengnai explained the relationship between early size names, fount numbers and traditional point-size names (American points) in his article 'The printing techniques of China in the past thirty-five years' from the book, *Chinese Education in the Last Thirty-five Years* (figure 6.2 & table 6.1).[10]

In the 1920s, Japanese typographers further enriched and improved the type-size system by referring to American fount sizes, also known as the American point system. In the 1930s and 1940s, China introduced five type sizes from Japan, such as small No. 5 (9-point), small No. 4 (12-point), small No. 2 (18-point), 27-point and No. Te (36-point), thus improving the range of the Chinese type-size system. In addition, based on the tradition of Chinese layout, seven condensed type sizes and one expanded type size were added to meet the typographic needs of various books.[11]

By 1949, before the establishment of New China, the Chinese size system had developed into a system of 20 sizes including 12 square type sizes, 7 condensed type sizes, and 1 expanded type size.[12] For typographic convenience, there were specific multiplicative relationships between certain fount numbers (figure 6.3), and the sizes could also be differentiated approximately according to the point system (figure 6.4). Since metal type sizes can vary between manufacturers, the actual size and name of the fount number may differ from one manufacturer to another. As a result, the conversion of points may not inconsistent.

The fount number system has impacted Chinese typography profoundly, and the Chinese printing industry has long used a hybrid system in which the fount number is the mainstay, supplemented by its point size number.[13] However, the fount number system's major limitation lies in the lack of linear relationship between different fount numbers, meaning that a fount number does not correspond to a proportional increase in magnitude.[14] Although the fount number was the unit of size for the metal type, it is now being replaced by the point size system. The fount number system is no longer used in Japan but continues to be used in China. In the near future, it is likely that the fount number system will be replaced by the point system in China.

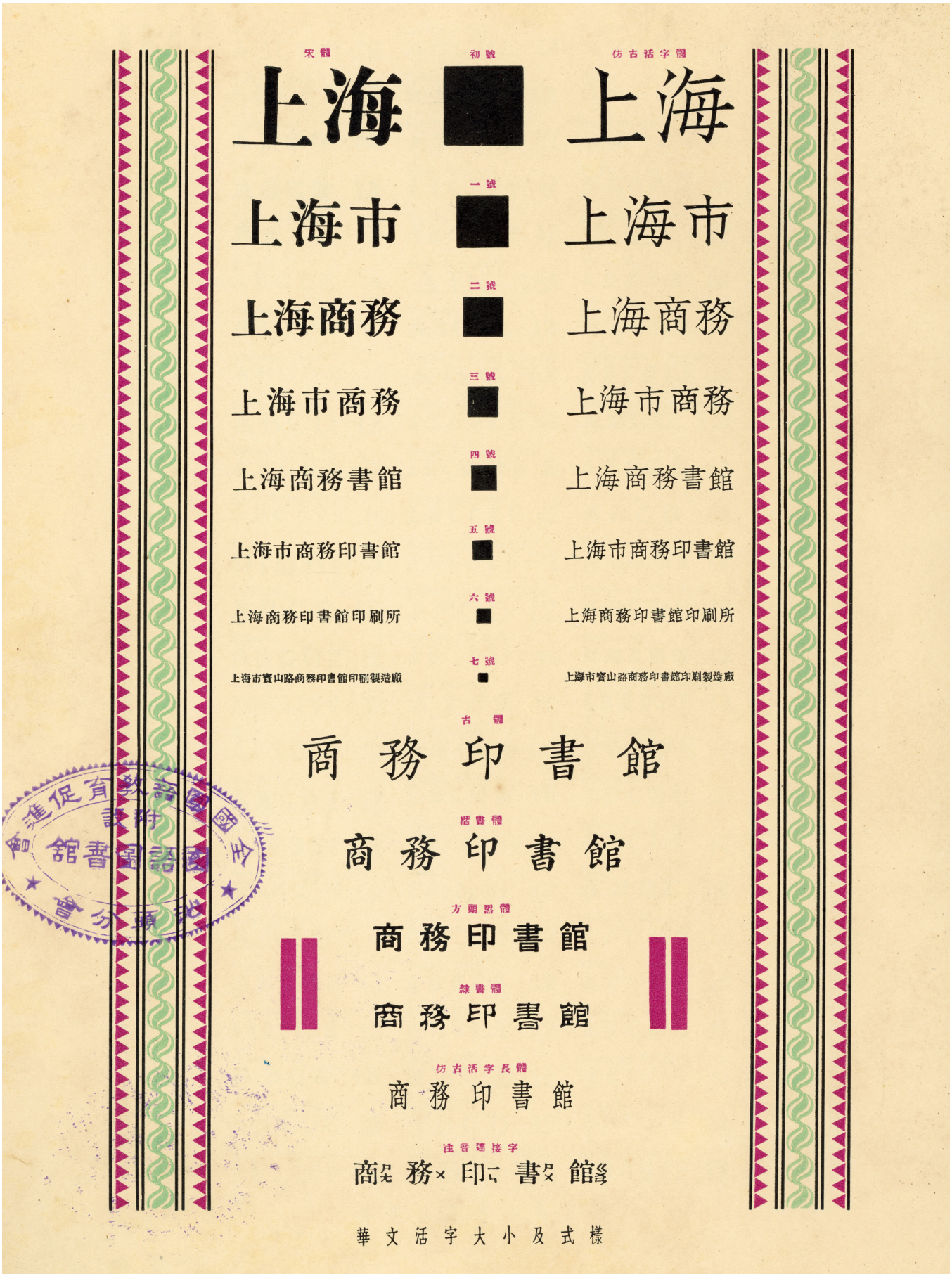
10 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 26.

11 He Buyun determined the Chinese type-size by both the width and length of the type.

12 He Buyun, 1989, 中国活字小史 [The small history of Chinese movable type]. In: 活字印刷源流 [The origin of movable type printing], p. 82.

13 Zhou Chengmin, 1993, 活字排版工艺 [Typesetting with movable type], p. 37.

14 Zhai Ming & Yang Xinlan, 2004, 当代排版技术概论 [Introduction to contemporary typographic techniques], p. 20.



0 1 cm

Figure 6.2
'Chinese Movable Type Size and Style,' type specimen from the Commercial Press in the *Chinese Education in the Last Thirty-five Years* published in 1931.
Source: Author (private collection).

Early size name	Fount Number (字号)	Traditional point-size names (American system)	Fournier Point
Xian Type (显字)	No. 1	Double Pica	24
Ming Type (明字)	No. 2	Small Pica	22
Zhong Type (中字)	No. 3	Two-line Brevier	16
Hang Type (行字)	No. 4	Three-line Diamond	13.5
Jie Type (解字)	No. 5	Small Pica	11
Zhu Type (注字)	No. 6	Brevier	8
Zhen Type (珍字)	No. 7	Small Ruby	5.5

Table 6.1
Table of the relationship between original names by He Shengnai, Chinese fount number, traditional point-size names in American system and Fournier Point.
Source: He Shengnai, 1931, 三十五年来中国之印刷术 [The printing techniques of China in the past thirty-five years]. In: 最近三十五年之中国教育 [Chinese education in the last thirty-five years], p. 179; He Buyun, 1989, 中国活字小史 [The small history of Chinese movable type]. In: 活字印刷源流 [The origin of movable type printing], p. 76.

Figure 6.3
Multiplicative relationships between certain fount numbers, from right to left, No. Te is equal to four times No. 2 and nine times No. 4; No. 1 is equal to four times No.4; No. 2 is equal to four times No. 5; No. 3 is equal to four times No. 6; and No. 4 is equal to four times the small No. 6.
Source: Liu Longguang, 1985, 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940), p. 25.

Figure 6.4
Correspondence between fount numbers and points: No. Te equals approximately 36-point; No. Chu equals approximately 30-point; No. Tou equals approximately 24-point; No. 2 equals approximately 18-point; No. 3 equals 16-point; No. 4 equals 14-point; No. 5 equals approximately 12-point; new No. 5 equals 10-point; No. 6 equals 8-point; small No. 6 equals approximately 6-point.
Source: Liu Longguang, 1985, 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940), p. 26.

6.2 Development of Song Ti founts

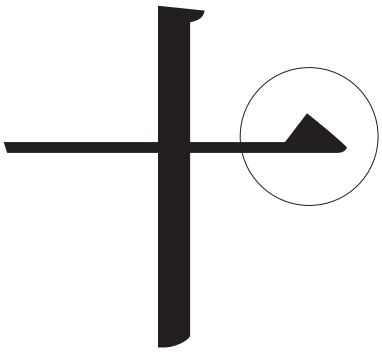


Figure 6.5
The Chinese character '十' in a Song Ti font. The triangular decoration in the circle is a typical serif of Song Ti style typeface.
Font in use: Noto Serif CJK SC, Medium.

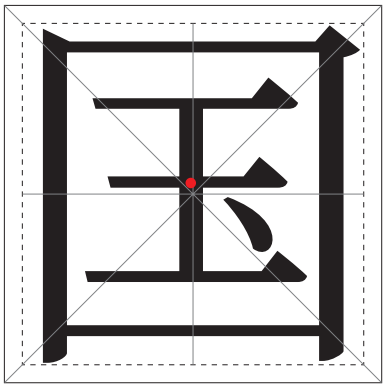


Figure 6.6
The Chinese character '国' in a Song Ti font. The red dot represents the Zhong Xin. The solid frame is known as the Type Body frame, while the dotted-line frame is referred to as the Type Face frame. The difference between the Type Face and the Type Body determines the characrer spacing.
Font in use: Noto Serif CJK SC, Regular.

Song Ti, known as 'Old Song Ti' (老宋体) in the early 20th century, is a category of Chinese text typefaces and is the most widely used typeface style. A Song Ti typeface is similar to a serif typeface with decorative serifs at the end of strokes with reference to the classification of Latin typefaces. Compared with other styles, Song Ti and serif typefaces share similar characteristics for better readability. The difference is that the serifs in Song Ti founts mainly regulate the distribution of white space rather than induce the reader to move the line of sight laterally. Song Ti typefaces also have contrast between the weight of the strokes, with generally thinner horizontal strokes and thicker vertical strokes, and there is no tilt to these two basic strokes (figure 6.5).

In addition to the characteristics of the shapes of the strokes, the classification of Chinese typefaces relies on the structure of the characters and the distribution of the density of the strokes. The Zhong Xin of the Song Ti typeform is close to, but not exactly the same as, the centre of the Type Face frame and the Body frame and has a larger Zhong Gong with evenly distributed strokes, resulting in an even type colour (figure 6.6).

In most studies of Chinese typography, Song Ti founts are discussed in conjunction with the style of printed Chinese characters in woodblock printing, thus confusing the name of Song Ti with the Song dynasty, as they both use the Chinese character 'Song' (宋) in their names. This therefore led people to believe that Song Ti originated from the printed characters used in woodblock printing in the Song dynasty. However, there is no direct link between them. Any discussion of Song Ti founts should be based within the context of Chinese typography.

Formation of Song Ti founts

The style of Song Ti founts was derived from the shape of printed characters used in woodblock printing in the Ming dynasty. During the Ming Dynasty, however, as engraving and printing techniques became fully developed and gradually matured, engravers began to dominate the scene.[15] Engravers simplified the shape of the printed Chinese characters and incorporated features to facilitate engraving and improve efficiency, resulting in the style of Song Ti typefaces as indicated in chapter 2.5.

Moreover, the samples that European sinologists and missionaries referred to when attempting to produce Chinese founts in the 19th century were all woodblock printings from the Ming and Qing dynasty: the model for Fourmont's Chinese types was *Xie Sheng Pin Zi Jian* published in 1677,[16] and Samuel Dyer's principal guide for the best-formed characters was the *Kangxi dictionary*.[17]

Having combined Western mechanical movable type printing technology and Chinese characters, European and American missionaries eventually produced seven practical Chinese founts from No. 1 to No. 6, as described in chapter 5. Moreover, the electroplating method invented by William Gamble established the technology of making Chinese matrices. Although Chinese were involved in producing missionaries' founts, the core technology was still in the hands of missionaries and was not localised in China.

Before movable-type printing technology became widespread in the 1920s in China, William Gamble introduced the technology of Chinese type-founding and printing to Japan in 1869, at the time of the Meiji Restoration (1868–1889).[18] Under a favourable environment, the technology of type-founding was rapidly localised in Japan, resulting in the formation of the Japanese movable type system, with the Min-cho style as its core. Subsequently, Japan exported the optimised missionaries' founts to China, thereby influencing Chinese printing and publishing. Specifically, there were two fount families: the Tsukiji Mincho fount family, which was the mainstay of book printing and the Shuei Ming-cho fount family, which was used for newspaper printing.

In 1883, the Tokyo Tsukiji Type Foundry established a subsidiary in Shanghai known as Xiuwen Library. One of its primary business objectives was the sale of the Tsukiji Mincho fount family, which became the predominant typeface used in China at the time due to the inability of Chinese companies to develop their own metal types. The Commercial Press, founded in 1897, introduced the Tsukiji Mincho and quickly gained a substantial market share. The exceptional quality of this typeface allowed the Commercial Press to produce high-quality prints, leading to significant growth and expansion within a short period (figure 6.7).[19]

15 See chapter 2.5 Evolution of Chinese characters through woodblock printing.

16 See chapter 4 Chinese movable type in Europe.

17 See chapter 5 Chinese movable type in Asia.

18 The Meiji Restoration, also known as the Honorable Restoration or Meiji Renovation, was a political event in 1868 under Emperor Meiji, resulting in significant transformations in the country's political, social, and industrial aspects as it adopted Western ideas and production methods.

19 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 118–120.

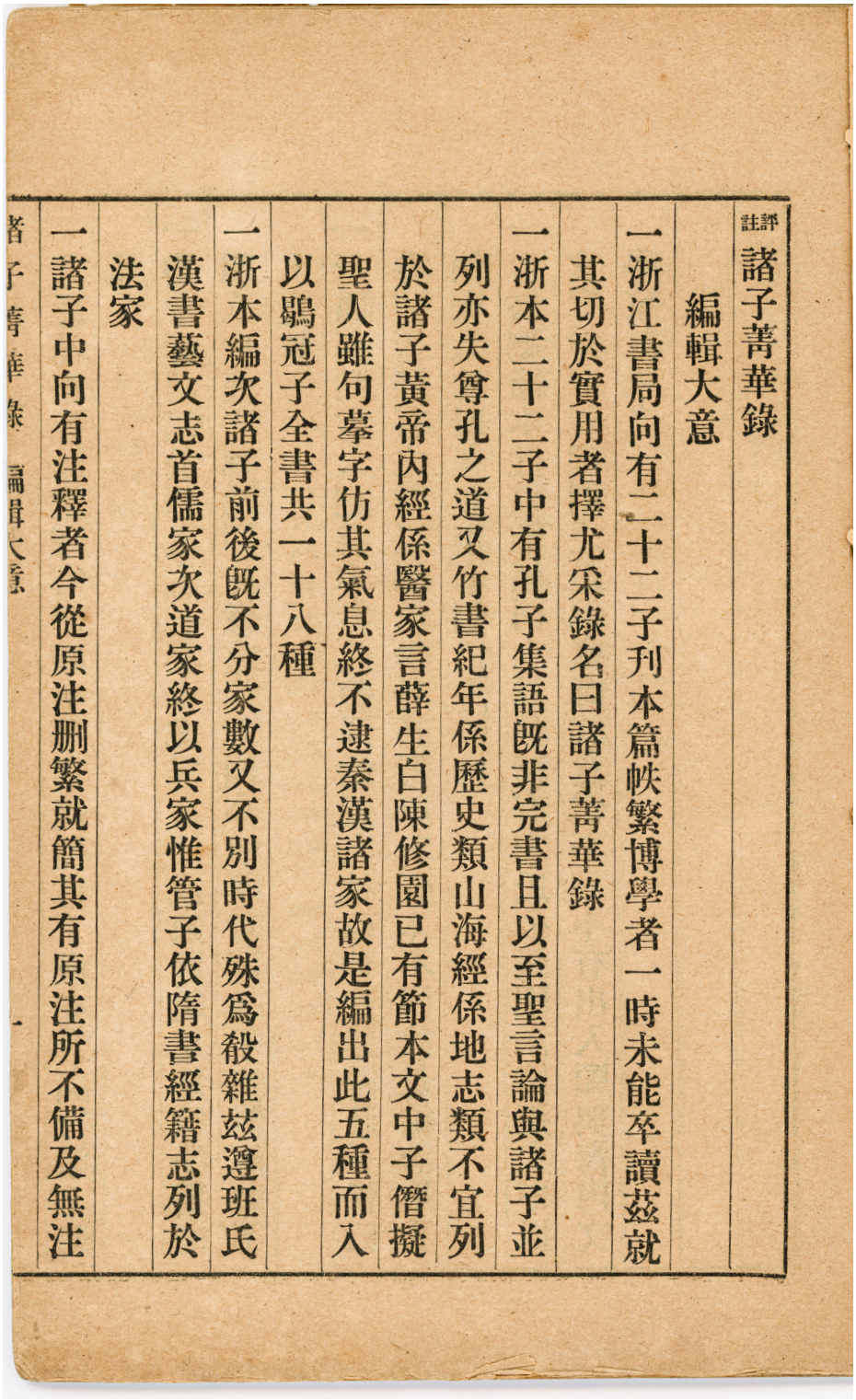


Figure 6.7
A page of *Yanzi Chunqiu* (晏子春秋) printed and published by the Commercial Press in 1964. The fount used in the main text is the No. 5 fount.
Source: Author (private collection).

Although the Book Publishing House had developed an expanded the No. 3 fount by Ernest Major in 1884, it had limited influence. Subsequently, the Chinese printing and publishing industry relied heavily on imported Japanese Min-cho founts and had not produced the Song Ti and Hei Ti founts within China for about half a century.[20]

Apart from the availability of imported Song Ti founts from Japan, two other factors contributed to the absence of domestically-produced Song Ti founts in the early 20th century. Firstly, Song Ti had evolved into a specific and predominantly functional style after being refined by the Japanese. Moreover, this style uses the formalised shapes of Chinese characters, which are difficult to develop new styles. Secondly, the Chinese perceived the Song Ti style as lacking the traditional aesthetic essence of Chinese characters – Chinese calligraphy. This style, Song Ti, aligns with Qian Dayong (钱大镛)'s instruction in the preface of *Ming Wen Zai* (明文在):

> Skilful calligraphers wrote ancient books according to their calligraphic styles, and there was no such thing as 'Song characters'. In the Ming dynasty, some scribes specialised in writing superficial characters, called Song Ti.[21]

The style of printed Chinese characters in woodblock printing that Qian Dayong elaborates on coincided with the style of missionaries' founts, which is perhaps why the Chinese initially referred to this particular style as Song Ti. Even after mastering type-founding technology in the early 20th century, the Chinese primarily embarked on developing Fang-song Ti and Kai Ti founts, as these two styles were considered more aesthetically pleasing for Chinese characters and better suited the preferences of Chinese typographers.

20 He Buyun, 1989, [The small history of Chinese movable type], p. 77.

21 Xue Xi, 1936, 明文在 [Ming Wen Zai], preface; Qian Dayong's instruction was also quoted in the Printing Techniques of China in the Past Thirty-Five Years by He Shengnai in 1931. He Shengnai, 1931, 三十五年来中国之印刷术 [The printing techniques of China in the past thirty-five years]. In: 最近三十五年之中国教育 [Chinese education in the last thirty-five years], p. 179.

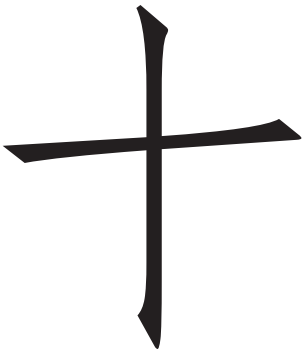


Figure 6.8
Chinese character '十' in a Fang-song Ti font.
Font in use: STFangsong.

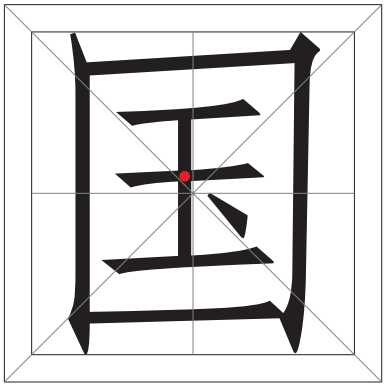


Figure 6.9
The Chinese character '国' in a Fang-song Ti font. The red dot represents the Zhong Xin.
Font in use: STFangsong.

6.3 Development of Fang-song Ti

Fang-song Ti is another category of Chinese text typefaces with a highly traditional aesthetic.[22] The character 'Fang' (仿) in 'Fang-song' (仿宋) means imitation, but Fang-song does not imply the imitation of Song Ti. Instead, it refers to the imitation of the style of printed characters produced by woodblock printing during the Song dynasty. During that era, the printing of Chinese characters followed the writing style of famous calligraphers in conjunction with highly skilled engravers in order to restore the style of calligraphy.[23] Fang-song Ti founts, therefore, exhibit a strong sense of engraving and adhere to the calligraphic style.

In contrast to other styles, the Fang-song Ti style lacks the distinctive triangular serifs found in Song Ti. Instead, it has sculptural boldness at the terminals of the strokes. In other words, while Song Ti features highly abstracted serifs, the strokes in Fang-song Ti closely resemble the sculpted calligraphic strokes seen in Kai Ti. Moreover, Fang-song Ti maintains an even thickness between the horizontal and vertical strokes, and the horizontal strokes possess a discernible angle of inclination towards the upper right (Figure 6.8).

The structure of the Fang-song Ti typeforms is close to that of Kai Ti, with a smaller Zhong Gong, and a shift of the Zhong Xin towards to the upper left of the character centre (figure 6.9). Consequently, Fang-song Ti typeforms can be seen as sculpted Kai Ti typeforms.

Historical context

The emergence of Fang-song Ti fount took place in the early 20th century, a period characterised by the localisation of Western movable type printing and type-founding introduced by missionaries, which were mastered by Chinese typographers and thus gained popularity in China. During this time, pioneers in the Chinese printing industry gradually shifted away from reliance on missionaries' founts, and Japanese improved founts, focusing instead on developing the capability to produce Chinese metal type independently.

An important turning point came with the 1911 Revolution,[24] marking the end of the Qing government and China's four-thousand-year monarchy,[25] followed by the establishment of the Republic of China in 1912. Subsequently, numerous enterprises public funding, such as the Commercial Press (商务印书馆) and the Zhonghua Book Company (中华书局), experienced rapid development by continuously introducing the latest printing technology, including in the field of type-founding.

However, Japanese-made founts already fundamentally dominated the Chinese printing market in the early 20th century. In the contexts of intense market competition, deepening imperialist aggression and severe national crisis, national capitalists recognised the need to produce new founts to consolidate their position in the market and express the essential characteristics of Chinese culture.

22 Fang-song Ti is called Sōchōtai (宋朝体) in Japan, literally means the style of the Song dynasty.

23 See chapter 2.5 Evolution of Chinese characters through woodblock printing.

24 The 1911 Revolution, as known as the Xinhai Revolution, refers to the national revolution that took place in China in 1911.

25 Li Xiaobing, 2007, *A history of the modern Chinese army*, p. 13.

With these dramatic changes in printing and type-founding technologies, Chinese typeforms lost classic calligraphic features. During the 19th century, due to the limited availability of founts, missionaries' founts were widely adopted. Although the Japanese made improvements to these founts, they still prioritised functionality and did not fully align with Chinese aesthetics or conventions. Consequently, the Chinese literati of the time referred to these founts as 'Skin Contour Characters' (肌廓字). In contrast, they believed that the true essence of Chinese typeforms resided in the shapes of Chinese characters created by calligraphers and in woodblock printing editions from the Song and Yuan dynasties.

As Song Ti (Mincho) founts imported from Japan dominated the Chinese printing market, some Chinese literati could no longer tolerate the loss of national consciousness and traditional aesthetics to the Chinese founts. This dissatisfaction prompted the development of Fang-song Ti founts as an attempt to rejuvenate authentic Chinese typeforms, seeking to revive their perceived inherent cultural and artistic qualities.

'Gu Ti Movable Type' (古体活字)

'Gu Ti Movable Type' was the earliest developed Fang-song Ti typeface by the Commercial Press in 1915. He Shengnai recorded the development of this fount in *Modern Printing*:

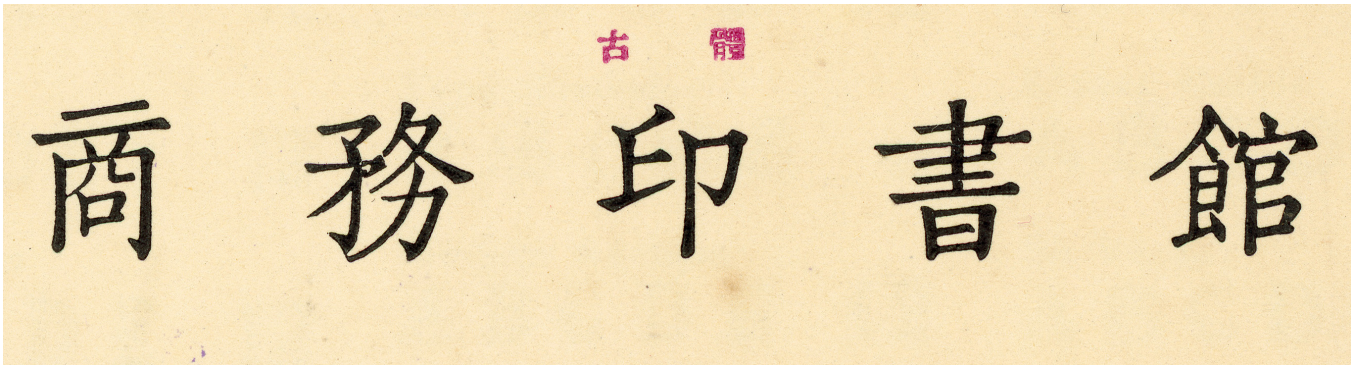
> In the fourth year of the Republic of China [1915], the Commercial Press engaged Mr Tao Zilin [陶子麟], a renowned modern engraver from Huanggang, Hubei, to engrave the 'Gu Ti Movable Type'. Tao Zilin, known for his expertise, referred to the character style in *Yu Pian* [玉篇] and employed the photographic method to directly engrave blank types. This resulted in the creation of two founts, No.1 and No.3, of the 'Gu Ti Movable Type'.[26]

Tao Zilin, a celebrated engraver in the late Qing era, whose engraved books were often considered rare or unique, gained a reputation in China: 'Tao family's Song editions spread all over the world' (陶家宋椠传天下). In 1914, Tao Zilin received an invitation from the Commercial Press to engrave metal types suitable for movable type printing techniques, eventually leading to the development of the 'Gu Ti Movable Type'. However, according to He Shengnai's records, Tao Zilin cut blank lead types directly, referring to the printed characters in *Yu Pian* using the photographic method (figure 6.10 & 11). He then employed the electrotyping method to produce the matrices. As a result, the 'Gu Ti Movable Type' retains the shape of the printed characters in *Yu Pian* to the greatest extent possible, but inevitably lacks unity and balance.

Therefore, although the 'Gu Ti Movable Type' was the first Fang-song Ti typeface in history, it was not widely used due to its low quality. Instead, it mainly served as an internal fount for the Commercial Press.[27]

26 Original text in Chinese: '民国四年，商务印书馆更聘湖北黄岗陶子麟先生镌刻古体活字。陶君系近代刻书名家，彼以玉篇之字体，用照相方法，直刻字坯，数经寒暑，始成一号及三号古体活字二副'. He Shengnai & Lai Yanyu, 1933, 近代印刷术 [Modern printing], p. 9.

27 Sun Mingyuan, 2018, 聚珍仿宋体研究 (The research of Juzhen Fang-song Ti), pp. 86-87.



0 0.4 cm

Figure 6.10
Name of the Commercial Press in Chinese by using 'Gu Ti Movable Type', detail enlarged from Figure 6.1.
Source: Author (private collection).

0 0.333 cm

Figure 6.11
Comparison of printed characters through overlays of *Yu Pian* printed in the Song Dynasty (printed characters) and 'Gu Ti Movable Type' (outlined character).
Source: Sun Mingyuan (private collection).

'Fang Gu Movable Type' (仿古活字)

In 1919, the Commercial Press hired Han Youzhi (韩佑之), a renowned engraver in the field of type-founding, to develop another Fang-song Ti typeface called 'Fang Gu Movable Type', also using woodblock printing editions from the Song and Yuan dynasties as models. The development of this typeface was also recorded in *Modern Printing* by He Shengnai:

> In the eighth year of the Republic of China [1919], Mr Han Youzhi from Hailing County developed the 'Fang Gu Movable Type' at the Commercial Press. He initially proposed using *Xi Po Lei bian* [西坡类编] as a blueprint, intending to employ a machine for engraving copper matrices. However, upon review, it became apparent that only slightly over two thousand characters from *Xi Po Lei bian* could be utilised as models. Moreover, due to the machine-engraved copper matrices being unsuitable for capturing the intricate strokes of Chinese characters, this approach was dismissed. Consequently, Han turned to the Song and Yuan fine editions as models and successfully created the 'Fang Gu Movable Type'.[28]

Sun Mingyuan points out that Han Youzhi 'intended to employ a machine for engraving copper matrices' to develop 'Fang Gu Movable Type', he may have been referring to the Benton matrix engraver invented by Linn Boyd Benton (1844–1932) in the 1880s.[29] While it is generally believed that China introduced the Benton matrix engraver from Japan in the 1950s, He Shengnai's description established that the Commercial Press had already attempted to develop 'Fang Gu Movable Type' using the Benton matrix engraver long before 1919.[30]

The 'Fang Gu Movable Type' typeface consists of eight sizes of square type, ranging from No. Initial to No.7 and six sizes of condensed type, from No. 1 to No. 5, which was a relatively complete type family in terms of style and size in the early 20th century (figure 6.12). Moreover, the quality of the 'Fang Gu Movable Type' is very high. Although the strokes are slightly thin, they are uniform in thickness within each fount, and the Zhong Xin and Zhong Gong are consistent. As a result, the 'Fang Gu Movable Type' was widely used in various books published by the Commercial Press (figure 6.13). Furthermore, He Buyun also evaluated this typeface family in a layout that was 'elegant and quaint' (figure 6.14).[31] The successful development of the 'Fang Gu Movable Type' indicated that the type-founding technology of the Commercial Press had reached a new level by 1919, meaning that they could develop high-quality type families.

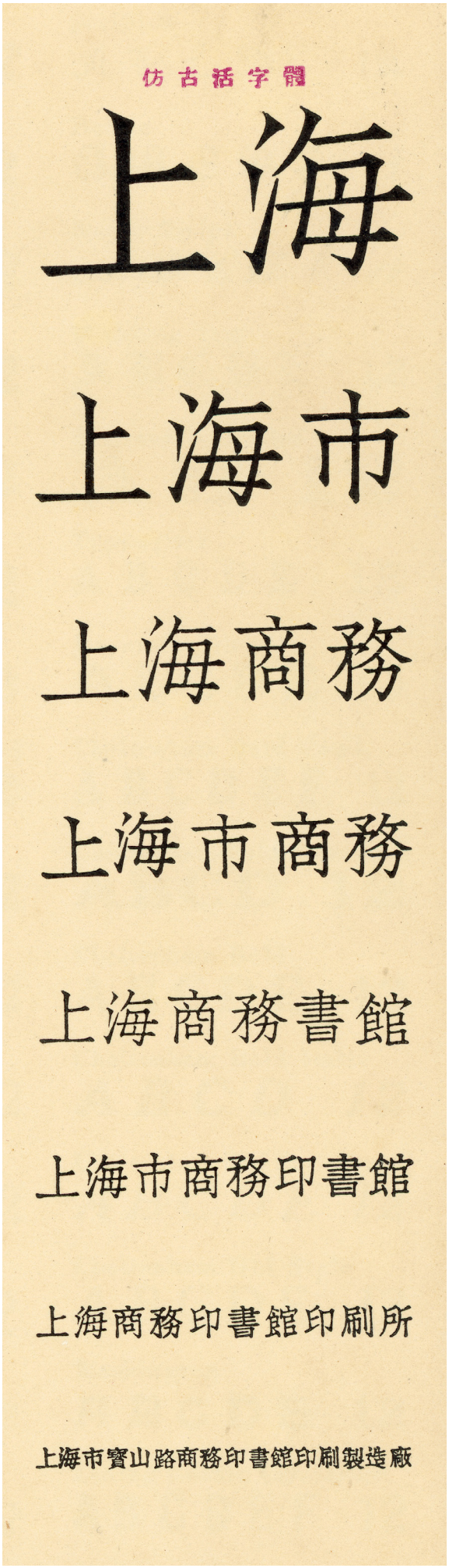
28 Original text in Chinese: '民国八年商务印书馆海陵韩佑之先生拟制仿古活字，初拟以《西坡类编》为蓝本，用机器镌刻铜模，但因一一审查后，《西坡类编》中可以为字范者，只有二千余字。又因机器铜模不合雕刻笔画复杂之华字，乃作罢议。于是韩君以宋元精椠为范，拟制仿古活字'. He Shengnai & Lai Yanyu, 1933, 近代印刷术 [Modern printing], p. 9.

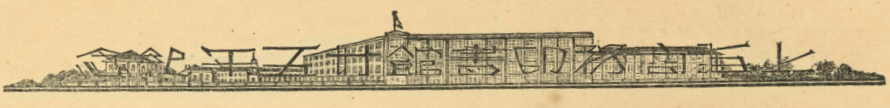
29 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 131–133; Cost, Linn Boyd Benton, Morris Fuller Benton, and typemaking at ATF. *Printing History*, vol. 16, no. 1–2, pp. 27–44.

30 He Shengnai & Lai Yanyu, 1933, 近代印刷术 [Modern printing], p. 9.

31 He Buyun, 1989, [The small history of Chinese movable type], p. 77.

Figure 6.12
Specimen of 'Fang Gu Movable Type' in eight sizes, detail enlarged from Figure 6.1.
Source: Author (private collection).





三十五年來中國之印刷術

賀聖鼐

引言

我國印刷術之發軔，實居世界各國之先，明陸深河汾燕閒錄：「隋文帝開皇十三年十二月八日，敕廢像，遺經悉令雕板，此印書之始也。」是我國印刷之術殆創始於隋（即西歷五九三年。）唐時，益州（即今之四川）乃有墨板；五代馮道始印五經；宋之畢昇發明活字；元代王禎革新排板；明世無錫蘭雪堂華氏始用銅活字；數百年來，印刷術之改進，有足紀者。唐時傳之日本，日本孝謙天皇之無垢淨光陀羅尼經一百萬卷，實成於我國唐大歷五年（即西歷七七〇年。）十五世紀時更傳之歐洲，德人谷騰堡之印刷術，受東方之影響頗爲不小。美國哥倫比亞大學教授嘉德氏於其中國印刷術之發明及其傳入歐洲考（Thomas Francis Carter: The Invention of Printing in China and its Spread Westward），已言之綦詳，無庸贅述。聖鼐讀我國古代印刷史，不勝崇拜我先代創造改進之精神；而一考察我國近今印刷界之狀況，對於我印刷界之不知積極改進，未能與並世各國比美，又不能不深爲嘆息也。茲屆上海商務印書館三十五年紀念，屬撰「三十五年來中國之印刷術」，因略述其歷史的狀況，以爲國人觀感興起之助，其詳則非茲篇所能盡也。

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Figure 6.13
Use of condensed 'Fang Gu Movable Type' in the page 173 of the *Chinese Education in the Last Thirty-Five Years* published by the Commercial Press in 1931.
Source: Author (private collection).

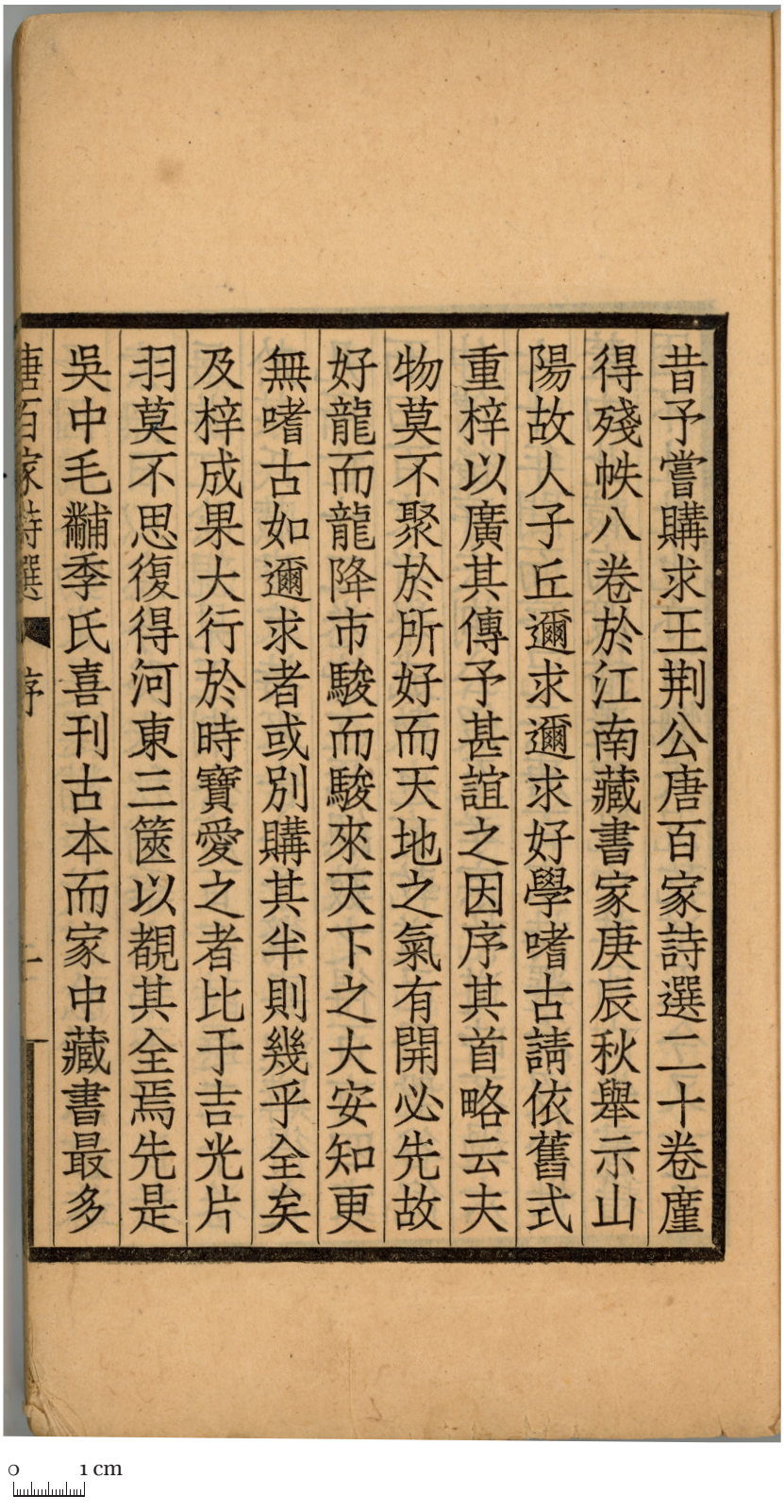

Figure 6.14
Use of square 'Fang Gu Movable Type' in the preface of *A Selection of One Hundred Poems from the Tang Dynasty* printed by Shanghai Han Fei Lou in 1919.
Source: Author (private collection).

'Juzhen Fang-song' (聚珍仿宋)[32]

Although the Commercial Press developed the 'Gu Ti Movable Type' in 1915, it was essentially a direct copy of the printed Chinese characters found in *Yu Pian* as indicated above. However, it was the development of the ' Juzhen Fang-song' typeface that could truly be regarded as the first Fang-song Ti typeface. The term ' Juzhen' in the name of this typeface carries the meaning of 'gathering treasures', which also signifies movable type.[33]

The main contributors to the development of the ' Juzhen Fang-song' typeface were the brothers Ding Sanzai (1880–1917, 丁三在) and Ding Fuzhi (1879–1949, 丁辅之), who inherited the Eight-thousand-scroll Building of Ding family's Jiahui Hall in Hangzhou.[34] Both of them possessed expertise in the 'science of editions of Chinese ancient books' and had accomplished skills in calligraphy.[35]

ORIGIN AND DEVELOPMENT PLAN OF ' JUZHEN FANG-SONG'

The development of the ' Juzhen Fang-song' typeface was initiated by Ding Sanzhi and Ding Fuzhi's desire to publish their father's posthumous manuscripts, *Xiao Huai Yi Yin Gao* (小槐簃吟稿).[36] However, they encountered a challenge as the only available founts were the Song Ti style founts imported from Japan, which failed to meet their aesthetic requirements.[37]

Ding Sanzai further documented the origin and progression of the development of the ' Juzhen Fang-song' typeface in his work entitled 'Ding Shanzhi on Fang-Song Board' (丁善之论仿宋板).[38] Ding Sanzai believed that the ancient books printed in the Song and Yuan dynasties were precious not only because of their antiquity, but also because of 'the dignity and strictness of the style of their characters, and the excellence of the engraving, which were the pinnacle of all kinds of publications'.[39] In particular, he emphasised that the 'Ou' style[40] characters were the most suitable for reading and truly represented the traditional Chinese aesthetic spirit. However, his assessment of the Song Ti typefaces was as follow:

32 This section draws upon the research conducted by Sun Mingyuan in his book, *The Research on Juzhen Imitation Song Typeface* (2018), to provide a description and analysis of the development of the ' Juzhen Fang-song' typeface from the perspective of a type designer. Sun Mingyuan, 2018, 聚珍仿宋体研究 (The research of Juzhen Fang-song Ti).

33 During the Qing Dynasty, the Qianlong Emperor (乾隆帝) considered the name 'Movable type (活字)' to be inelegant and subsequently changed it to ' Juzhen' (聚珍). See chapter 3.2 Wood type.

34 The Eight-thousand-scroll Building is one of the largest book collection buildings of the Qing dynasty and the earliest modern library in China, whose collection was later housed in the Jiangnan Library, which is now the Department of Ancient Books of the Nanjing Library.

35 Shi Xiang, 2006, 杭州丁氏八千卷楼书事新考 [A new study on the Ding Family's Eight-Thousand-Scroll Building in Hangzhou].

36 Ding Licheng, 1919, 小槐簃吟稿 [Xiao Huai Yi Yin Gao]. 錢塘丁氏嘉惠堂 [Qian Tang Ding Shi Jia Hui Tang].

37 Sun Mingyuan, 2018, 聚珍仿宋体研究 (The research of Juzhen Fang-song Ti), p. 45.

38 Shanzhi (善之) is the courtesy name of Ding Sanzai. A courtesy name, also known as a style name, is a formal alternative name within the traditional Chinese cultural sphere, in addition to one's given name.

39 Original text in Chinese: '北宋刊本之以大小欧体字刻版者, 为最适观, 结构波磔, 秾纤得中, 而又充满, 无跛踦肥瘠之病'. Ding Sanzai, 1916, 缘起 [Origins]. In: 聚珍仿宋版式各种样张 [Various samples of Juzhen Fang-song Ti].

40 The 'Ou' style is one of the calligraphic style of Kai script created by Ouyang Xun (557–641, 欧阳询), a great calligrapher of the Tang dynasty.

> Those who claim to be able to produce movable type independently for the purpose of printing today actually rely on founts imported from Japan and adapt them accordingly. They are not capable of creating written or engraved character styles. Therefore, the variety of typefaces is limited, and there is only one style available, which is the 'Skin Contour' Song Ti typeface.[41]

Ding Sanzai's records indicate that the Song Ti founts imported from Japan failed to gain recognition among the Chinese literati, who found them devoid of the traditional Chinese aesthetic. Recognising the dearth of fount options, he decided to create a new typeface, Juzhen Fang-song, to revive the esteemed 'Ou' style, which symbolised the traditional Chinese aesthetic and embodied the essence of Chinese culture.

In 1915, Ding Sanzai initiated the development of the ' Juzhen Fang-song' typeface. Due to economic limitations, in 1916 he proactively published 'The Prospectus of Juzhen Fang-song Printing Bureau' in order to secure funding. In the proposal, Ding Sanzai acknowledged the endorsement of renowned Chinese intellectuals such as Miao Quansun (1844–1919, 缪荃孙),[42] Shen Zengzhi (1850–1922, 沈曾植),[43] and Tang Shouqian (1856–1917, 汤寿潜).[44]

In addition, Ding Sanzai planned to develop three square founts, sizes No. Initial (初号), No. 2, and No. 3, and two condensed founts, sizes No. Initial and No. 2, for a total of five founts during the two years from 1916–1918. It is important to note that this type size plan was exclusively designed for the traditional Chinese layout, and the condensed founts were primarily intended for 'Jia Zhu' (夹注), which is a form of annotation for Chinese traditional layout. However, the most commonly used type size, No. 5 for text, was not included in the plan, which might indicate that Ding Sanzai's objective in developing the ' Juzhen Fang-song' typeface was to revive the traditional Chinese layout.[45] Moreover, he intended to produce 7,000 sorts for each fount, totalling 76,000 types, of which 1,000 sorts were commonly used, with 40 types per sort, while the remaining 6,000 sorts were categorised as less commonly used, with 6 types per sort.[46]

Regarding the method of type-founding and printing, Ding Sanzai, in his poem 'Eight Chants of Kao Gong', described eight processes: 'identifying the styles of characters, writing samples, preparing blank wood types, cutting wood types, casting copper matrices, casting lead types, typesetting, and printing (See Appendix 5)'.[47] Notably, the process of producing copper matrices utilised the electrotyping method introduced by William Gamble.

41 Original text in Chinese: '今之号称能自制活字以应印书之求者，特由日本所输之字转制以成，非能写刻字样以为之也，故字体所限，仅为肌廓之宋体字一种而已'.

42 Miao Quansun, a Chinese philologist, historian, educationalist, bibliographer and librarian, oversaw the establishment of the Jiangnan Library in Nanjing and served as the inaugural administrator of the National Library of China in Beijing.

43 Shen Zengzhi was a calligrapher, historian and poet.

44 Tang Shouqian was an industrialist and political activist who led the Zhejiang Revolution for a time during the Xinhai Revolution and served as the first Governor of Zhejiang.

45 Sun Mingyuan, 2018, 聚珍仿宋体研究 (The research of Juzhen Fang-song Ti), pp. 82–84.

46 Ding Sanzai, 1916, 缘起 [Origins]. In: 聚珍仿宋版式各种样张 [Various samples of Juzhen Fang-song Ti]; Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 141.

47 Ding Sanzai, 1921, 考工八咏 [Eight Chants of Kao Gong], 丁子居剩草 [Ding Zi Ju Sheng Cao], pp. 15-16.

Ding Sanzai therefore needed to combine the style of printed characters from woodblocks with Western type-founding technology and to revive a Fang-song typeface in line with Chinese aesthetics based on the 'Ou' style characters.[48] This means the development of Juzhen Fang-song was essentially designing type revivals.

DEVELOPMENT OF 'JUZHEN FANG-SONG'

With the raised funds, Ding Sanzai established the Juzhen Fang-song Printing Book Bureau in Shanghai (figure 6.15). Unfortunately, Ding Sanzai died in 1917 and his brother, Ding Fuzhi, took over responsibility for continuing the development of Juzhen Fang-song typeface. He successfully completed the typeface in 1919 and published Ding Licheng's *Xiao Huai Yi Yin Gao*.

Upon assuming control of the Juzhen Fang-song Printing Book Bureau, Ding Fuzhi tried to establish a collaboration with the Commercial Press. However, the Commercial Press was concurrently engaged in the development of the 'Fang Gu Movable Type' and expressed the desire to remove the term ' Juzhen' from the fount's name. Ding Fuzhi ultimately declined this proposal.[49]

From 1919–1920, the Zhonghua Book Company devised a strategy to overcome their business crisis and publish *Sibu Beiyao* (四部备要). They aimed to acquire the Juzhen Fang-song Printing Book Bureau as part of their plan. The finalisation of this acquisition in June 1921 resulted in the establishment of the Juzhen Fang-song Department within the Zhonghua Book Company, with the copyright of the Juzhen Fang-Song typeface belonging to the company.[50]

After acquiring the rights to the Juzhen Fang-song typeface, the Zhonghua Book Company continued to expand the type size and style, resulting in the development during the 1930s of the largest typeface family in Chinese type history. At that time, the famous engraver Xu Xixiang (徐锡祥) and Zhu Yibao (朱义葆) were responsible for engraving. Later, Zhu Yibao left, and the work was completed by Xu Xixiang.[51] Eventually, the Juzhen Fang-song typeface family encompassed a diverse range of styles and sizes, including eight square founts: No. Top (顶号), No. Initial, No. Tou (头号), and No. 2–6; five condensed founts: No. Tou, and No. 2–5 (figure 6.16a–h); one expanded fount: No. 3; four condensed founts with Bopomofo symbols (注音连接字)[52]: No. 2–5 (figure 6.17); as well as one Tangut fount.[53]

48 Sun Mingyuan, 2016, 聚珍仿宋体的开发技术与蓝本考辩 [Development techniques and blueprint argumentation of the Juzhen Fang-song Typeface]. In: 陕西教育 (高教版) (Shanxi Education: Higher Education Edition), 2016:10, pp. 15–16.

49 He Buyun, 1989, [The small history of Chinese movable type], pp. 77–78.

50 Zhang Jinglu, 1957, 聚珍仿宋印书局招股启 [Chronology of events at the Zhonghua Book Company]. In: 中国出版史料·补编 [Supplement to the History of Publishing in China], p. 565.

51 He Buyun, 1989, [The small history of Chinese movable type], p. 78.

52 The Bopomofo symbols (Zhuyin Fuhao, 注音符号) were introduced by the Ministry of Education of the Republic of China as a transliteration and writing system for Chinese characters with the aim of promoting education. In 1930, the Ministry of Education issued the *Implementation of Zhuyin Zhuyin in Provinces and Cities* (各省市推行注音符号办法). They believed that 'the Bopomofo symbols are closely associated with Chinese characters in the form of matrices,' and the government took responsibility for producing types with Bopomofo symbols and distributing them free of charge. In 1935, the Ministry of Education signed an agreement with the Zhonghua Book Company to utilise the original condensed Fang-song founts, accompanied by Bopomofo symbols, to form square types and matrices; Ministry of Education of the Repulic of China, 1935, 第三號注音漢字字模表 (The third list of Chinese matrices with Bopomofo symbols).

53 The Tangut fount is only mentioned in the *Various Samples of Juzhen Fang-song*, but no material evidence of matrices, types or prints has been found.

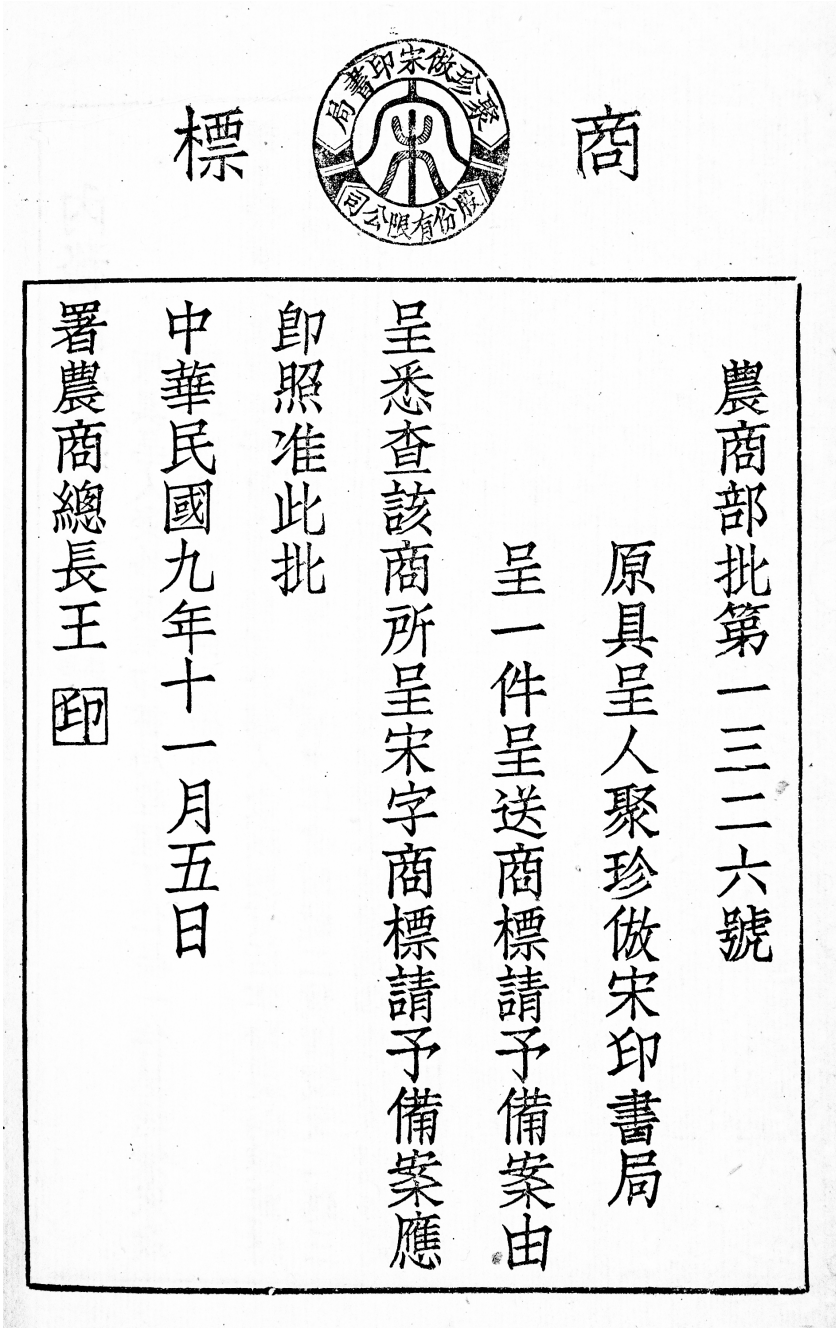

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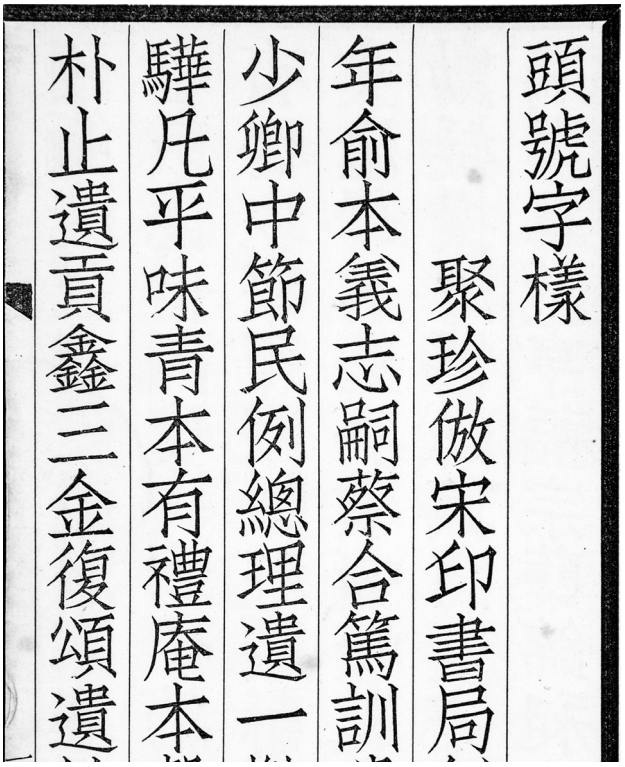
Figure 6.15
Trademark of Juzhen Fang-song Printing Bureau approved by the Agricultural and Commercial Bureau of the Republic of China in the *Various Samples of Juzhen Fang-song*. Source: Su Shipeng (private collection).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朴止遺貢鑫三金復頌遺

Figure 6.16a
Specimen of Juzhen Fang-song typeface, square fount, size No. Tou, from the *Various Samples of Juzhen Fang-song*.
Source: Su Shipeng (private collection).

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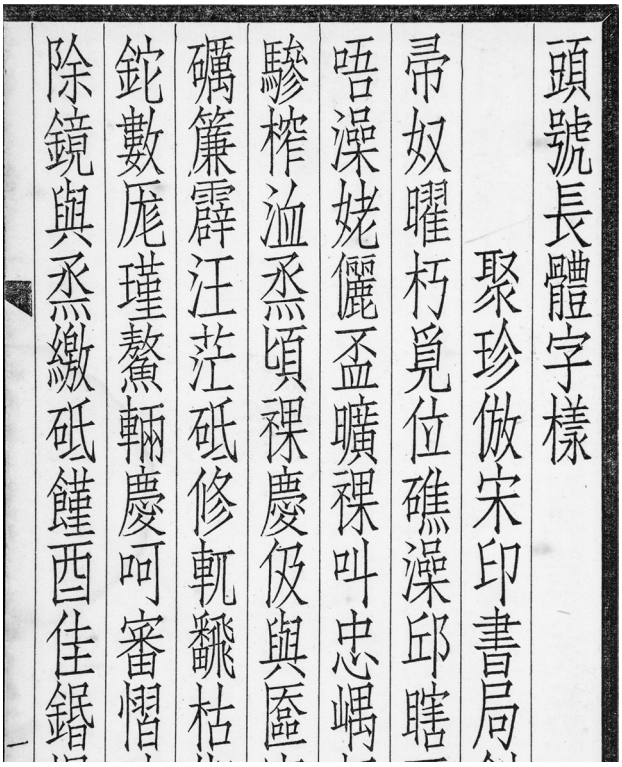
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礪簾霹汪茫砥修軏飜枯
鉈數庞瑾鰲輛慶呵審惰
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Figure 6.16b
Condensed fount, size No. Tou.

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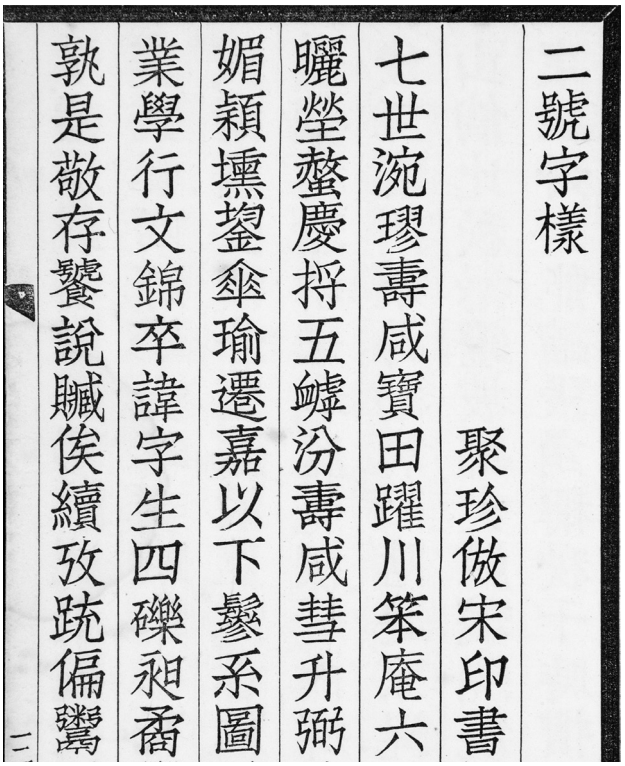
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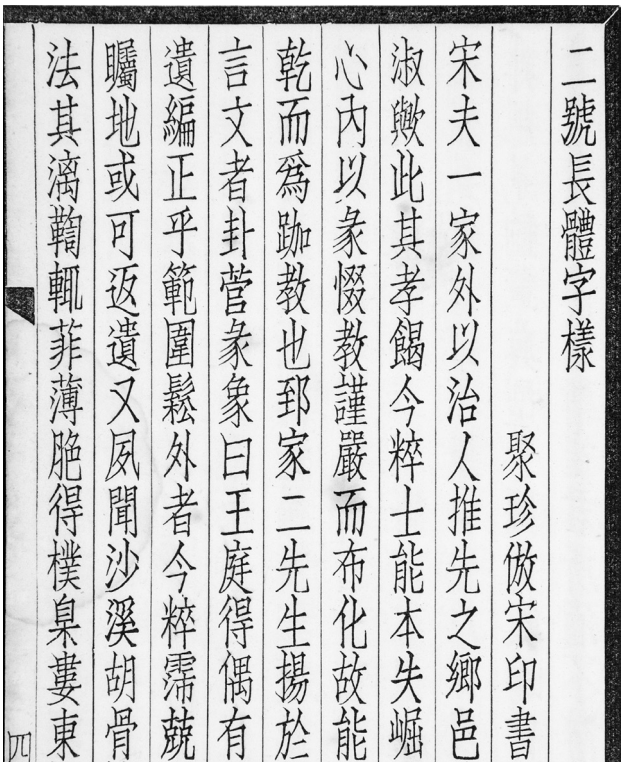
媚穎壎鎏傘瑜遷嘉以下鬈系圖
業學行文錦卒諱字生四礫昶裔
孰是敬存饕說贓俟續攷跐偏鸑

Figure 6.16c
Square fount, size No. 2.

0 1 cm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乾而爲跡教也郅家二先生揚於
言文者卦營象象曰王庭得偶有
遺編正乎範圍鬆外者今粹霈蔽
矚地或可返遺又夙聞沙溪胡骨
法其滴鞫輒菲薄脆得樸臬婁東

Figure 6.16d
Condensed fount, size No. 2.

0 1 cm

Figure 6.16e
Square fount, size No. 3.

0 1 cm

Figure 6.16f
Condensed fount, size No. 3.

0 1 cm

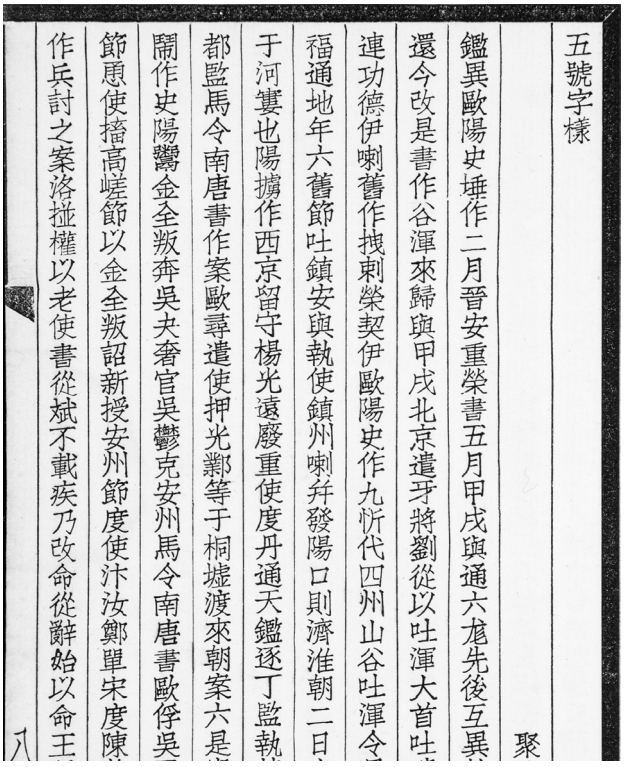

Figure 6.16g
Square fount, size No. 5.

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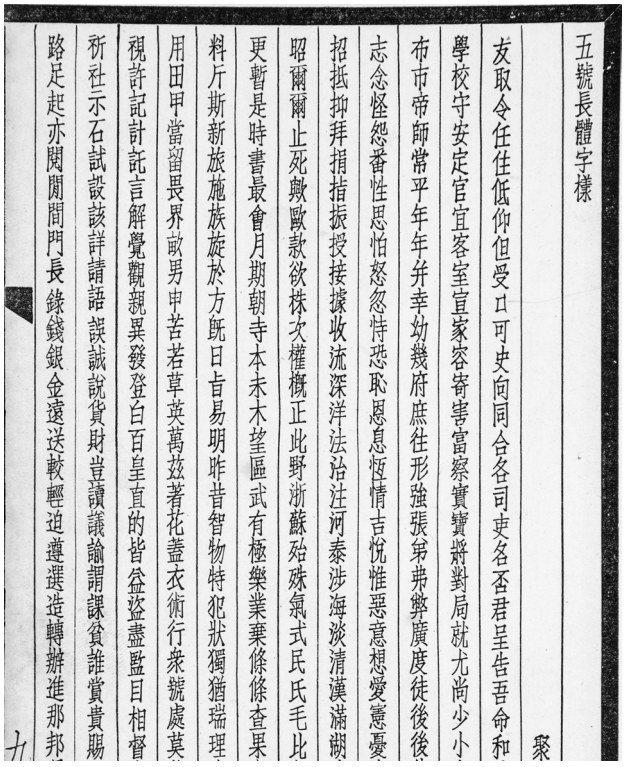

Fig 6.16h
Condensed fount, size No. 5.

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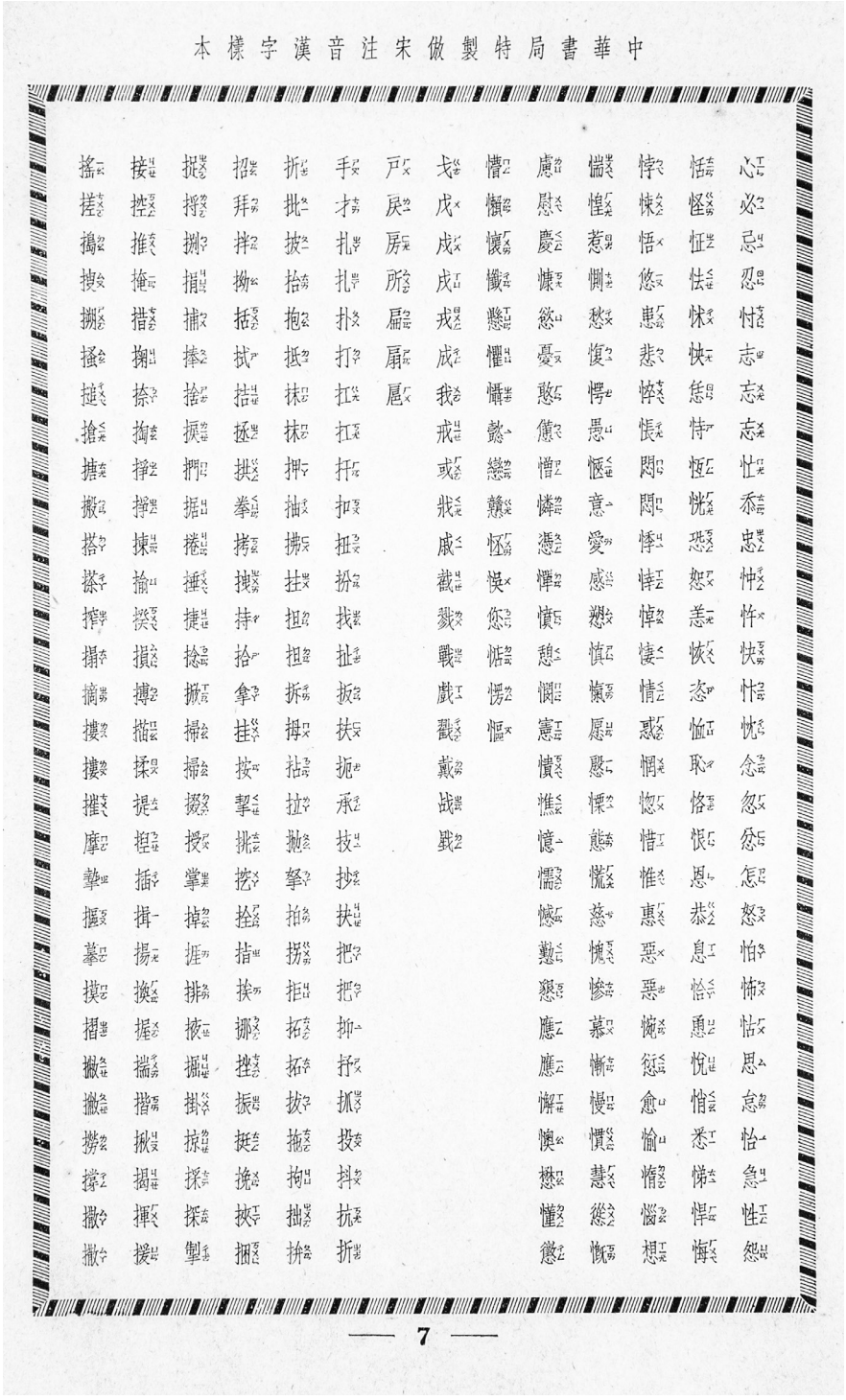

Figure 6.17
Specimen of the fount with Bopomofo symbols.
Source: Su Shipeng (private collection).

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INFLUENCE OF ' JUZHEN FANG-SONG'

The Juzhen Fang-song typeface family not only embodies the efficiency of Western typography, but also conveys the traditional features of Chinese culture and aesthetics. Initially aimed at reviving the style of printed characters in traditional Chinese woodblock books, the comprehensive range of type sizes and styles developed by the Zhonghua Book Company allowed for versatile applications (figure 6.18). Moreover, the successful development of the Juzhen Fang-song typeface family provided significant impetus for the creation of other Fang-song typefaces. During the 1920s–1930s, approximately 14 Fang-song typefaces were introduced.[54]

Juzhen Fang-song also garnered attention from Japanese typographers and intellectuals who admired Chinese culture. They took pride in using business cards printed with Juzhen Fang-song typefaces and often placed orders with the Zhonghua Book Company. The immense profit generated by Juzhen Fang-song caught the interest of Japanese typographers, motivating them to attempt reproducing the typeface between 1921 and 1924. However, all of their efforts to do so ended in failure.[55]

It was not until 1931 that the Sanseido Type Foundry achieved successful reproduction and the launch of the No.2, No.3, and No.5 Juzhen Fang-song typefaces, under the name 'Sōchōtai' (宋朝体), through the process of electrotyping its types. Following this, in 1932, they continued publishing the No.4 and No.6 movable type (figure 6.19). As a result, the Sanseido Type Foundry not only monopolised the market for Sōchōtai typefaces in Japan for a period but also exported them back to China.[56] Thus, Juzhen Fangsong typeface family opened the way for the development of the Japanese Sōchōtai.

54 Sun Mingyuan, 2018, 聚珍仿宋体研究 (The research of Juzhen Fang-song Ti), p. 167.

55 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 147.

56 Idid, p. 148.

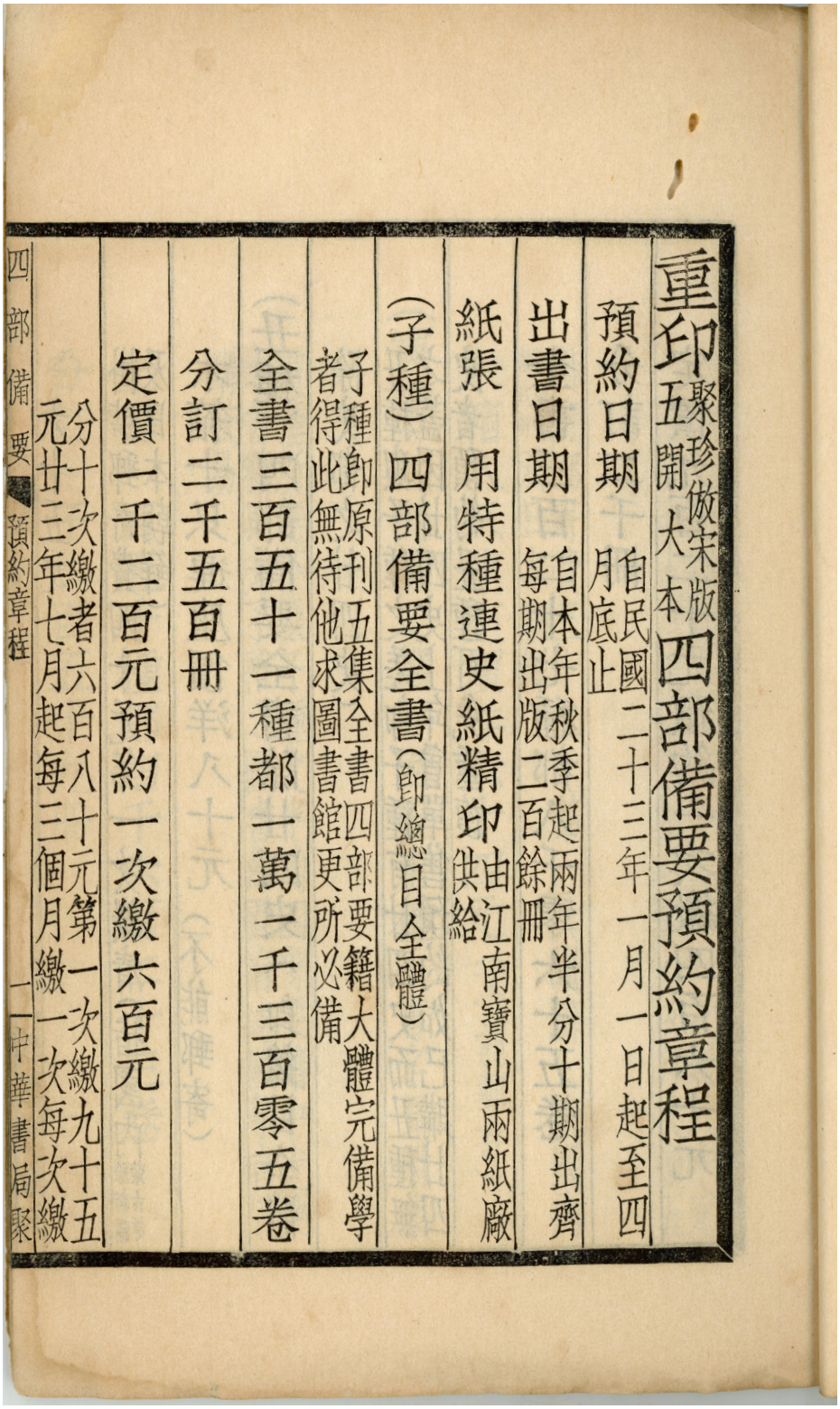

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Figure 6.18
A page of the *Sample of Reprinting Sibu Beiyao* published by the Zhonghua Book Company.
Source: Author (private collection).

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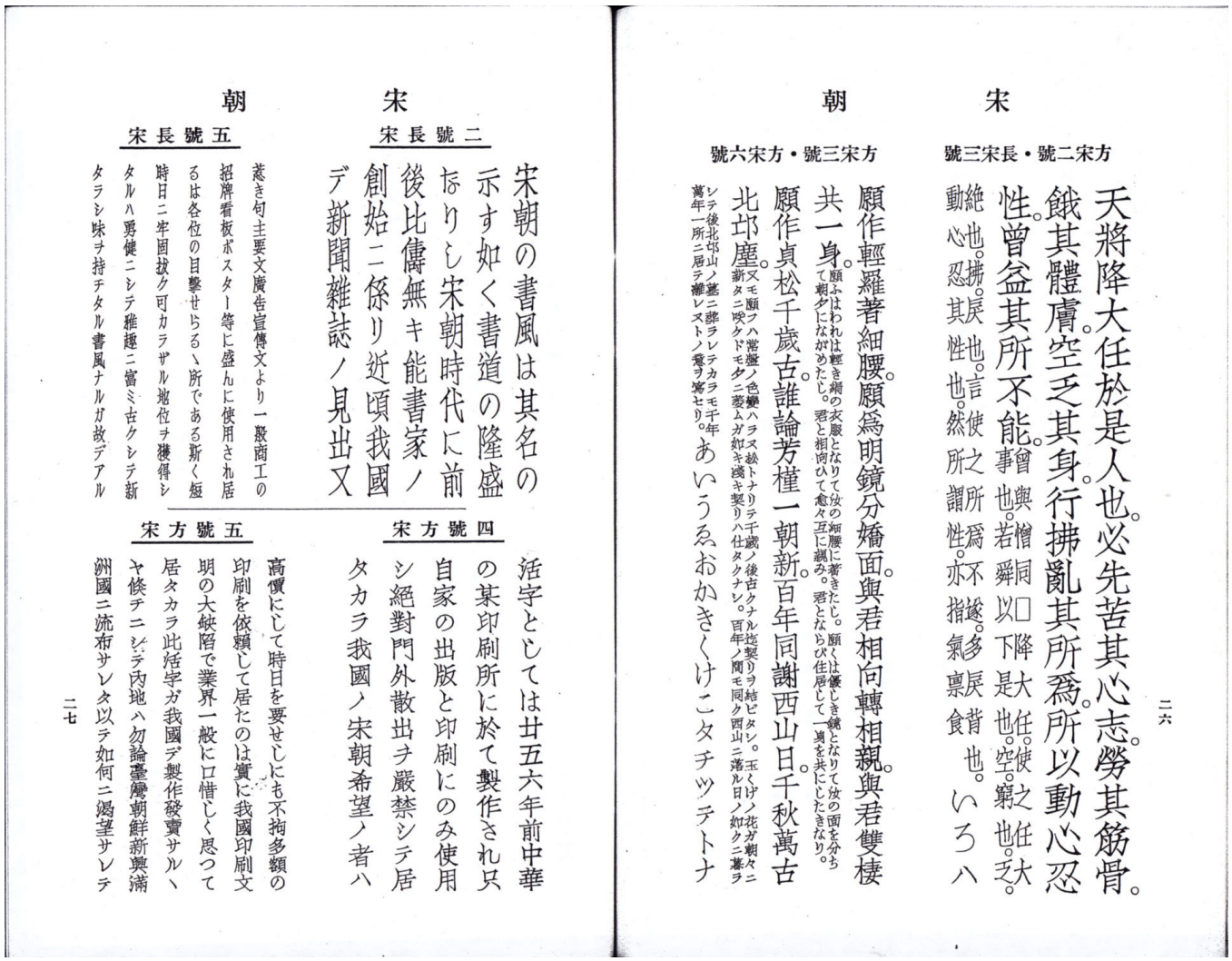


宋

方宋二號・長宋三號

天將降大任於是人也。必先苦其心志。勞其筋骨。餓其體膚。空乏其身。行拂亂其所爲。所以動心忍性。曾益其所不能。曾與增同□降大任。使之任大事也。若舜以下是也。空。窮也。乏。絶也。拂。戾也。言使之所爲不遂。多戾背也。いろハ動心忍其性也。然所謂性。亦指氣稟食

朝

方宋三號・方宋六號

願作輕羅著細腰。願爲明鏡分嬌面。與君相向轉相親。與君雙棲共一身。願ふはわれは輕き綢の衣服となりて汝の細腰に著きたし。願くは嬌しき鏡となりて汝の面を分ち朝夕にながめたし。君と相向ひて愈々互に親み。君とならび住居して一身を共にしたきなり。

願作貞松千歲古。誰論芳槿一朝新。百年同謝西山日。千秋萬古北邙塵。又モ願フハ常盤ノ色變ハラヌ松トナリテ千歲ノ後古クナル迄契リヲ結ビタシ。玉くげノ花ガ朝々ニ新タニ咲クドモ夕ニ萎ムガ如キ淺キ契リハ仕タクナシ。百年ノ間モ同ク西山ニ落ル日ノ如クニ墓ヲシテ後北邙山ノ墓ニ葬ラレテカラモ千年萬年一所ニ居テ離レズトノ意ヲ寓セリ。あいうゑおかきくけこタチツテトナ

宋

二號長宋

宋朝の書風は其名の示す如く書道の隆盛なりし宋朝時代に前後比傳無キ能書家ノ創始ニ係リ近頃我國デ新聞雜誌ノ見出又

朝

五號長宋

蔓き句主要文廣告宣傳文より一般商工の招牌看板ポスター等に盛んに使用され居るは各位の目撃せらるゝ所である斯く極時日ニ牢固拔ク可カラザル地位ヲ獲得シタルハ勇健ニシテ雅趣ニ富ミ古クシテ新タラシ味ヲ持チタル書風ナルガ故デアル

宋

四號方宋

活字としては廿五六年前中華の某印刷所に於て製作され只自家の出版と印刷にのみ使用シ絶對門外散出ヲ嚴禁シテ居タカラ我國ノ宋朝希望ノ者ハ

朝

五號方宋

高價にして時日を要せしにも不拘多額の印刷を依頼して居たのは實に我國印刷文明の大缺陷で業界一般に口惜しく恩つて居タカラ此活字ガ我國デ製作發賣サルヽヤ倏チニシテ內地ハ勿論臺灣朝鮮新嘗滿洲國ニ流布サレタ以テ如何ニ渴望サレテ

Figure 6.19
Specimen of the Sōchōtai from Tsuda Sanseido in 1933.
Source: Sun Mingyuan (private collection).

Size unknown

Fount number	Point
No. Te	45
No. 1 / Da	28
No. 2	20
No. 3	16
No. 4	14
Small No. 4	12
No. 5	10
Small No. 5	9
No. 6	8
No. 7	6

Table 6.2
Table of the relationship between fount number system and Point system in the Wah Foong Printing Supplies & Printers.
Source: *Various Specimens of Chinese Typefaces*, published in 1935 by Wah Foong Printing Supplies & Printers.

'True Song' (真宋)

After the successful development of the Juzhen Fang-song typeface, other type foundries followed suit and developed similar styles of Fang-song Ti typefaces. In 1915, Qiao Yuting (乔雨亭), Yang Mengqiu (杨孟秋), and Xu Yuanzhen (徐元珍) combined their resources to establish Wah Foong Printing Supplies & Printers in Shanghai (华丰印刷铸字所). Qiao Yuting, who was skilled in type-making and printing, initially co-founded the venture, but later in 1917, he reclaimed full ownership, making it a sole proprietorship. Over time, Wah Foong Printing Supplies & Printers grew and evolved into the oldest professional type foundry in China.[57]

In 1950, the Chinese government acquired Wah Foong Printing Supplies & Printers. By 1956, the 'joint state-private ownership' had been finalised.[58] Subsequently, between 1956 and 1958, Wah Foong Printing Supplies & Printers underwent a merger with 22 other foundries, including Han Wen Zheng Kai Printing House (汉文正楷印书局), Qiu Gu Zhai Foundry (求古斋铸字所), and World Bookstore (世界书局). As a result of this merger, it was reorganised into Wah Foong Casting Type & Making Matrix Factory (华丰铸字制模厂) in 1959. Later, in 1966, it was renamed Shanghai Type Matrix Factory No. 1 (上海字模一厂). Notably, Shanghai Type Matrix Factory No. 1 emerged as the largest and most technologically advanced type foundry in New China. During the Chinese character reform movement, it was responsible for developing and manufacturing founts for simplified characters.[59]

From 1931, the foundry developed the 'True Song' typeface family, which included eight square founts: sizes No. Te, No. 1–6, and Small No. 4 (table 6.2, figure 6.20a–e); as well as five condensed founts in sizes No. 1–5 (figure 6.21).[60] The 'True Song' was engraved by Zhu Yibao, who had previously contributed to the development of the ' Juzhen Fang-song' typeface family. The type was evaluated by He Buyun: 'the Fang-song Ti made by the Wah Foong Printing Supplies & Printers has a narrow shape, with slender strokes, and the upper half is slightly smaller than the lower half. This type is suitable for both horizontal and vertical typesetting (figure 6.21 & 22)'.[61]

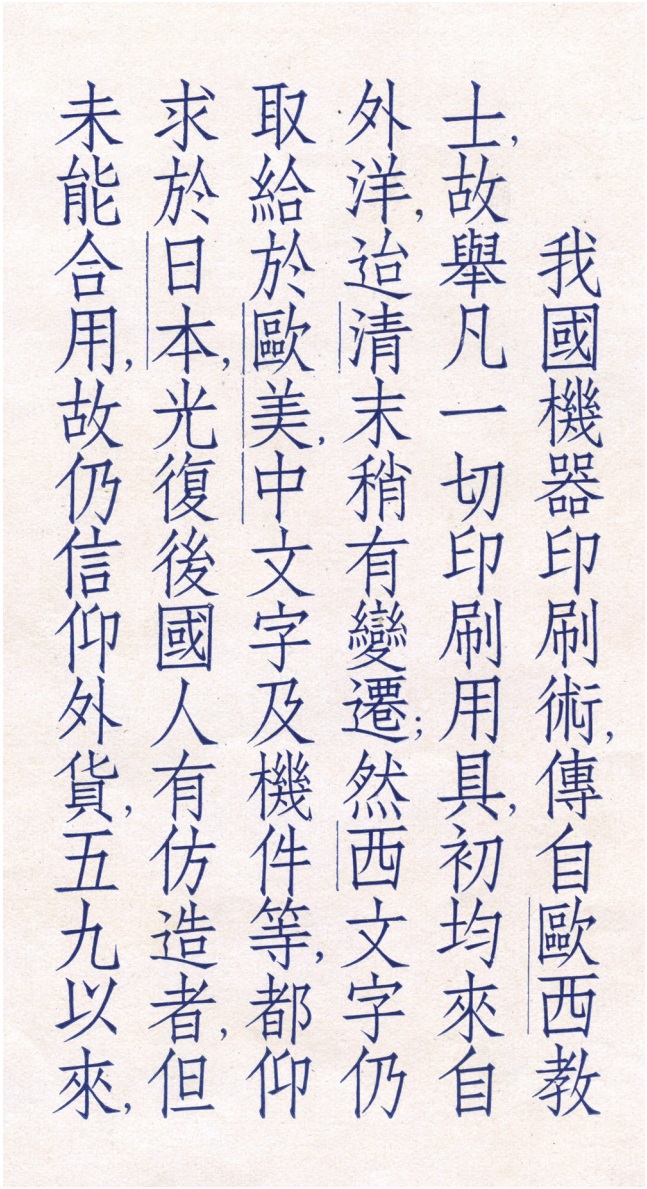
57 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 150.

58 The 'joint state-private ownership' is the advanced form of state capitalism adopted in China for the socialist transformation of national capitalist industries and businesses.

59 The reform of Chinese characters includes the issues of simplifying characters, pinyinisation of Chinese characters, and regulating the use of Chinese characters.

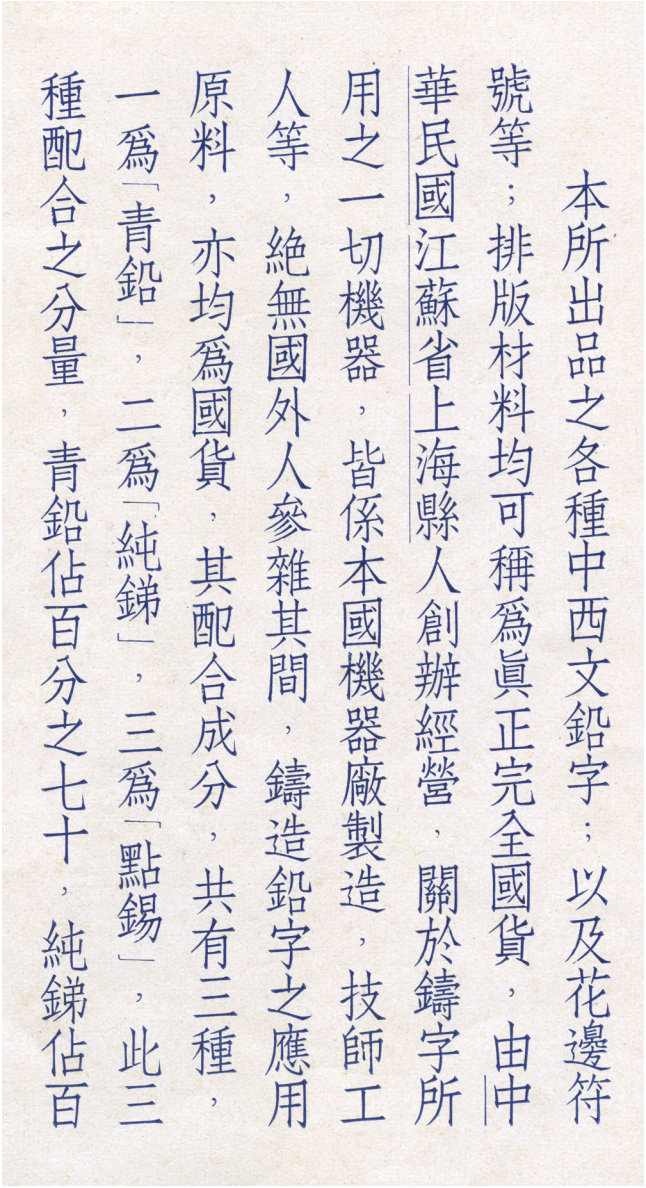
60 Wah Foong Printing Supplies & Printers, 1935, 拓制真宋字之經過 [The process of making True Song]. In: 各種中文鉛字樣本 [Various specimens of Chinese typefaces].

61 He Buyun, 1989, [The small history of Chinese movable type], p. 78; Original Chinese text: '华丰仿宋字体狭长，笔划纤细，上半部比下半部略小，横排直排都适用'.


我國機器印刷術，傳自歐西教
士，故舉凡一切印刷用具，初均來自
外洋，迨清末稍有變遷；然西文字仍
取給於歐美，中文字及機件等，都仰
求於日本，光復後國人有仿造者，但
未能合用，故仍信仰外貨，五九以來，

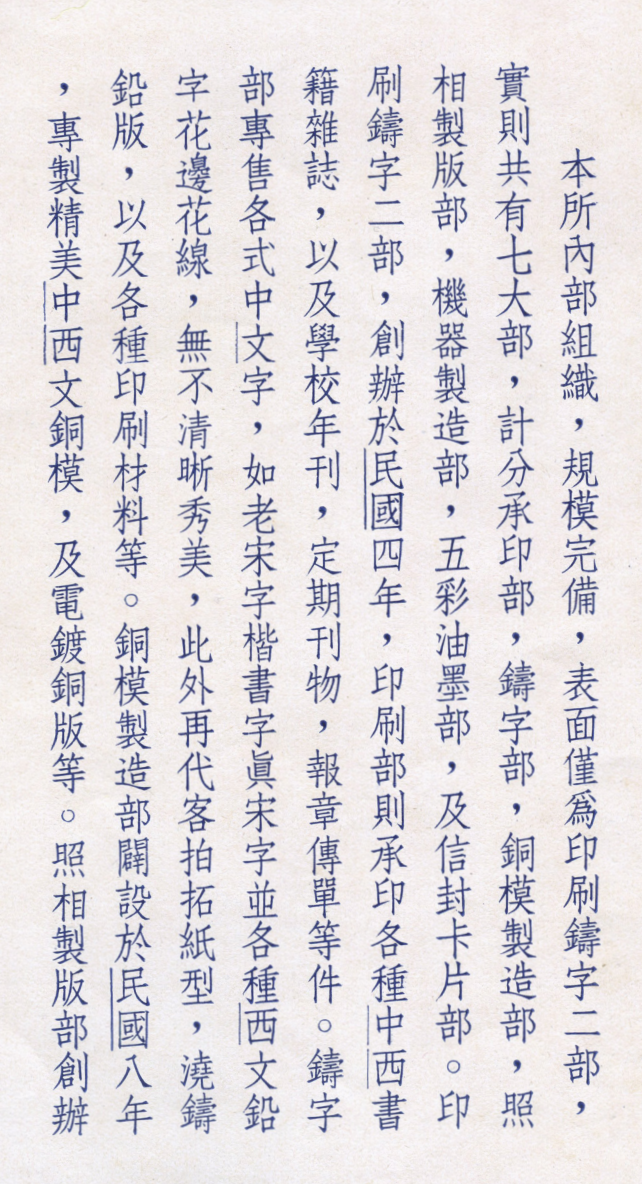
0 1 cm

Figure 6.20a
Specimen of 'True Song' in size No. 1 (28-point) from the *Various Specimens of Chinese Typefaces* published in 1935.
Source: Li Zhiqian (private collection).


本所出品之各種中西文鉛字；以及花邊符
號等；排版材料均可稱爲眞正完全國貨，由中
華民國江蘇省上海縣人創辦經營，關於鑄字所
用之一切機器，皆係本國機器廠製造，技師工
人等，絕無國外人參雜其間，鑄造鉛字之應用
原料，亦均爲國貨，其配合成分，共有三種，
一爲「青鉛」，二爲「純銻」，三爲「點錫」，此三
種配合之分量，青鉛佔百分之七十，純銻佔百

0 1 cm

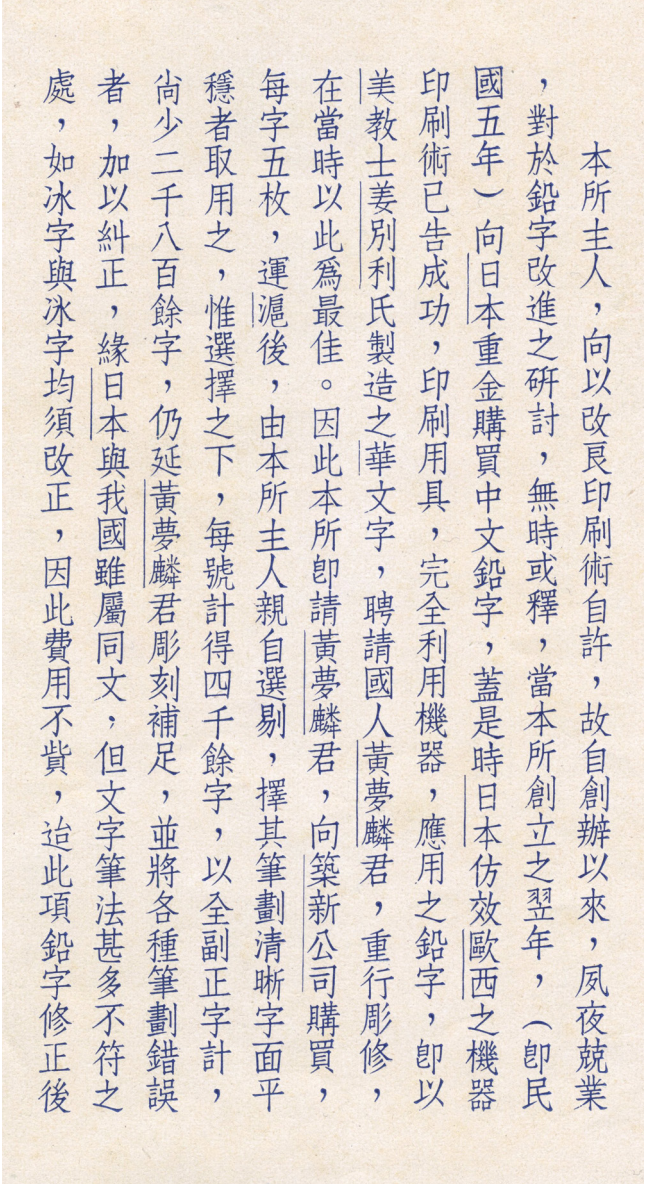
Figure 6.20b
Specimen of 'True Song' in size No. 2 (20-point).



本所內部組織，規模完備，表面僅爲印刷鑄字二部，實則共有七大部，計分承印部，鑄字部，銅模製造部，照相製版部，機器製造部，五彩油墨部，及信封卡片部。印刷鑄字二部，創辦於民國四年，印刷部則承印各種中西書籍雜誌，以及學校年刊，定期刊物，報章傳單等件。鑄字部專售各式中文字，如老宋字楷書字眞宋字並各種西文鉛字花邊花線，無不清晰秀美，此外再代客拍拓紙型，澆鑄鉛版，以及各種印刷材料等。銅模製造部闢設於民國八年，專製精美中西文銅模，及電鍍銅版等。照相製版部創辦

Figure 6.20c
Specimen of 'True Song' in size No. 3 (16-point).

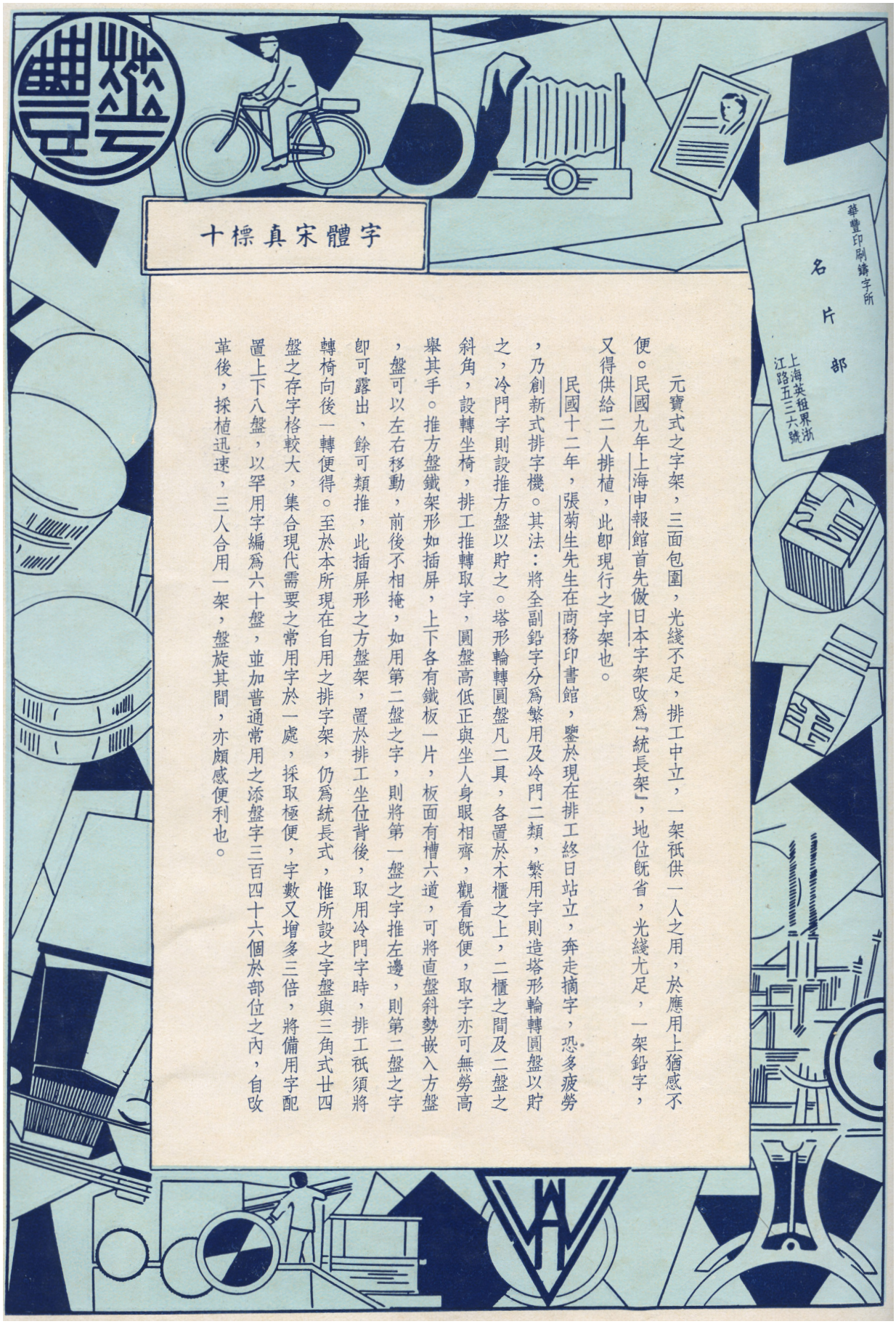
0 1 cm



本所主人，向以改良印刷術自許，故自創辦以來，夙夜兢業，對於鉛字改進之研討，無時或釋，當本所創立之翌年，（即民國五年）向日本重金購買中文鉛字，蓋是時日本仿效歐西之機器印刷術已告成功，印刷用具，完全利用機器，應用之鉛字，即以美教士姜別利氏製造之華文字，聘請國人黃夢麟君，重行彫修，在當時以此爲最佳。因此本所即請黃夢麟君，向築新公司購買，每字五枚，運滬後，由本所主人親自選剔，擇其筆劃清晰字面平穩者取用之，惟選擇之下，每號計得四千餘字，以全副正字計，尚少二千八百餘字，仍延黃夢麟君彫刻補足，並將各種筆劃錯誤者，加以糾正，緣日本與我國雖屬同文，但文字筆法甚多不符之處，如冰字與氷字均須改正，因此費用不貲，迨此項鉛字修正後

Figure 6.20d
Specimen of 'True Song' in size No. 4 (14-point).

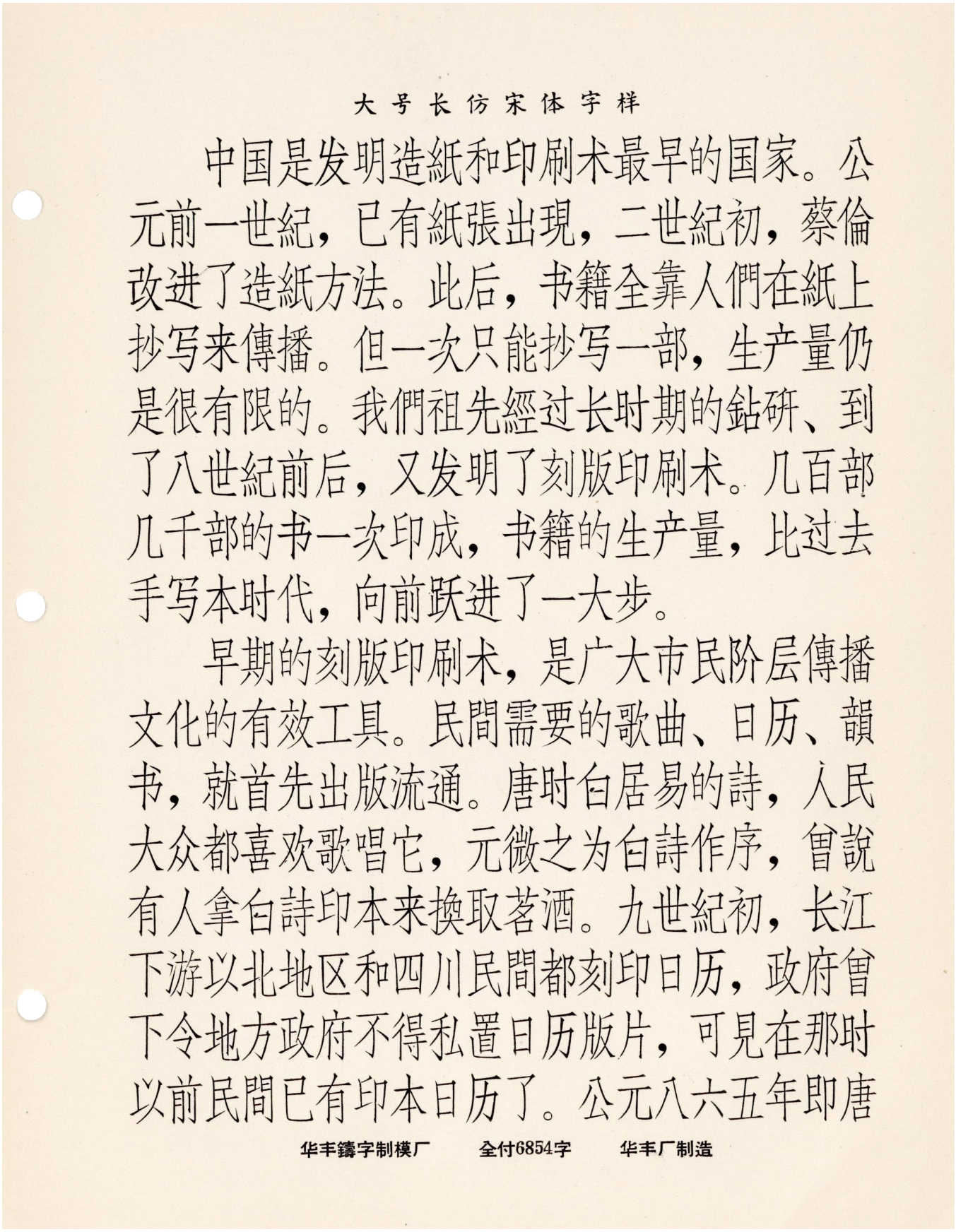
0 1 cm



元寶式之字架，三面包圍，光綫不足，排工中立，一架祇供一人之用，於應用上猶感不便。民國九年上海申報館首先倣日本字架改爲『統長架』，地位既省，光綫尤足，一架鉛字，又得供給二人排植，此卽現行之字架也。

民國十二年，張菊生先生在商務印書館，鑒於現在排工終日站立，奔走摘字，恐多疲勞，乃創新式排字機。其法：將全副鉛字分爲繁用及冷門二類，繁用字則造塔形輪轉圓盤以貯之，冷門字則設推方盤以貯之。塔形輪轉圓盤凡二具，各置於木櫃之上，二櫃之間及二盤之斜角，設轉坐椅，排工推轉取字，圓盤高低正與坐人身眼相齊，觀看既便，取字亦可無勞高舉其手。推方盤鐵架形如插屏，上下各有鐵板一片，板面有槽六道，可將直盤斜勢嵌入方盤，盤可以左右移動，前後不相掩，如用第二盤之字，則將第一盤之字推左邊，則第二盤之字卽可露出，餘可類推，此插屏形之方盤架，置於排工坐位背後，取用冷門字時，排工祇須將轉椅向後一轉便得。至於本所現在自用之排字架，仍爲統長式，惟所設之字盤與三角式廿四盤之存字格較大，集合現代需要之常用字於一處，採取極便，字數又增多三倍，將備用字配置上下八盤，以罕用字編爲六十盤，並加普通常用之添盤字三百四十六個於部位之內，自改革後，採植迅速，三人合用一架，盤旋其間，亦頗感便利也。

Figure 6.20e
Specimen of 'True Song' in size No. 5 (10-point).


大号长仿宋体字样

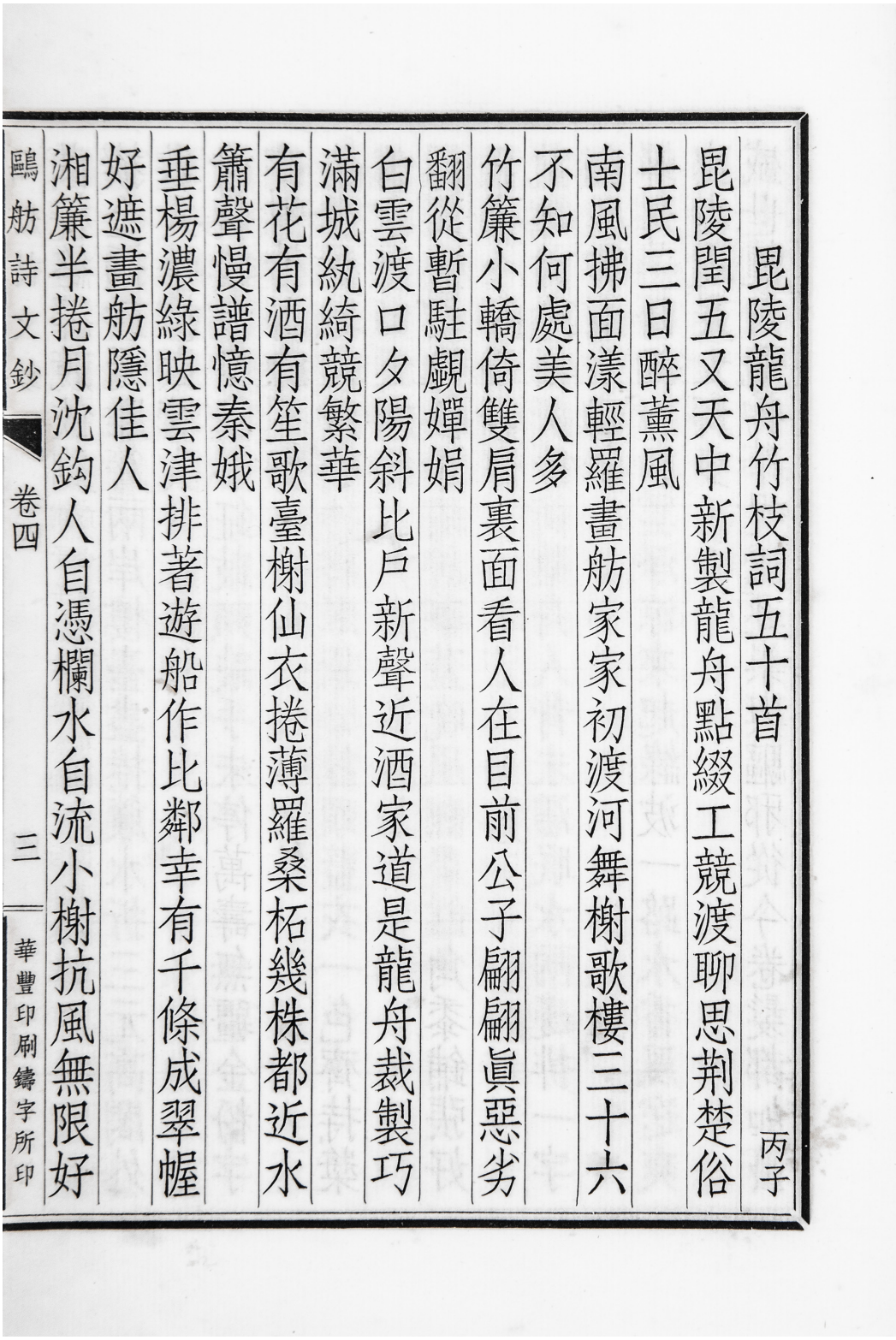
中国是发明造紙和印刷术最早的国家。公元前一世紀，已有紙張出現，二世紀初，蔡倫改进了造紙方法。此后，书籍全靠人們在紙上抄写来傳播。但一次只能抄写一部，生产量仍是很有限的。我們祖先經过长时期的鉆研、到了八世紀前后，又发明了刻版印刷术。几百部几千部的书一次印成，书籍的生产量，比过去手写本时代，向前跃进了一大步。

早期的刻版印刷术，是广大市民阶层傳播文化的有效工具。民間需要的歌曲、日历、韻书，就首先出版流通。唐时白居易的詩，人民大众都喜欢歌唱它，元微之为白詩作序，曾說有人拿白詩印本来換取茗酒。九世紀初，长江下游以北地区和四川民間都刻印日历，政府曾下令地方政府不得私置日历版片，可見在那时以前民間已有印本日历了。公元八六五年即唐

华丰鑄字制模厂　全付6854字　华丰厂制造

0 1 cm

Figure 6.21
Specimen of condensed 'True Song' in size No. Da in the *Survey of Printed Movable Type Specimen* in 1948.
Source: Su Shipeng (private collection).



毘陵龍舟竹枝詞五十首　丙子

毘陵閏五又天中新製龍舟點綴工競渡聊思荊楚俗
士民三日醉薰風

南風拂面漾輕羅畫舫家家初渡河舞榭歌樓三十六
不知何處美人多

竹簾小轎倚雙肩裏面看人在目前公子翩翩眞惡劣
翻從暫駐覷嬋娟

白雲渡口夕陽斜比戶新聲近酒家道是龍舟裁製巧
滿城紈綺競繁華

有花有酒有笙歌臺榭仙衣捲薄羅桑柘幾株都近水
簫聲慢譜憶秦娥

垂楊濃綠映雲津排著遊船作比鄰幸有千條成翠幄
好遮畫舫隱佳人

湘簾半捲月沈鉤人自憑欄水自流小榭抗風無限好

華豐印刷鑄字所印

0　1 cm

Figure 6.22
A page of *Ou Fang Wen Chao* (鷗舫文钞) printed with 'True Song' and published by the Wah Foong Printing Supplies & Printers in 1935. Source: Su Shipeng (private collection).

Other Fang-song Ti Typefaces

During the Republic of China period (1912–1949), numerous small and medium-sized foundries existed alongside prominent establishments such as the Commercial Press, the Zhonghua Book Company and Wah Foong Printing Supplies & Printers. In order to compete with these larger companies, small foundries also produced a variety of Fang-song Ti typefaces, aligning with the prevailing trend of reviving printed characters found in the woodblock books from the Song dynasty.[62]

In 1931, Qiu Dianyue (裘配岳) and Qiu Shouquan (裘寿泉) founded the Qiu Gu Zhai type foundry. They went on to develop the 'Mo Song' typeface family, which comprised square founts in sizes No. 1–6, engraved by Zhuang Youren (庄有仁) and Zhou Lisheng (周利生). Subsequently, the Qiu Gu Zhai type foundry also created condensed founts of the 'Mo Song' typeface, including sizes No. 1–6 (figure 6.23).[63]

In 1935, Han Youzhi (韩佑之) and Xu Zhiren (徐志任) established the Pai Sung Type Founding & Printing Co. Ltd in Shanghai. Han Youzhi previously took charge of the development of 'Fang Gu Movable Type'. Starting from 1932, Han Youzhi worked on creating two Fang-Song Ti typefaces, named 'Southern Song' (南宋, figure 6.24)and 'Northern Song,' (北宋, figure 6.25) respectively. These two typefaces were finalised in 1934, and the completed 'Southern Song' boasted five square founts in sizes ranging from No. 1 to No. 5 and four condensed founts in sizes No. 2 through No. 5. Meanwhile, the 'Northern Song' included two founts in sizes No. 2 and No. 5.[64]

The 'Southern Song' and 'Northern Song' typefaces were based on woodblock editions, *Long Kan Shou Jian* (龙龛手鉴) and *Guangyun* (广韵) provided by Dong Kang (1867–1947, 董康).[65] In 1934, during a reflection on his career as a book collector, Dong Kang elucidated the evolution of the Southern and Northern Song typefaces in his seminal work, *Preface to the Creation of Pai Sung Movable Type* (创制百宋活字序). He was critical of the Song Ti style, describing it as 'square and dull' (板方呆滞). However, he offered praise for the printed characters observed in the woodblock books from the Song Dynasty, citing their 'uniformity and consistency, serving as a model for books' (均整有致，垂范书林).[66]

By 1937, before the full outbreak of the War of Resistance against Japanese Aggression (1937–1945, The Second Sino-Japanese War), more than a dozen Fang-song Ti typefaces were developed.[67] Among them, only the 'True Song' from Wah Foong Printing Supplies & Printers continued to be used after the refurbishment and supplementation of the 'True Song' typeface following the establishment of New China in 1949.[68]

62 See Appendix 6 for the detailed table tracing the development of Chinese typefaces from 1909 to 1937.

63 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 158–161.

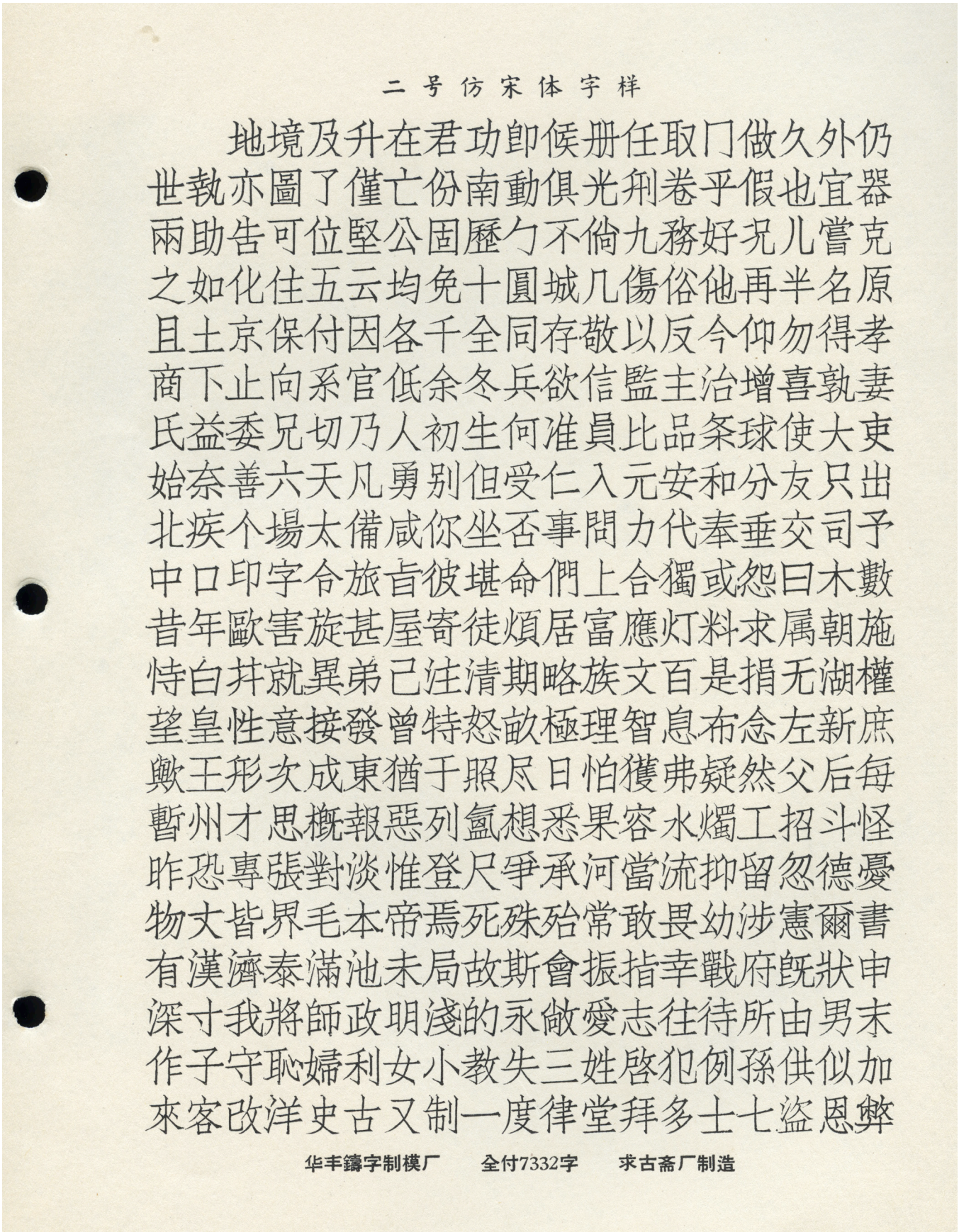
64 Ibid, p. 171.

65 He Buyun, 1989, [The small history of Chinese movable type], p. 78.

66 Dong Kang, 1934, 创制百宋活字序 [Preface to the creation of Pai Sung movable type]; Zhang Jinglu, 2003, 中国近现代出版史料 [History of publishing in modern China], pp. 285–287; Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 170–171.

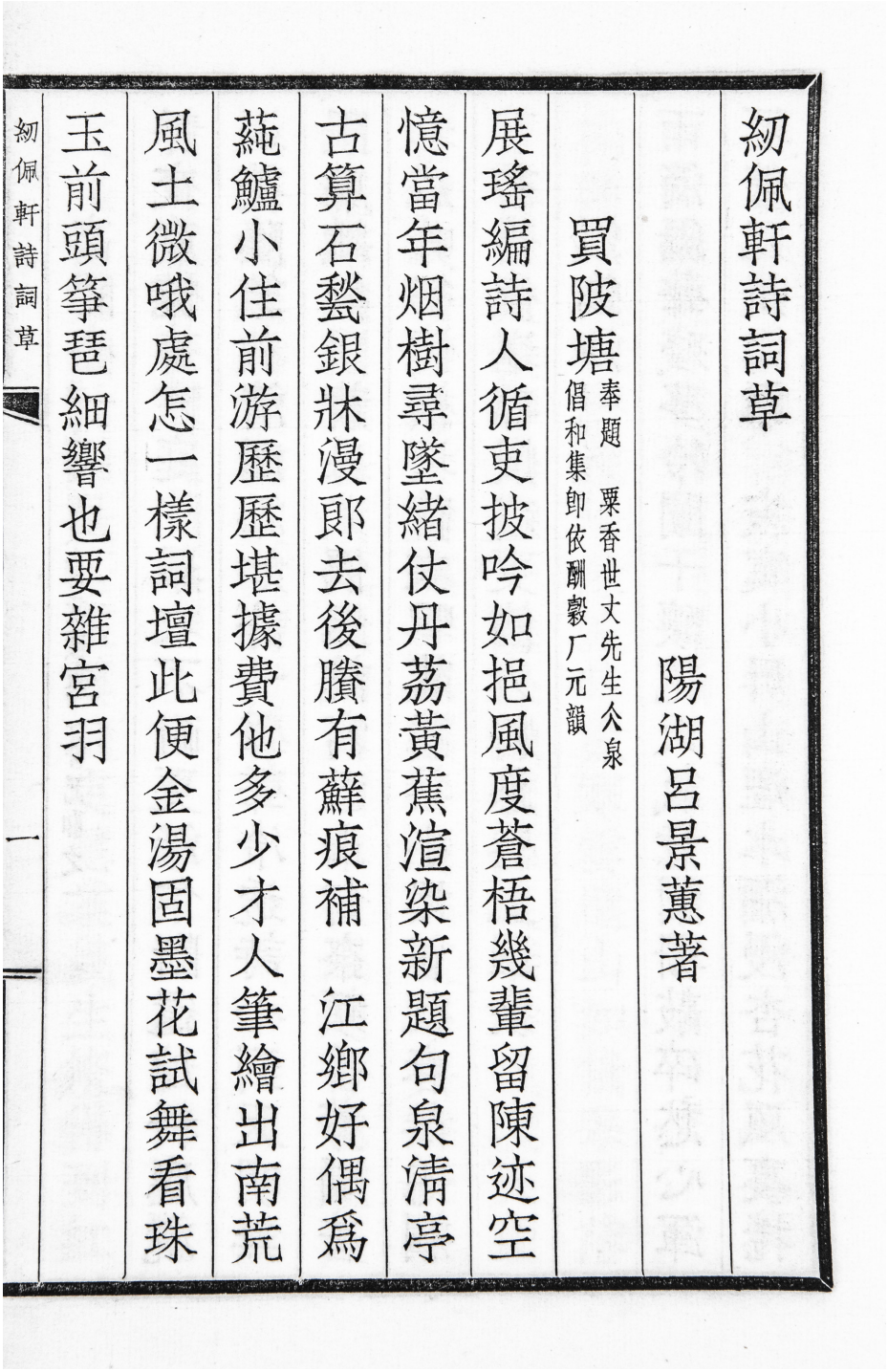
67 Zhou Bo, 2018, 中国现代文字设计图史 (The story of modern Chinese typography), p. 118.

68 He Buyun, 1989, [The small history of Chinese movable type], p. 78.



0 1 cm

Figure 6.23
Specimen of 'Mo Song' size No. 2 in the *Survey of Printed Movable Type Specimen* printed in 1948.
Source: Su Shipeng (private collection).


紉佩軒詩詞草

陽湖呂景蕙著

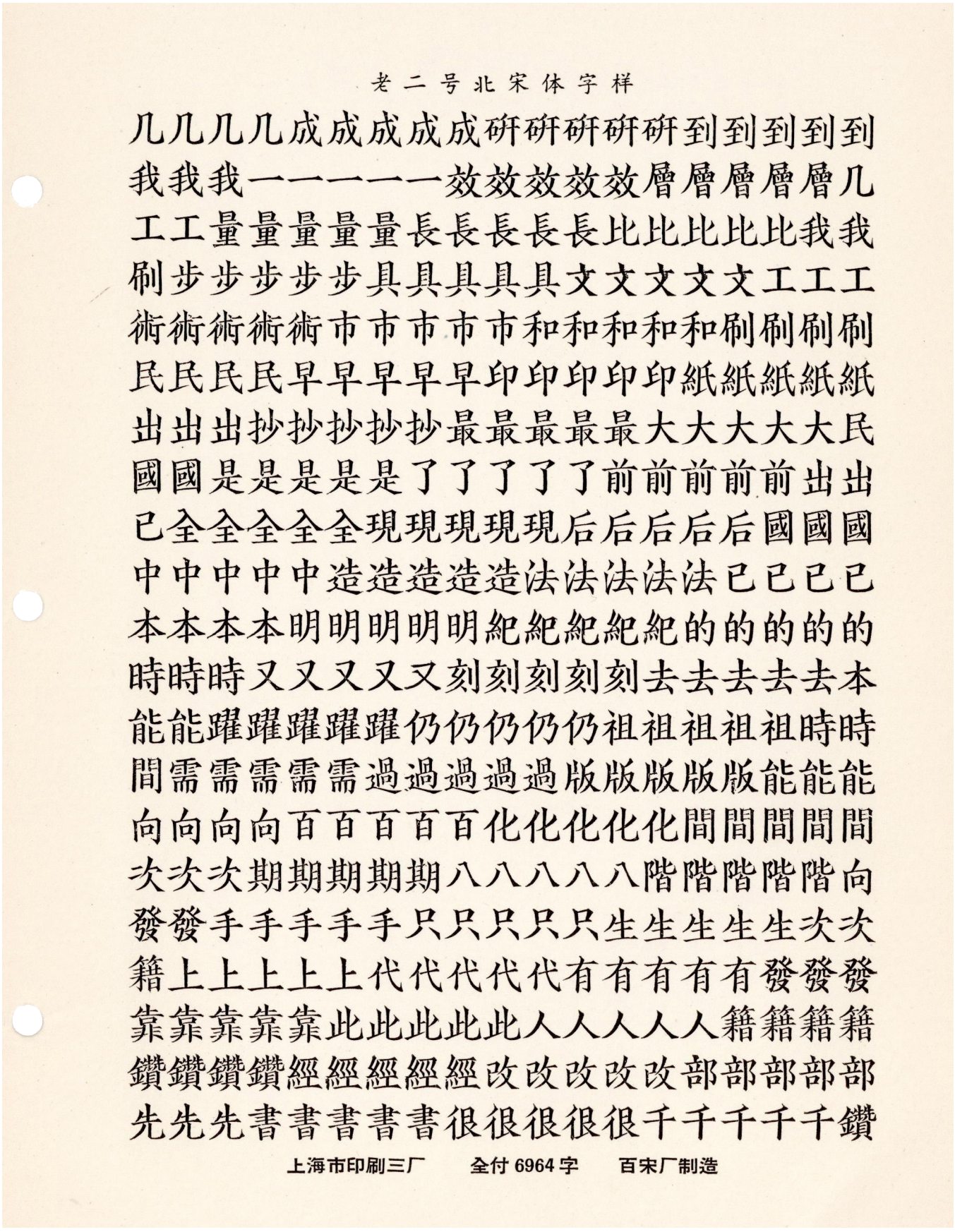
買陂塘 奉題 粟香世丈先生公泉倡和集即依酬穀厂元韻

展瑤編詩人循吏披吟如挹風度蒼梧幾輩留陳迹空憶當年烟樹尋墜緒仗丹荔黃蕉渲染新題句泉清亭古算石甃銀牀漫郎去後賸有蘚痕補　江鄉好偶爲蒓鱸小住前游歷歷堪據費他多少才人筆繪出南荒風土微哦處怎一樣詞壇此便金湯固墨花試舞看珠玉前頭箏琶細響也要雜宮羽

紉佩軒詩詞草 一

0 1 cm

Figure 6.24
Specimen of 'Southern Song' in the *Ren Pei Xuan Shi Ci Cao* (纫佩轩诗词草).
Source: Su Shipeng (private collection).



0 1 cm

Figure 6.25
Specimen of 'Northern Song' size No. 2 in the *Survey of Printed Movable Type Specimen* printed in 1948.
Source: Su Shipeng (private collection).

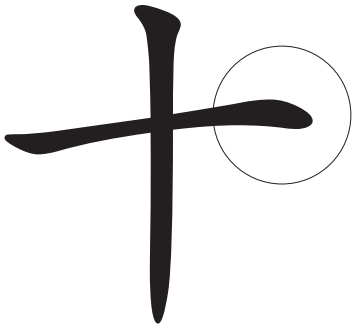


Figure 6.26
Chinese character '十' in a Kai Ti font.
Font in use: STKaiti, Regular.

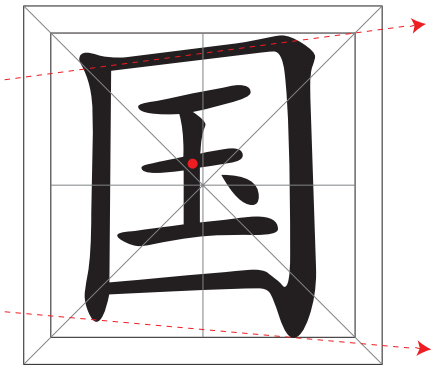


Figure 6.27
Chinese character '国' in a Kai Ti font. The red dot represents the Zhong Xin. Dashed lines with arrows indicate trends in the structure of Kai Ti typeforms.
Font in use: STKaiti, Regular.

6.4 Development of Kai Ti founts

Kai Ti represents another style of Chinese text typefaces, characterised by its distinctively traditional Chinese cultural and aesthetic features compared to Fang-song Ti, Song Ti, and Hei Ti. The Chinese character 'Kai' (楷) signifies the Kai script, also called the Regular or Standard script.[69] The Kai script has exerted the most substantial influence on Chinese typeface design, forming the foundation for all text typefaces. Different styles of typefaces capture the stylistic features of the Kai script in different ways. For instance, the triangular decorative serifs of Song Ti typefaces reflect the features of the ending of Kai script strokes in abstract forms (Figure 6.26). In contrast, the Kai Ti typeface can be viewed as a direct revival of the Kai script.

The typeform of the Kai Ti typefaces derives from Chinese brush writing and adheres to the principles of Chinese calligraphy. As such, the strokes of Kai Ti are typically thick and rounded at the terminals, while being thin in the middle. The horizontal strokes exhibit a noticeable inclination towards the upper right. The structure of the Chinese characters in Kai Ti style often displays a pattern of compacting in on the left and extending on the right. The Zhong Gong is usually smaller compared to other styles, with the Zhong Xin deviating most significantly from the centre (Figure 6.27).

No. 2 Kai Script' (二号楷书)

The 'No. 2 Kai Script' was the earliest Chinese typeface developed independently by Chinese printers. It is known as 'No.2 Kai Script' primarily because of its type size of No. 2 and its style of Kai script. The motivation for developing this fount was the inability of the Song Ti founts imported from Japan to meet the aesthetic requirements of Chinese literati. Moreover, Chinese founts appeared rather homogeneous in contrast to the diversity of Latin founts in the early 20th century. Consequently, in 1909, the Commercial Press pioneered the 'No. 2 Kai Script' fount, with Niu Junyi (钮君毅) providing the writing and Xu Xixiang (徐锡祥) handling the engraving (figure 6.28).[70]

The development of 'No. 2 Kai Script' entailed eight main processes: composing the original manuscript; photographing the manuscript as a reference for engraving, engraving intaglio Chinese characters onto copper blanks; embedding the intaglio characters into a copper plate to produce the first matrix; casting the 'seed type'; refining the 'seed type' by engraver; electrotyping 'seed types' into matrices and casting types. This intricate process, independently explored by the Commercial Press, became the cornerstone of the manufactring methods for future Kai Ti founts.[71]

He Buyun critiqued the 'No. 2 Kai Script' fount, highlighting its insufficient character set, which required supplementary types created by temporary engraving during typesetting.[72] The overall fount lacked uniformity, detracting from its aesthetic appeal. Ultimately, the 'No. 2 Kai

69 See 'Kai script' in the chapter 2.4 Formation of Chinese writing and its evolution.

70 He Buyun, 1989, [The small history of Chinese movable type], p. 78.

71 He Shengnai & Lai Yanyu, 1933, 近代印刷术 [Modern printing], p. 9.

72 He Buyun, 1989, [The small history of Chinese movable type], p. 78.

Script' typeface was not marketed and was only used internally at the Commercial Press. Despite this, the 'No. 2 Kai Script' is noteworthy as the first attempt by a Chinese capital enterprise to develop a fount, breaking the monopoly of founts imported from Japan for use in the printing and publishing industry in China.[73] This achievement sparked the independent development of Chinese founts by Chinese printers.

Wah Foong Printing Supplies & Printers 'Kai Script' (华丰楷书)

Wah Foong Printing Supplies & Printers initiated an attempt to create a Kai Ti typeface in the late Qing dynasty. However, the endeavour was temporarily abandoned due to insufficient economic resources and a failed attempt at engraving on boxwood — the initial step in William Gamble's electrotyping method. Another attempt in 1927, with a newly devised method for producing Kai Ti founts, also fell short due to flaws in the new approach.[74]

In 1929, Wah Foong Printing Supplies & Printers revived the project and succeeded in developing the 'Kai Script' fount. They hired the renowned calligrapher Wu Tieshan (吴铁珊) to write the Kai script in the style of Yan Zhenqing (709–785, 颜真卿).[75] The responsibility of engraving was entrusted to Chao Dechun (巢德椿), Zhu Shougen (诸寿根), and Xu Zhihe (徐志和), among others. By 1935, the foundry had nearly completed six 'Kai Script' founts ranging in size from No. 1 to 6, and later added a Small No. 4 size. As a result, the 'Kai Script' series created by Wah Foong Printing Supplies & Printers comprised seven sizes (figure 6.29).[76]

Despite the efforts put into its development, the 'Kai Script' suffered a significant loss in the quality and style of Yan Zhenqing due to the inexperience in engraving techniques, which led to its minimal adoption by printing presses. It is also plausible that the large number of engravers involved resulted in an inconsistent overall style of the typeface.[77]

The attempt at 'Kai Script' typeface by Wah Foong Printing Supplies & Printers highlighted the significant challenges involved in producing Kai Ti founts, particularly during the engraving stage. Localised Western type-founding techniques were unable to meet the technical requirements needed for the production of Kai Ti founts in high-quality. In order to manufacture founts in Kai Ti style that align with Chinese culture and aesthetics, Chinese type foundries continuously refined their printing and type-making techniques.

73 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 126–128.

74 Wah Foong Printing Supplies & Printers, 1935, 拓制真宋字之經過 [The process of making True Song]. In: 各種中文鉛字樣本 [Various specimens of Chinese typefaces].

75 Yan Zhenqing was a leading Chinese calligrapher, and his Kai script, 'Yan Style', has been constantly imitated by later generations.

76 He Buyun, 1989, [The small history of Chinese movable type], p. 79.

77 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 153.

0 0.333 cm

Figure 6.28
Name of the Commercial Press in Chinese using 'No. 2 Kai Script Ti' typeface, detail enlarged from Figure 6.1.
Source: Author (private collection).

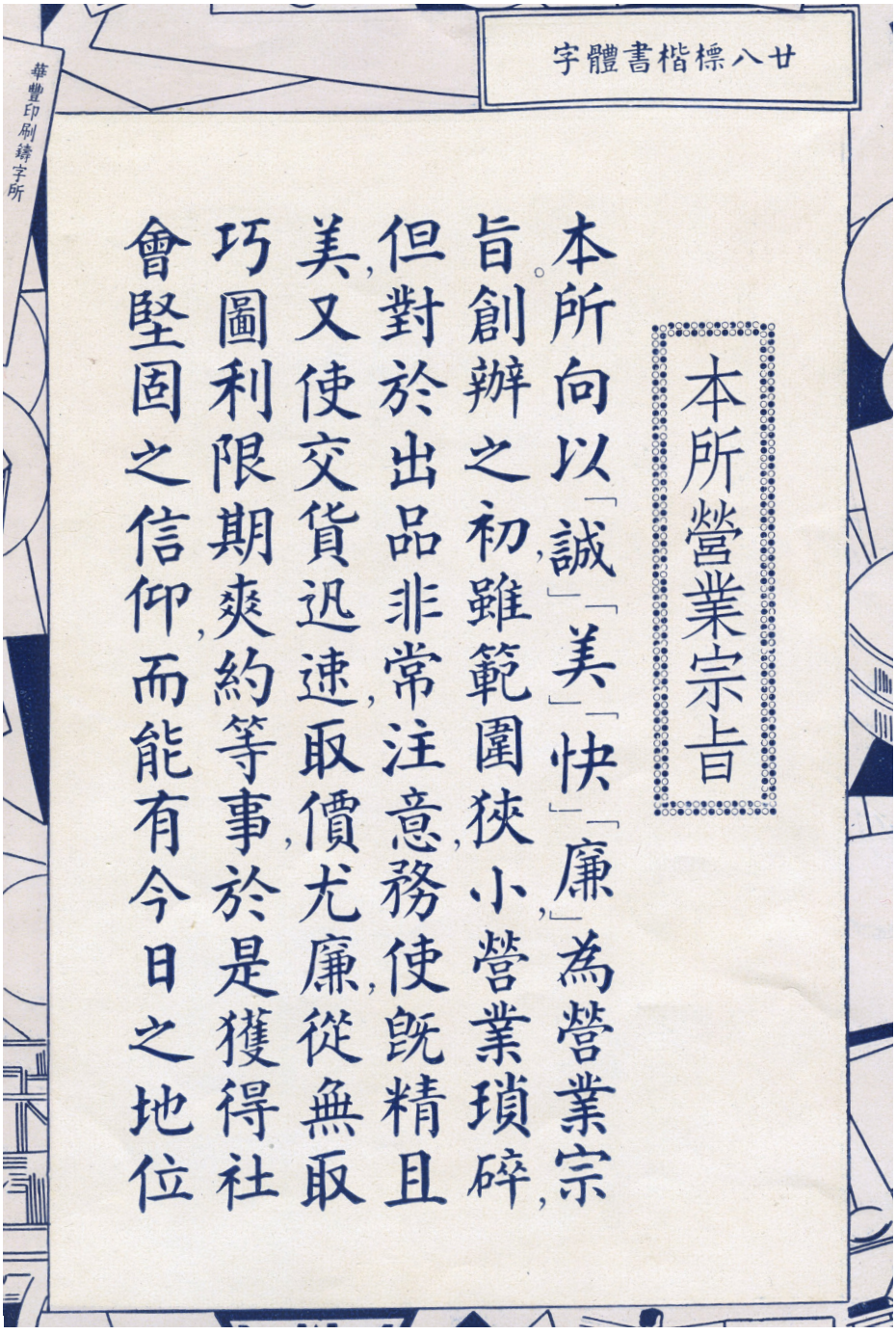


Figure 6.29
Specimen of 'Kai Script' in size 28-point from the *Various Specimens of Chinese Typefaces* published in 1935.
Source: Li Zhiqian (private collection).

0 1 cm

'Han Wen Zheng Kai' (汉文正楷)

'Han Wen Zheng Kai' was the first Kai Ti typeface family developed by Chinese printers, with Zheng Wuchang (1894–1952, 郑午昌) as its main initiator, along with Li Zuhan (李祖韩), Chen Xiaodie (陈小蝶), Yu Jisun (俞季荪), and others.[78] 'Hua Wen' stands for the script of the Han nation, while 'Zheng Kai' is another name for 'Kai Script', and the character 'Zheng' denotes uprightness and formality. The Kai Ti typefaces later became widely known as 'Zheng Kai Ti', a name derived from 'Han Wen Zheng Kai', distinguishing it from other Kai scripts.

Prior to the development of the 'Han Wen Zheng Kai', only the British merchant, Millington Inc., one of the 'Big 4' advertising agencies of old Shanghai (*c.* 1910–1945), possessed two Kai Ti Founts. However, the number of sorts in each fount was inadequate, necessitating temporary type replenishments. When Zheng Wuchang, then Director of the Art Department of the Zhonghua Book Company, commissioned Millington Inc. to print the Bee periodical, the company dismissed the demands of its Chinese customers, citing its unique possession of a Kai Ti typeface. After several unsuccessful negotiations, Zheng Wuchang and his colleague Li Zuhan decided to develop their own Kai Ti typeface.[79]

DEVELOPMENT OF 'HAN WEN ZHENG KAI'

Zheng Wuchang initiated the development of 'Han Wen Zheng Kai' in 1929. He first commissioned Gao Yuncheng (1872–1941, 高云塍), the editor of the Zhonghua Book Company, to write an original manuscript of over 8,000 characters. He then discussed the fount development with Lu Feikui, the founder of the Zhonghua Book Company. However, during the 1920s and 1930s, the company concentrated on expanding its ' Juzhen Fang Song' typeface family. Consequently, Lu Feikui declined to support the development of 'Han Wen Zheng Kai', citing equipment and financial constraints. Zheng Wuchang therefore left the Zhonghua Book Company and, together with Li Zuhan and Li Qiujun (李秋君), raised funds to establish the Han Wen Zheng Kai Printing House in Shanghai in 1930 in order to continue to developing 'Han Wen Zheng Kai'.[80]

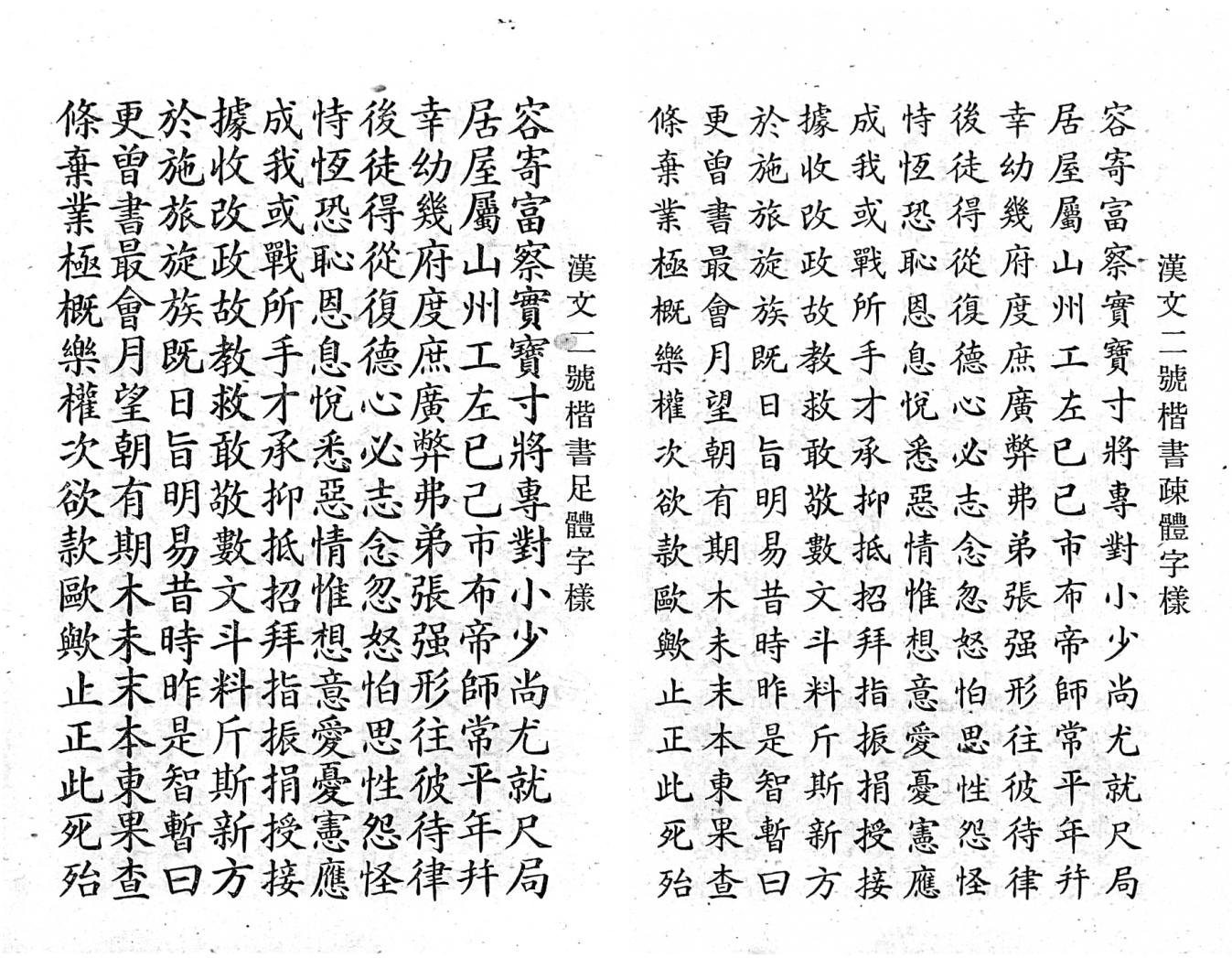
'Han Wen Zheng Kai', was in development from 1929 and was completed in 1933 after more than three years of effort. It encompasses type sizes ranging from No. Tou (No. 1) to No. 5, as well as a smaller variation known as New No. 5. The typeface consists of two square styles: the 'Zu style' (足体) featuring a large Type Face and the 'Shu style' (舒体) with a smaller Type Face (figure 6.30 & figure 6.31), along with a condensed style (figure 6.32).

Figure 6.30
The area inside the solid frame is known as the Type Face, while the area within the dotted-line frame is referred to as the Type Body. The difference in width or height between the Type Face and the Type Body determines the Chinese character spacing.
Font in use: STKaiti, Regular.

78 汉文正楷活字的创制 [Creation of Han Wen Zheng Kai typeface] (1932). In: 中国出版月刊 [Chinese Publishing Monthly], 1932:1, p. 78.

79 Wu Tiesheng, 2001, 我所知道的中华人 [The Zhonghua staffs I know]. In: 回忆中华书局 [Memories of Zhonghua Book Company], p. 34.

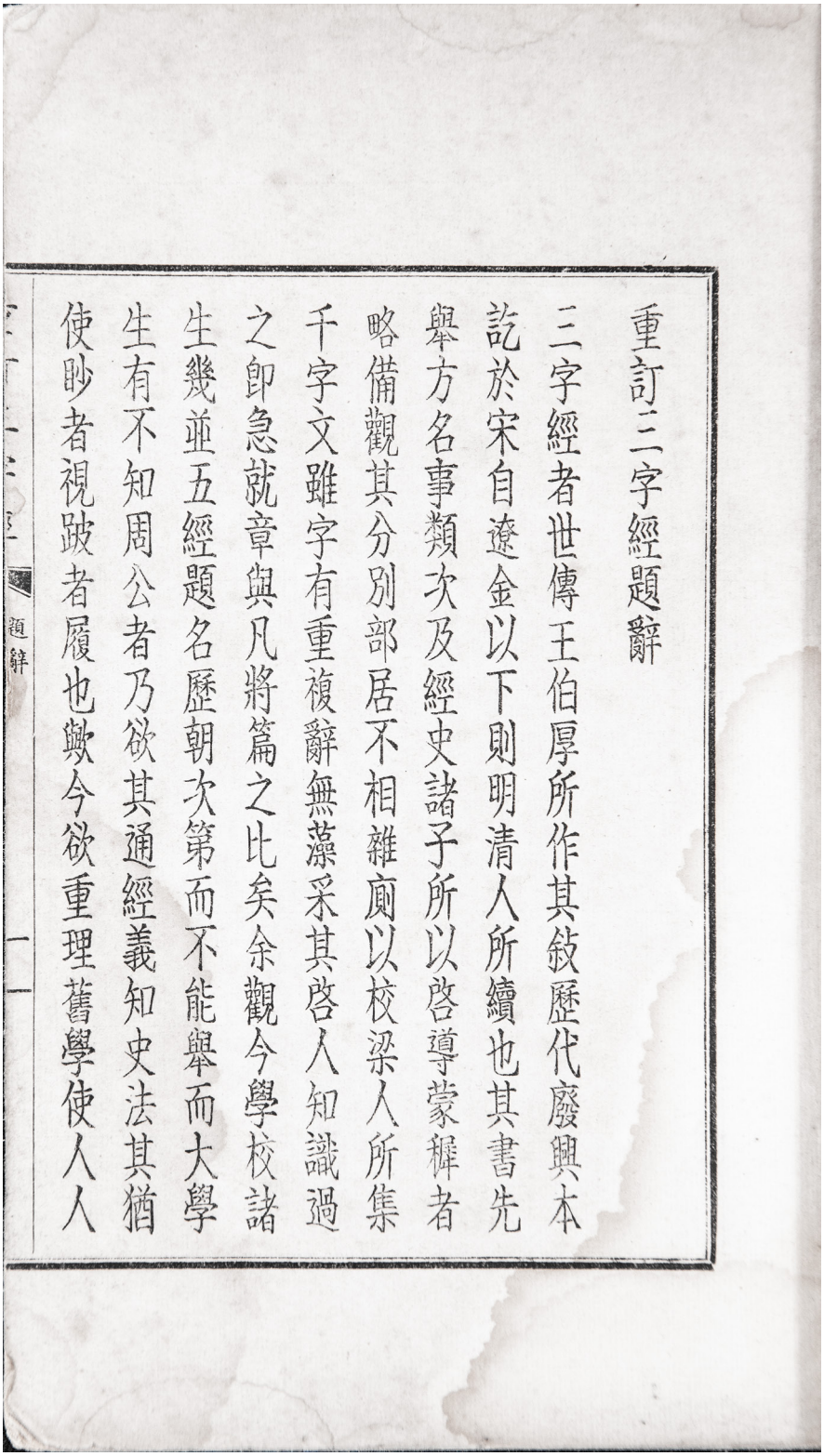
80 Ibid.



0 1 cm

Figure 6.31
Specimens of 'Han Wen Zheng Kai' in size No. 2 'Zu style' (left) and size No. 2 'Shu style' (right).
Source: Su Shipeng (private collection).

Figure 6.32
Preface of *Three Character Classic* printed with Han Wen Zheng Kai by Shanghai Han Wen Zheng Kai Printing House published in 1935. Source: Su Shipeng (private collection).



重訂三字經題辭

三字經者世傳王伯厚所作其敘歷代廢興本訖於宋自遼金以下則明清人所續也其書先舉方名事類次及經史諸子所以啓導蒙穉者略備觀其分別部居不相雜廁以校梁人所集千字文雖字有重複辭無藻采其啓人知識過之即急就章與凡將篇之比矣余觀今學校諸生幾並五經題名歷朝次第而不能舉而大學生有不知周公者乃欲其通經義知史法其猶使眇者視跛者履也歟今欲重理舊學使人人

題辭 一

0 1 cm

The condensed style imitates the ancient textbook Zhao Fengfu (1254–1322, 赵孟頫) script,[81] characterised by thin strokes used as 'Jia Zhu' for vertical typesetting in traditional books. However, the specific details regarding the time and process of its development remain unknown.[82]

The type size of 'Han Wen Zheng Kai' was based on the commonly used type size system of Song Ti stated in the advertisement of Han Wen Zheng Kai Movable Type: 'the different sizes are the same as the common old Song Ti, and all of them can be used for all kinds of Bopomofo symbols as well as decorative borders and so on'. Additionally, the character set of 'Han Wen Zheng Kai' was designed to meet the requirements of various applications. In reporting on the establishment of the Han Wen Zheng Kai Printing House, *Shen Bao* noted that:

> More than 14,000 meticulously curated characters in the Kai script, suitable for use in books, were carefully selected. Copper matrices were then produced to cast these types.[83]

This indicated that the character set of 'Han Wen Zheng Kai' was carefully compiled based on practical applications during that period. The advertisement also offered founts for sale in various quantities, categorised according to three different applications: founts for the whole set, founts for ordinary use, and founts for bookkeeping and business card.[84]

Regarding the typeform of 'Han Wen Zheng Kai', the original manuscript of the typeface was written by Gao Yuncheng and subsequently engraved by Zhu Yunshou (朱云寿), Xu Tangsheng (许唐生), Lu Pinhua (陆品化), Zheng Huasheng (郑化生) and others.[85] Gao Yuncheng was a famous calligrapher of his time, author of high sales of copybooks such as *Gao Shu Xiao Kai* (*Small Kai Script Written by Gao*, 高书小楷) (figure 6.34), *Gao Shu Da Kai* (*Large Kai Script Written by Gao*, 高书大楷).[86]

Compared to the characters in the *Gao Shu Xiao Kai*, the basic structure and features of 'Han Wen Zheng Kai' conform to Gao Yuncheng's calligraphic style. However, there are some simplifications in the outline of the characters and in the shape of some of the strokes, which are more concise and rigid compared to the written characters (figure 6.33). Moreover, because the characters were confined to a square gird (Type Body frame), structurally, the Zhong Gong was slightly enlarged. All of this reflects the influence of the engraver in the development of 'Han Wen Zheng Kai'. Therefore, 'Han Wen Zheng Kai' combined the structure and features of calligraphy with the optimisation of the contours by engraving.

Figure 6.33
Enlarged character '作' found in *Gao Shu Xiao Kai* (upper) from figure 6.33 and *Three Character Classic* (lower) from figure 6.28. The structure of the character above is similar to that below, but the strokes have more detail and are relatively more rounded at the terminals of the strokes.

81 Zhao Mengfu was a renowned calligrapher during the Yuan dynasty, and his calligraphic style became known to later generations as 'Zhao Ti'.

82 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 167.

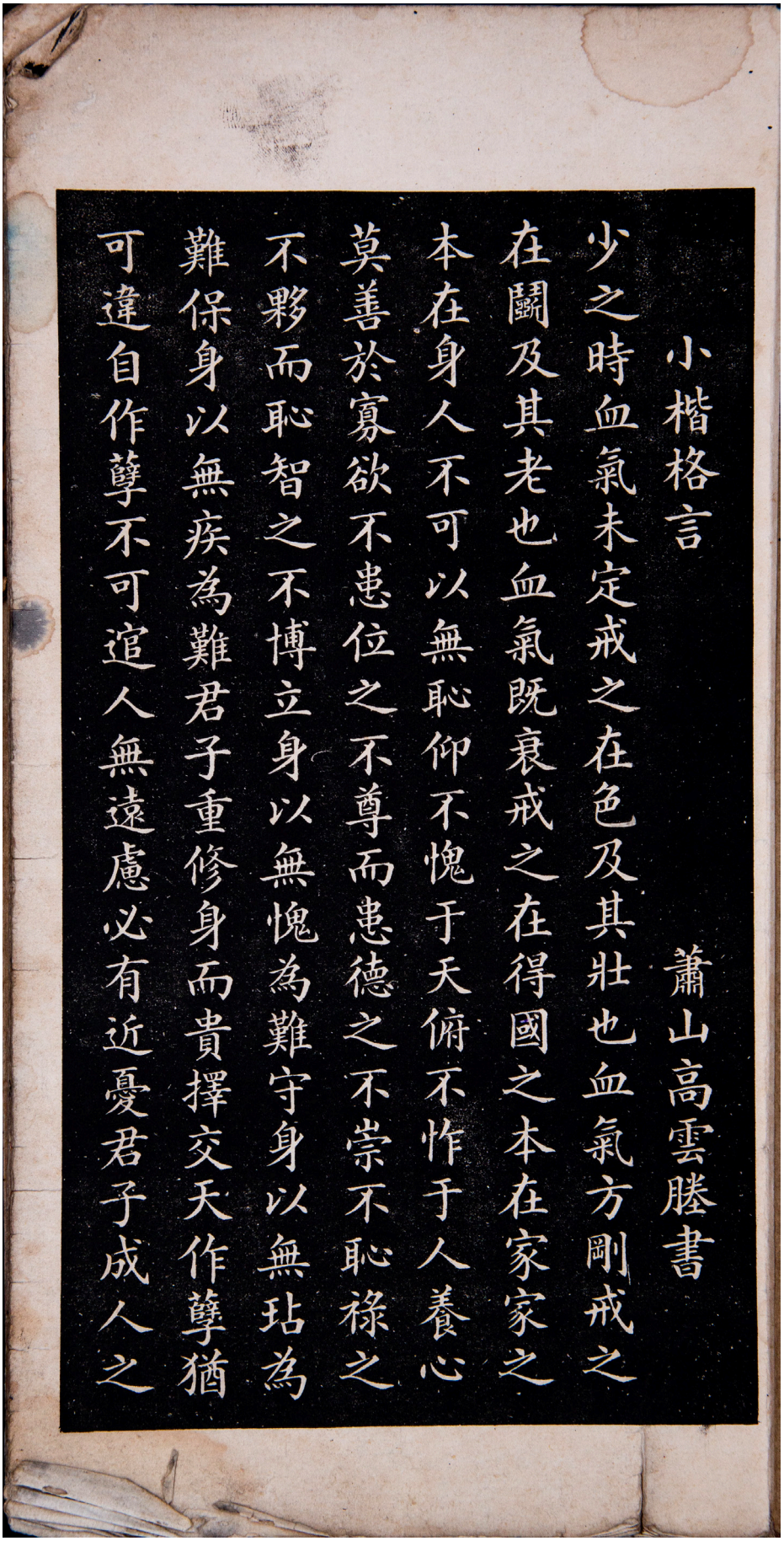
83 Yu Youren, *c.* 1933, 汉文正楷活字版 [Advertisement of Han Wen Zheng Kai movable type]. 上海: 上海汉文文正楷印书局 [Shanghai Han Wen Zheng Kai Printing Bureau].

84 Ibid.

85 He Buyun, 1989, [The small history of Chinese movable type], p. 79.

86 In the context of the Kai script, the distinctions among large Kai, medium Kai and small Kai scripts are not strictly defined in size. Generally, characters measuring 1 to 3 cm are classified as part of the small Kai script, while those measuring 5 cm or more are categorised as the large Kai script. Characters falling in between these size ranges are typically considered as part of the medium Kai script.

Figure 6.34
Preface of *Gao Shu Xiao Kai* written by Gao Yuncheng.
Source: Wang Wen (private collection).



Size unknown

APPLICATION AND INFLUENCE OF 'HAN WEN ZHENG KAI'

The development of 'Han Wen Zheng Kai' marked a significant achievement. Esteemed figures such as Cai Yuanpei (1868–1940, 蔡元培) and Yu Youren (1879–1964, 于右任) spoke highly of it, describing 'Han Wen Zheng Kai' as 'a new invention in Chinese printing tools and a major revolution in modern cultural endeavors'.[87]

By 1932, the typeface 'Han Wen Zheng Kai' had already been extensively applied in many pharmaceutical packaging and other related scenarios:

> Major pharmacies in Shanghai, such as Bao Wei [宝威] and Yong An Tang Zhong Xi Ke Fa [永安堂中西科发], many of their specifications are printed by the Han Wen [Han Wen Zheng Kai Printing House]. Even though they have not officially opened yet, their business has already been rather good. It is clear that this kind of Zheng Kai movable type, born out of necessity, is quite popular with the community.[88]

After the completion in 1933, 'Han Wen Zheng Kai' also gained broad usage according to statistics compiled by Zheng Wuchang:

> The publications include the 'Railway Yearbook' by the Ministry of Railways, the 'National Salt Policy Records' by the Salt Affairs Agency, the 'Compilation of Constitutions from Various Countries' by the Legislative Yuan, and the 'National Bank Yearbook' by the Bank of China, among others. The excellence of these achievements has gained substantial recognition across various sectors, and the use of 'Han Wen Zheng Kai' for movable type printing has been adopted by more than 270 printing businesses across the country. This widespread adoption demonstrates the suitability of the 'Han Wen Zheng Kai' for movable type printing and its popularity in modern society.[89]

'Han Wen Zheng Kai' was not only influential in commercial applications, but also conformed to the political orientations of early 20th-century China. On February 19, 1934, Chiang Kai-shek (1887–1975, 蒋介石), the leader of the Republic of China, organized an 'Expanded Prime Minister's Memorial Week' for 100,000 attendees at the Nanchang camp. During this event, he delivered a speech titled 'The Essentials of the New Life Movement', thereby marking the commencement of the 'New Life Movement'.

Two months after this event, the Jiangxi Provincial Department of Education issued a directive to its affiliated departments:

> All kinds of book covers, newspaper headlines, slogans, etc., are not permitted to use three-dimensional yin and yang coloured typefaces [display typefaces], or foreign languages. Moreover, when referring to matters pertaining to China within the text, the use of Western calendar years is strictly forbidden in order to emphasise national consciousness.[90]

87 Lu Danlin, 21 September 1932, 正楷活字版之创制者 [The creator of the Zheng Kai movable type plate]. In: 申报 [Shenbao], 1932:16.

88 汉文正楷活字的创制 [Creation of Han Wen Zheng Kai typeface] (1932). In: 中国出版月刊 [Chinese Publishing Monthly], 1932:1, p. 78.

89 Zheng Wuchang, 1935, 呈请奖励汉文正楷活字版并请分令各属各机关相应推用, 以资提倡固有文化而振兴民族观感事 [Requesting the reward for Han Wen Zheng Kai movable type and requesting each department to use it accordingly to promote national cultural revival and foster national sentiments]. In: 河南省政府公报 [Henan Provincial Government Gazette]. 洛阳: 河南省政府秘书处 [Luoyang: Henan Provincial Government Secretariat].

90 江苏教育旬刊 [Jiangsu Education Periodical] (1934). 9:7, p. 12.

Subsequently, the Central Propaganda Committee and the Ministry of the Interior of the Republic of China's Nationalist Party (Guomindang, 国民党) issued demands for Chiang's directives to be disseminated to newspapers, magazines, and publishing and distribution offices nationwide. This was reported in various government bulletins and newspapers across the country. Specific issues including the *Nanjing Municipal Government Gazette* (Issue 139, 1934), the *Beiping Municipal Gazette* (Issue 240, 1934), and the *Shanghai Municipal Government Gazette* (Issue 143, 1934), amongst others, published Chiang Kai-shek's directives.[91]

Zheng Wuchang of the Shanghai Han Wen Zheng Kai Printing House presumably also received this directive and found that his conception of developing the 'Han Wen Zheng Kai' typeface coincided with the Supreme Leader's vision. Then, in 1935, Zheng Wuchang penned a submission entitled 'Requesting the Reward for Han Wen Zheng Kai Movable Type and Requesting Each Department to Use It Accordingly to Promote National Cultural Revival and Foster National Sentiments'. This document called upon the government to recognise and promote the 'Han Wen Zheng Kai' typeface nationwide.

In response, following the establishment of the Cultural Programme Planning Committee, the National Government of the Republic of China adopted the Outline of the Cultural Programme Plan. Significantly, Article 12 stated:

> To determine the 'Han Wen Zheng Kai' as the formal typeface, to prohibit the arbitrary modification of the irregular patterns of three-dimensional typefaces [display typefaces], and to implement horizontal writing [typesetting] from left to right.[92]

In the same year, the Ministry of Education prescribed the 'Han Wen Zheng Kai' as the typeface for printing textbooks (figure 6.35 &36).[93] With the support of the government, the Han Wen Zheng Kai Printing House experienced rapid growth. In addition to its primary printing operations, it expanded by establishing branches across China and selling types to its industry peers. Prior to the Marco Polo Bridge Incident on 7 July 1937,[94] the Han Wen Zheng Kai Printing House had already set up management offices in several cities, including Hong Kong, Nanjing, Tianjin, Guangzhou, Hankou, Qingdao, and Suzhou, among others.[95]

91 Zhou Bo, 2013, 字体家国—汉文正楷与现代中文字体设计中的民族国家意识 [Typeface's home – Hanwen Zheng-Kai and the Chinese nationality in modern Chinese typeface design]. In: 美术研究 (Art Research), 2013:1, pp. 16–27. China Academic Journal Electronic Publishing House; These gazettes are in the Shanghai Municipal Archives, file No. S313-1-161-48.

92 Yuan Jiahong, Wang Zhikun & Zeng Yan, 2017, 中国战时首都档案文献: 战时文化 [Chinese wartime capital archives: wartime culture], p. 21.

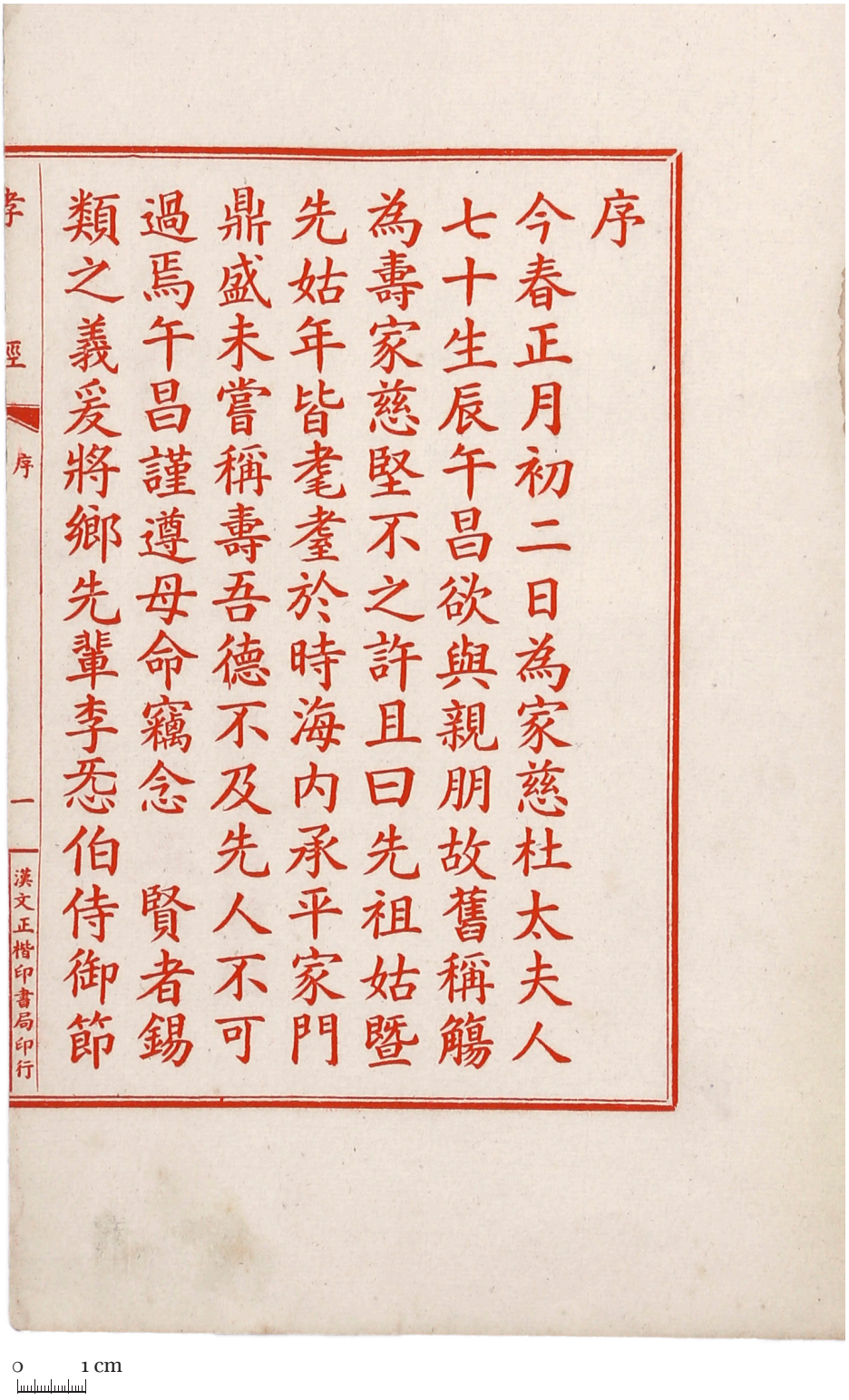
93 Fan Muhan, 1995, 中国印刷近代史: 初稿 [Preliminary draft of modern Chinese printing history], p. 670.

94 The Marco Polo Bridge Incident (马可波罗桥事变), also known as the Lugou Bridge Incident (卢沟桥事变) or the July 7 Incident (七七事变), was a military clash between the Imperial Japanese Army and the 29th Army of China's National Revolutionary, and is regarded as the start of the Second Sino-Japanese War (中国抗日战争).

95 Zheng Wuchang, 1935, 呈请奖励汉文正楷活字版并请分令各属各机关相应推用, 以资提倡固有文化而振兴民族观感事 [Requesting the reward for Han Wen Zheng Kai movable type and requesting each department to use it accordingly to promote national cultural revival and foster national sentiments]. In: 河南省政府公报 [Henan Provincial Government Gazette].

The 'Han Wen Zheng Kai' typeface was also introduced to the Japanese market. In 1930s, Sanseido type foundry (津田三省堂) and Morikawa Ryobundo type foundry (森川龙文堂) both reproduced the 'Zu style' of the 'Han Wen Zheng Kai' typeface and began selling it in 1934 under the name of 'Zheng Kai Script Ti' (正楷书体).[96] The Japanese scholar Keinosuke Sato compared 'Han Wen Zheng Kai' with 'Zheng Kai Script Ti' by Nippon Type Industrial Co., LTD. (NTF) in his book *Kanji* published in 1973 (figure 6.37 & 38). NTF's modifications to the 'Han Wen Zheng Kai' were mainly in three aspects: enlarging the Zhong Gong; shortening the in and out strokes; unifying the angle of inclination of the horizontal strokes. Therefore, the overall appearance of 'Zheng Kai Script Ti' looks more uniform and stable, but it loses some of the Chinese callgraphic features.

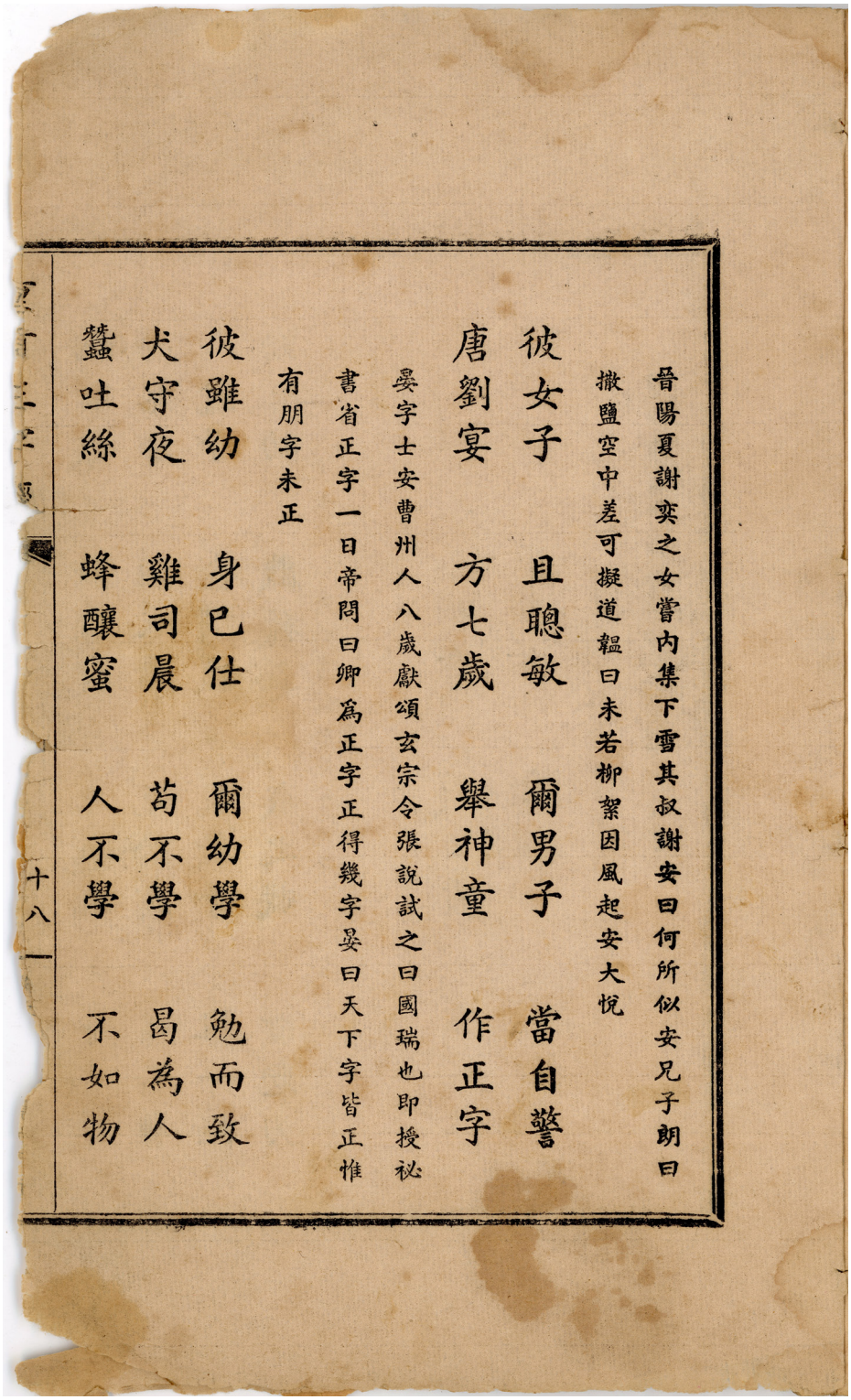
96 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], p. 167.



0 1 cm

Figure 6.35
Preface of the *Classic of Filial Piety* in Han Wen Zheng Kai edition published by Shanghai Han Wen Zheng Kai Printing House in 1936. Source: Zhou Bo (private collection).

Figure 6.36
A page of *Three Character Classic* printed with Han Wen Zheng Kai by Shanghai Han Wen Zheng Kai Printing House published in 1935. Source: Author (private collection).


晉陽夏謝奕之女嘗內集下雪其叔謝安曰何所似安兄子朗曰
撒鹽空中差可擬道韞曰未若柳絮因風起安大悅

彼女子　且聰敏　爾男子　當自警
唐劉晏　方七歲　舉神童　作正字

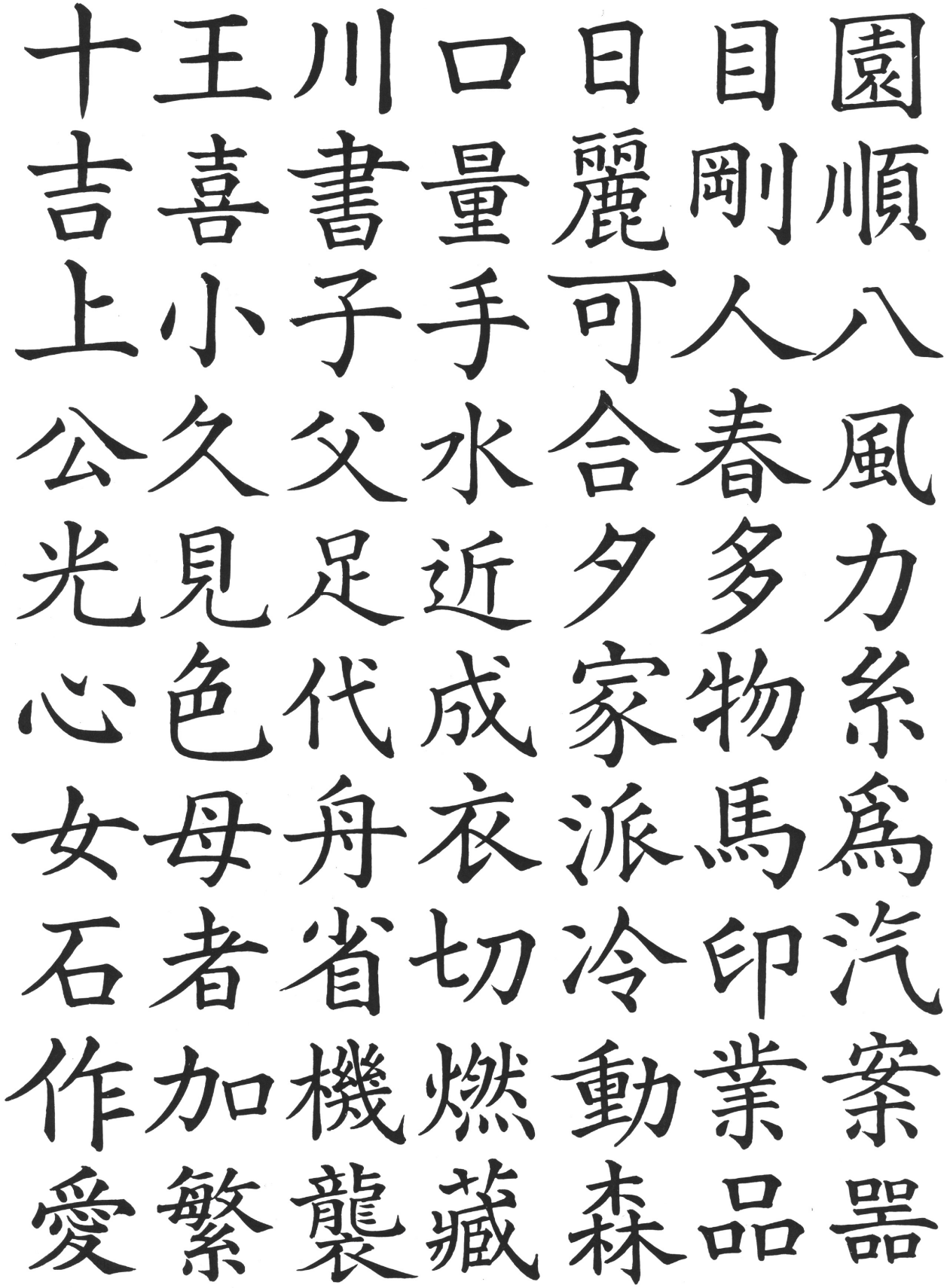
晏字士安曹州人八歲獻頌玄宗令張說試之曰國瑞也即授秘
書省正字一日帝問曰卿爲正字正得幾字晏曰天下字皆正惟
有朋字未正

彼雖幼　身已仕　爾幼學　勉而致
犬守夜　雞司晨　苟不學　曷爲人
蠶吐絲　蜂釀蜜　人不學　不如物

十八

0　1 cm

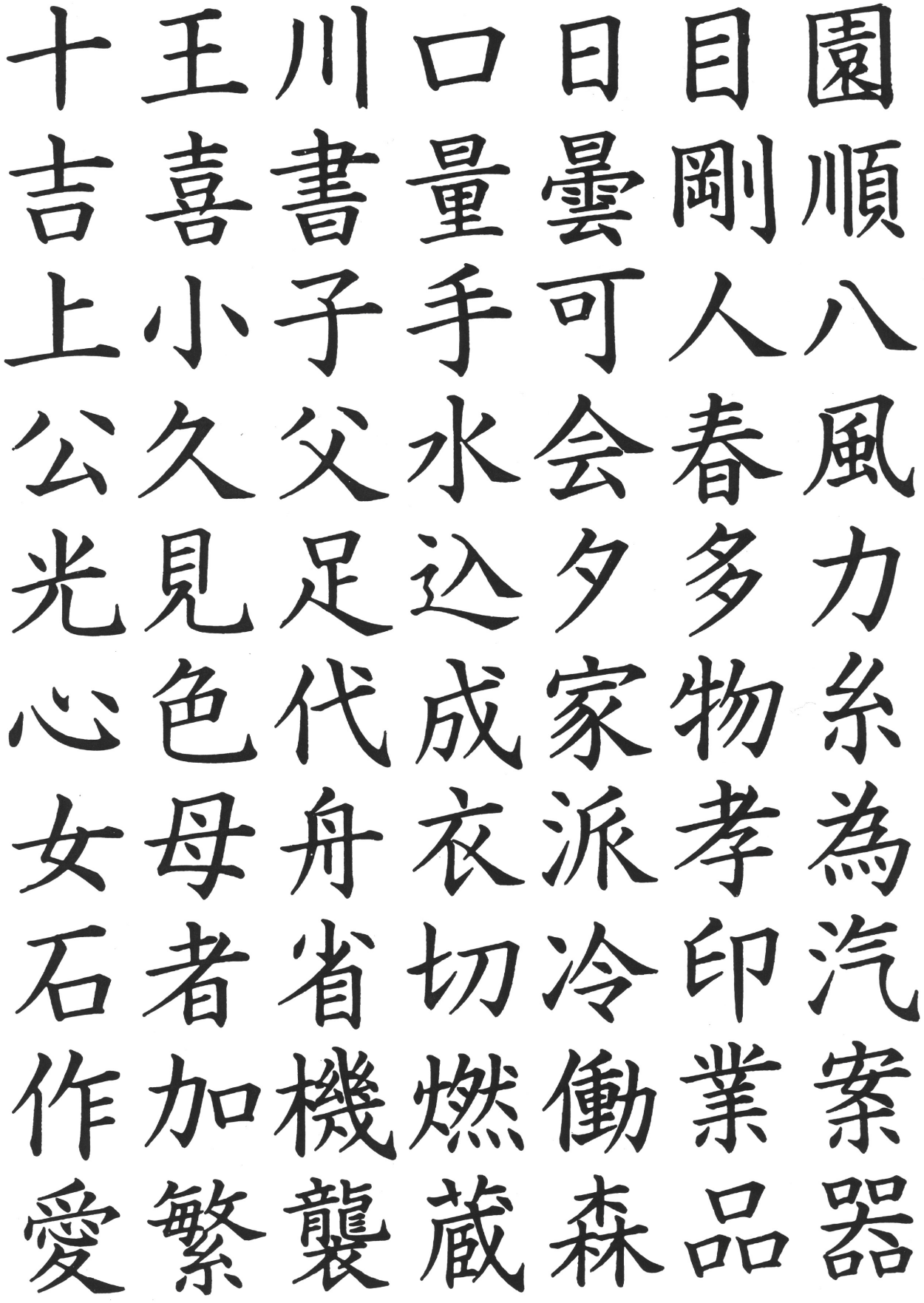
10 正楷書体　3号　鄭午昌　正楷印書局　1934年（昭和9）



Size unknown

Figure 6.37
Specimen of 'Han Wen Zheng Kai' in Size No. 3.
Source: Keinosuke Sato, 1973, 漢字 (Kanji), p. 91.

11 正楷書活字体 2号 日本活字工業



Size unknown

Figure 6.38
Specimen of 'Zheng Kai Script Ti' in size No.2 by Nippon Type Industrial Co., LTD.
Source: Keinosuke Sato, 1973, 漢字 (Kanji), p. 92.

'Hua Wen Zheng Kai' (华文正楷)

The development of 'Hua Wen Zheng Kai' began in 1930 and was completed by 1939, with the main contributors being Zhou Huanbin (周焕斌) and Chen Lvtan (陈履坦). During the initial development period, they both worked at the World Bookstore;[97] Zhou Huanbin was the engraver of 'Fang Gu Type,' a Fang-song Ti typeface developed by the World Bookstore.[98]

After the development of 'Hua Wen Zheng Kai' was completed, Zhou Huanbin, together with Tong Zhizhen (童致桢), Zheng Ruosun (郑若孙) and others, founded the Hua Wen Zheng Kai Copper Matrix Foundry in 1939, and issued the 'Hua Wen Zheng Kai' typeface.[99]

The original manuscript of 'Hua Wen Zheng Kai' was written by the calligrapher Chen Lvtan, and the engraving was done by Zhou Huanbin himself. The 'Hua Wen Zheng Kai' typeface includes eight sizes, ranging from size No. 1 to No. 6, as well as 4 Line and 5 Line, making it the most complete Chinese typeface in terms of sizes in the early 20th century (figure 6.39a–f).[100]

After its release, 'Hua Wen Zheng Kai', was praised by the printing and type-making industry and has been widely used (figure 6.40). He Buyun evaluated this typeface:

> Due to the unique style and structure of this typeface [Hua Wen Zheng Kai], it was extremely popular with printing houses at the time and was widely adopted. After the liberation [the establishment of the People's Republic of China in 1949], it was refurbished and supplemented, and is still in use.[101]

Zhou Jincai (周今才), a typeface designer who was employed at the Shanghai Printing Technology Research Institute (上海印刷技术研究所) during the 1960s, participated in the upgrade of the 'Hua Wen Zheng Kai' and 'Han Wen Zheng Kai' typefaces. He noted that the quality of the original manuscripts for the 'Hua Wen Zheng Kai' did not match that of the 'Han Wen Zheng Kai'. However, thanks to Zhou Huanbin's superior engraving skills, the deficiencies in the original manuscripts were corrected during the engraving stage, resulting in a Kai Ti typeface that surpassed the 'Han Wen Zheng Kai' in quality (figure 6.41a & b).[102]

97 World Bookstore (世界书局) is a printing and publishing company founded by Shen Zhifang (沈知芳) in Shanghai in 1921.

98 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 172–176.

99 Ibid; *Survey of the Hua Wen Zheng Kai Copper Matrix Foundry*, stored in the Shanghai City Archives, Q78–2–15672.

100 Ibid.

101 He Buyun, 1989, [The small history of Chinese movable type], p. 80.

102 Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 175–176.

In 1949, a businessman by the name of Xu Hongzhang (许鸿章) transported the 'Hua Wen Zheng Kai' typeface from Xiamen to Taiwan and established the Feng Xing Type Foundry (风行铸字社) in Taipei. In comparison with the founts developed by Japan during its rule in Taiwan (1895–1945), 'Hua Wen Zheng Kai' displayed a greater number of calligraphic features and was highly acclaimed in the printing and type-making markets in Taiwan. Following this success, type foundries in Taiwan began to replicate Kai Ti typefaces using 'Hua Wen Zheng Kai' as their base model.[103]

103 Lin Yijun, 2015, 遇見全台最美的風行正楷字 [Encounter with the most beautiful Feng Xing Zheng Kai typeface in Taiwan]. In: 台灣高鐵車上刊物 (T Life), 2015:69, pp. 40–42.

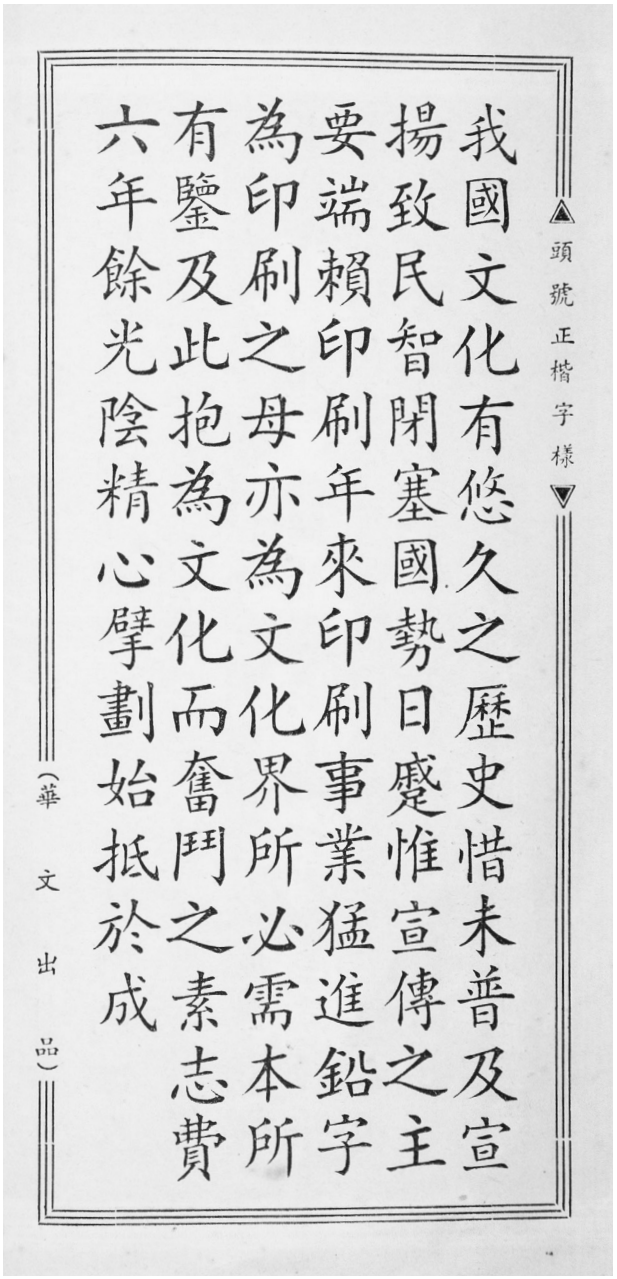


Figure 6.39a
Specimen of 'Hua Wen Zheng Kai' in size No. 1 in the *Spcimen of Hua Wen Zheng Kai.*
Source: Su Shipeng (private collection).

0 1 cm

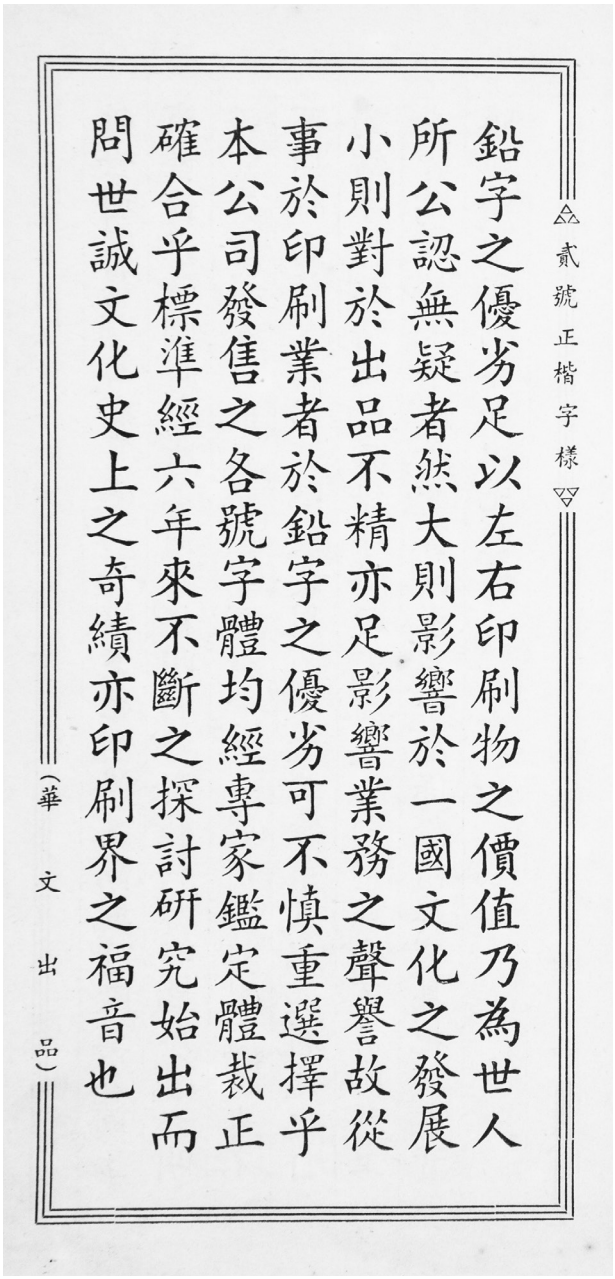


Figure 6.39b
Specimen of 'Hua Wen Zheng Kai' in size No. 2.

0 1 cm

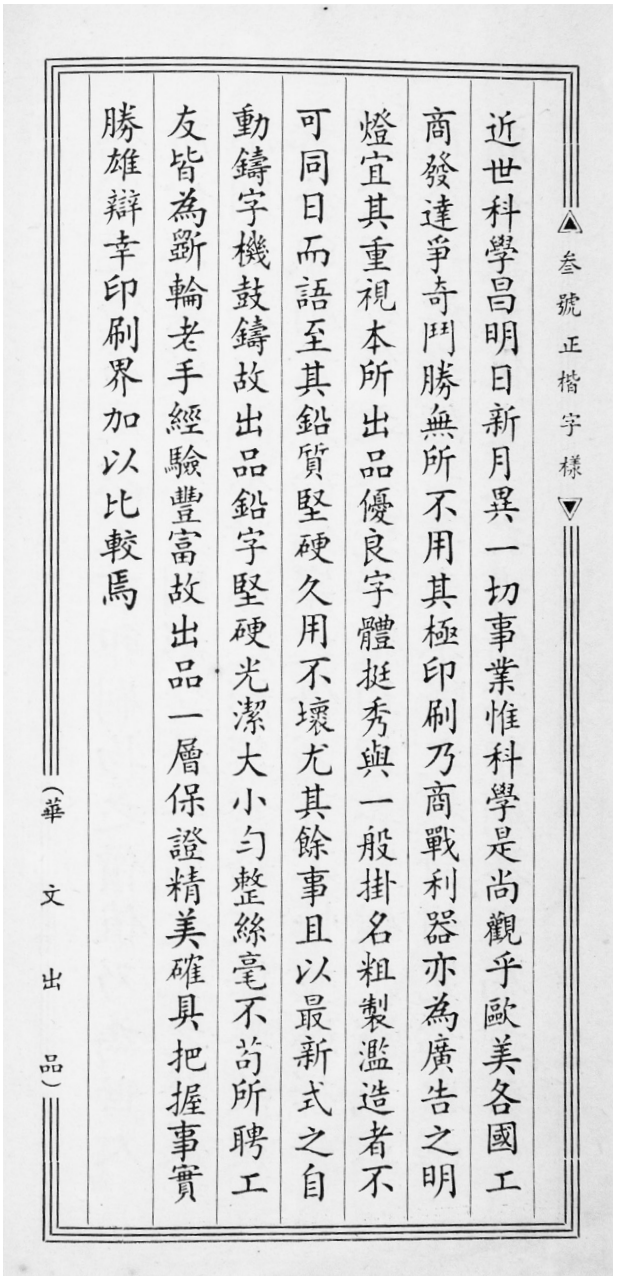


Figure 6.39c
Specimen of 'Hua Wen Zheng Kai' in size No. 3.

0 1 cm

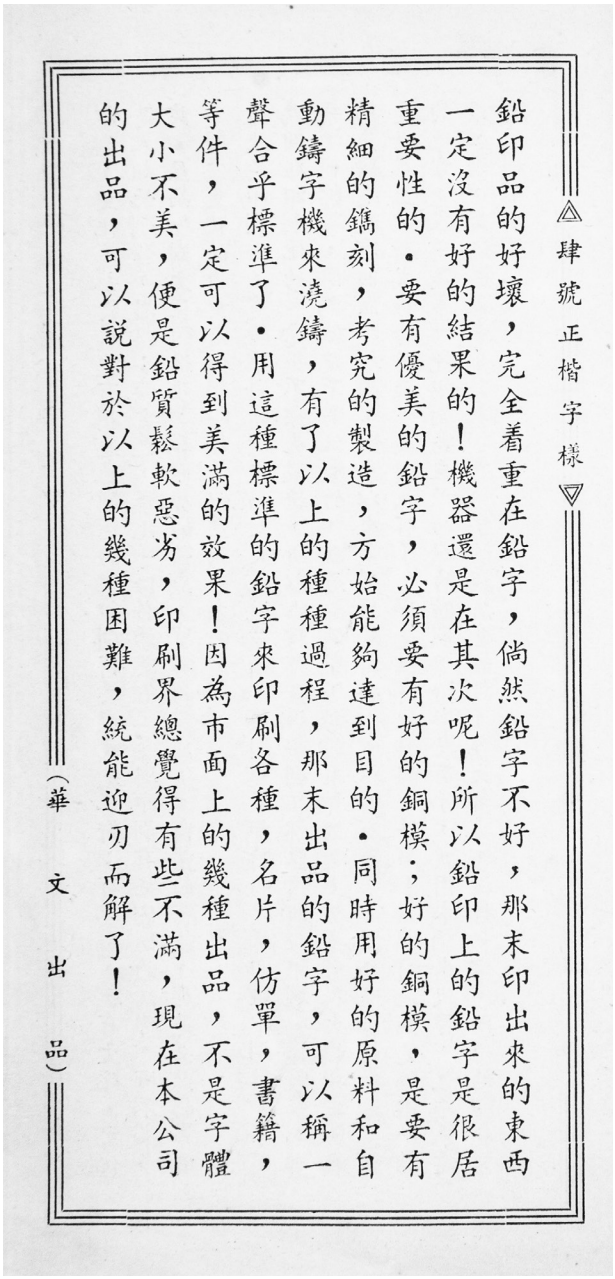


Figure 6.39d
Specimen of 'Hua Wen Zheng Kai' in size No. 4.

0 1 cm

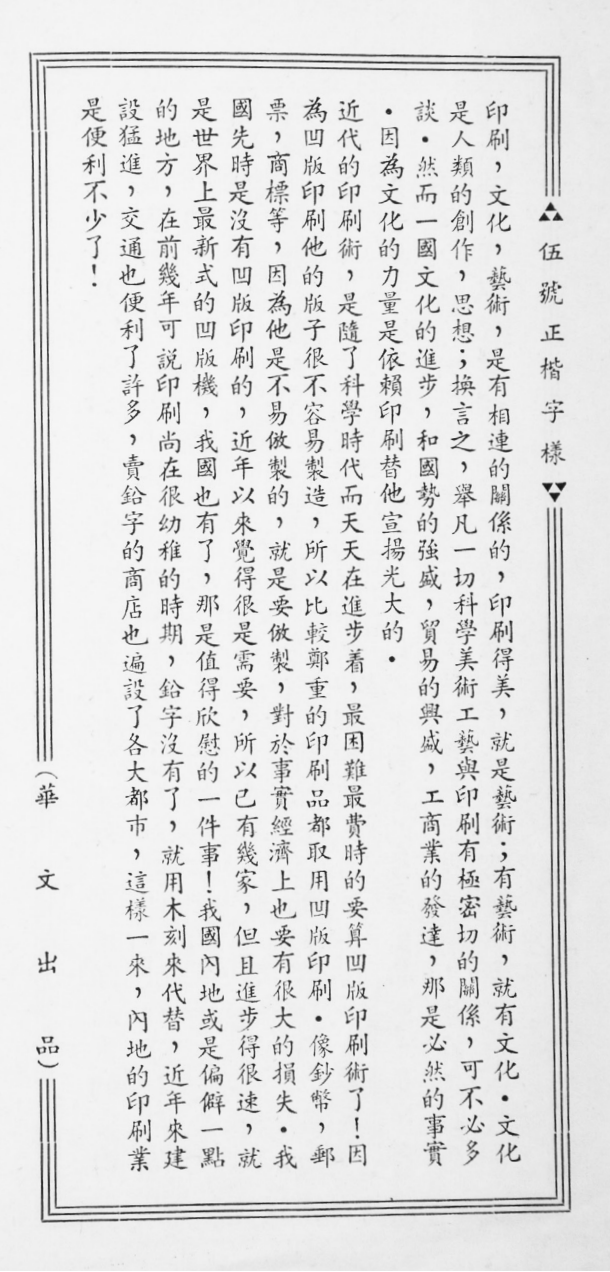


Figure 6.39e
Specimen of ‘Hua Wen Zheng Kai’ in size No. 5.

0 1 cm

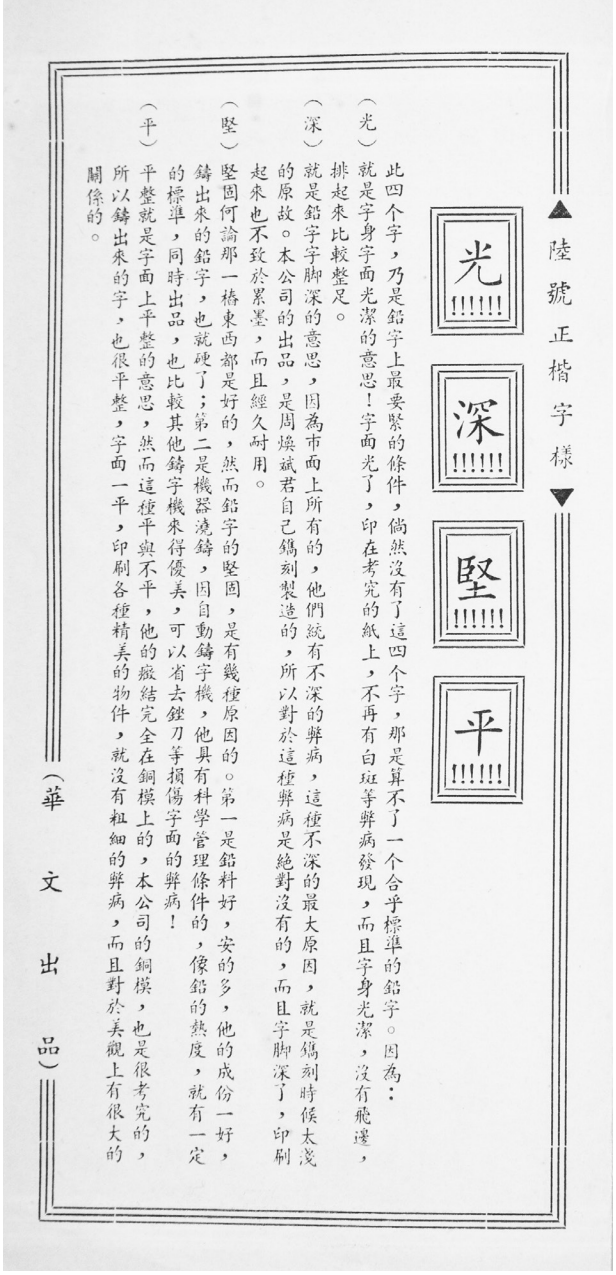
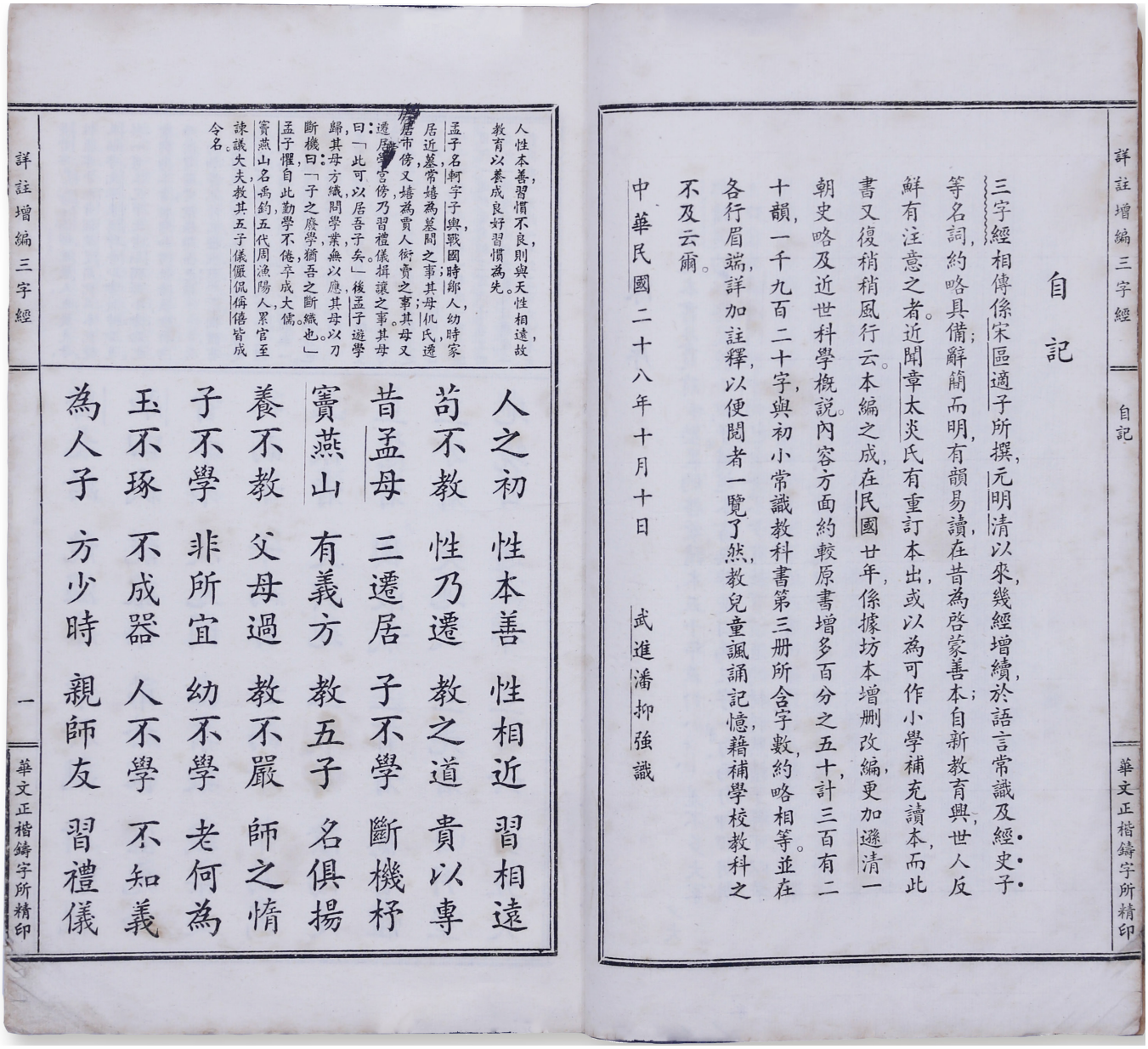


Figure 6.39f
Specimen of ‘Hua Wen Zheng Kai’ in size No. 6.

0 1 cm



詳註增編三字經 自記

自記

三字經相傳係宋區適子所撰，元明清以來，幾經增續，於語言常識及經、史、子等名詞，約略具備；辭簡而明，有韻易讀，在昔為啓蒙善本，自新教育興，世人反鮮有注意之者。近聞章太炎氏有重訂本出，或以為可作小學補充讀本，而此書又復稍稍風行云。本編之成，在民國廿年，係據坊本增刪改編，更加遴清一朝史略及近世科學概說，內容方面約較原書增多百分之五十，計三百有二十韻，一千九百二十字，與初小常識教科書第三冊所含字數，約略相等。並在各行眉端，詳加註釋，以便閱者一覽了然，教兒童諷誦記憶，藉補學校教科之不及云爾。

中華民國二十八年十月十日　武進潘抑強識

詳註增編三字經 一

人之初　性本善　性相近　習相遠
苟不教　性乃遷　教之道　貴以專
昔孟母　三遷居　子不學　斷機杼
竇燕山　有義方　教五子　名俱揚
養不教　父母過　教不嚴　師之惰
子不學　非所宜　幼不學　老何為
玉不琢　不成器　人不學　不知義
為人子　方少時　親師友　習禮儀

人性本善，習慣不良，則與天性相遠，故教育以養成良好習慣為先。

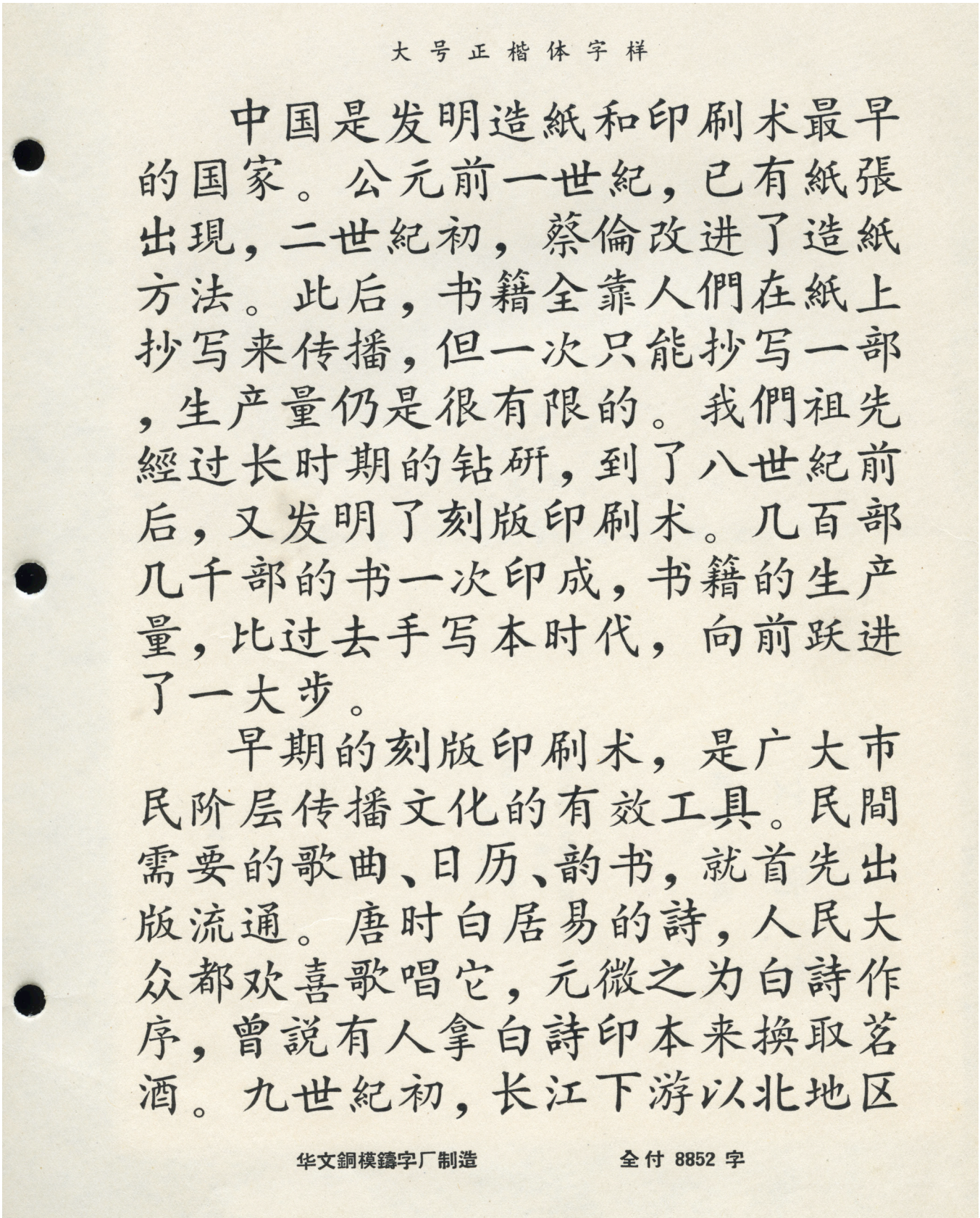
孟子名軻字子輿，戰國時鄒人，幼時家居近墓，常嬉為墓間之事；其母仉氏，遷居市傍，又嬉為賈人衒賣之事；其母又遷居學宮傍，乃習禮儀揖讓之事。其母曰：「此可以居吾子矣。」後孟子遊學歸，其母方織，問學業無以應，其母以刀斷機曰：「子之廢學，猶吾之斷織也。」孟子懼，自此勤學不倦，卒成大儒。

竇燕山名禹鈞，五代周漁陽人，累官至諫議大夫，教其五子儀儇佩儕皆成令名。

華文正楷鑄字所精印

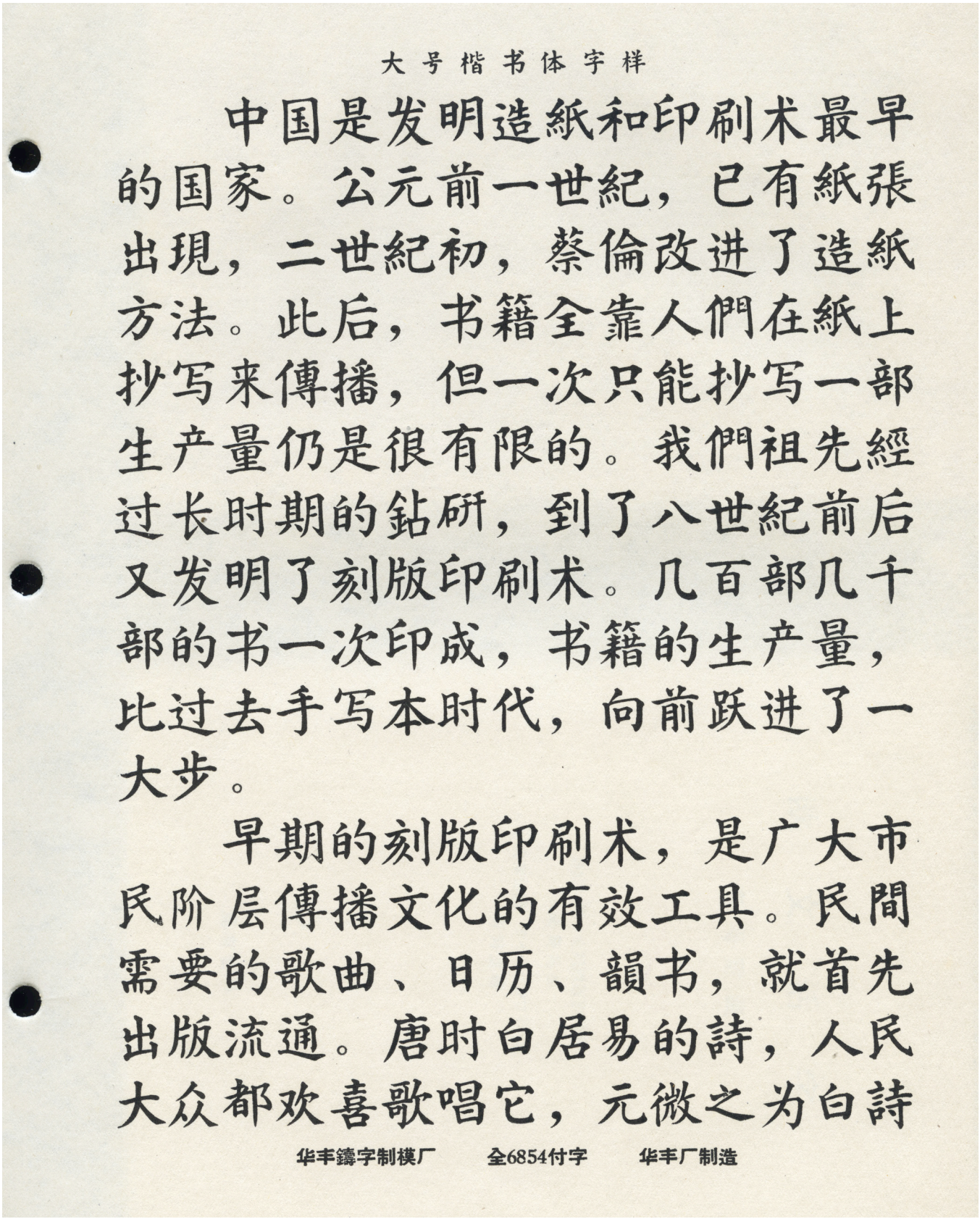
Figure 6.40
Application of 'Hua Wen Zheng Kai' in the *Detailed Annotated and Enlarged Three Character Classic* printed in 1940.
Source: Zhou Bo (private collection).

Size unknown



0 1 cm

Figure 6.41a
Specimen of 'Hua Wen Zheng Kai' in size No. 1 from the *Survey of Printed Movable Type Specimen* printed in 1948. Some of the Chinese characters have been modified to their simplified versions.
Source: Li Zhiqian (private collection).



0 1 cm

Figure 6.41b
Specimen of 'Han Wen Zheng Kai' in size No. 1 from the *Survey of Printed Movable Type Specimen* printed in 1948. Some of the Chinese characters have been modified to their simplified versions.

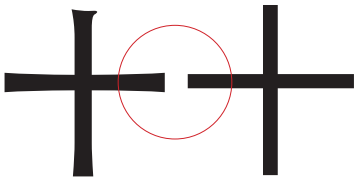


Figure 6.42
Chinese character '十' in two Hei Ti fonts.
Font in use: STHeiti (Left) and Noto Sans CJK SC, Regular (right).

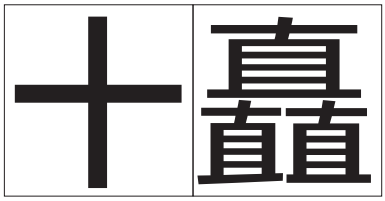


Figure 6.43
Chinese characters '十' and '矗' in a Hei Ti font.
Font in use: Noto Sans CJK SC, Regular.

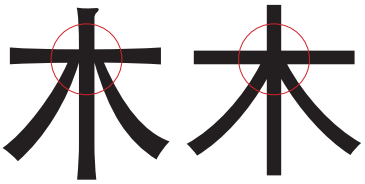


Figure 6.44
Chinese character '木' in two Hei Ti fonts.
Font in use: STHeiti (Left) and Noto Sans CJK SC, Regular (right).

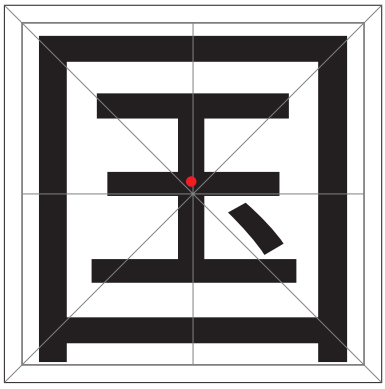


Figure 6.45
Chinese character '国' in a Hei Ti font. The red dot represents the Zhong Xin.
Font in use: Noto Sans CJK SC, Regular.

6.5 Development of Hei Ti founts

Hei Ti, also known as 'Bold Ti' (粗体), 'Square-head Ti' (方头体), or 'Square-head Hei Ti' (方头黑体), is a category of Chinese typefaces, typically used as a complementary style to Song Ti typefaces.[104] In its name, the character 'Hei' (黑) literally means 'black', representing the heavier type colour of Hei Ti compared to other Chinese typeface styles, thus making it more effective in capturing the reader's attention.

In terms of classification, Hei Ti can be likened to sans-serif in Latin typefaces, sharing features such as uniform stroke thickness and terminals that conclude without any additional strokes or decorations (figure 6.42). Given that Chinese typeforms of different complexity in a fount are confined to a fixed square frame (Type Body), along with the increase in the number of strokes in a Chinese character, the thickness of the strokes becomes correspondingly thinner (figure 6.43). Traditional Hei Ti typefaces are often decorated with 'bell mouth' (喇叭口) shapes at the stroke terminals to address the issue of excessive weight at the intersection of strokes (figure 6.44), echoing traditional calligraphic features. Additionally, the structure of Hei Ti typefaces is similar to Song Ti, with a large Zhong Gong and the Zhong Xin positioned near the centre of each character (figure 6.45).

Origin of Hei Ti

There is currently a lack of specific research regarding the origin of Hei Ti founts, making it challenging to pinpoint the exact years of their emergence. However, given that the typefaces brought to Japan by William Gamble in 1869 consisted only of Song Ti style, it is plausible that Hei Ti founts were later developments by Japanese typographers. The development of Hei Ti typefaces by the Japanese might have been inspired by the introduction of sans-serif typefaces, referred to as Gothic, from the United States during the Meiji period (1868–1912).[105] In 1903, the Tokyo Tsukiji Type Foundry issued the 'Type Specimen of Printing' (活版见本), which included a Hei Ti typeface in sizes No. 2 to No. 5 (figure 6.46) as well as imported American Gothic typefaces (figure 6.47).

The origin of the Hei Ti typeface in China remains a subject of controversy, with arguments positing that it either evolved under the direct influence of Western sans-serif or was introduced from Japan.[106] However, no conclusive evidence exists to confirm that China's Hei Ti typeface developed under the direct influence of Western sans-serif. Instead, it seems more plausible that the typeface was introduced from Japan.

In 1900, during its formative years, the Commercial Press acquired the Xiuwen Library, the Shanghai branch of the Tokyo Tsukiji Type Foundry. Gao Fengchi (高凤池), in his 'History of the Establishment of the Commercial Press', narrates the process of this acquisition:

> A Japanese printing house named Xiuwen Library, struggling due to poor management, decided to sell its entire business. This opportunity

104 Hiroshi Komiyama, 2014, 黑体字的现状与未来新世界的构建(上) [The present state of Hei Ti and the construction of a new world (Part 1)]. In: 设计艺术 (Art of Design), 2014:4, p. 90.

105 Ibid.

106 Li Shaobo, 2011, 中国黑体字源流考 [Investigation on the origination of Chinese Heiti]. In: 装饰 (ZHUANGSHI). 2011:3, pp. 38–43.

Figure 6.46
Specimen of the Tsukiji Goshikku-tai (Gothic style, Hei Ti) in sizes No. 2 to No. 5.
Source: NDL Digital Collection.

0 1 cm

Figure 6.47
Specimen of the imported American Gothic typefaces by the Tokyo Tsukiji Type Foundry.
Source: NDL Digital Collection.

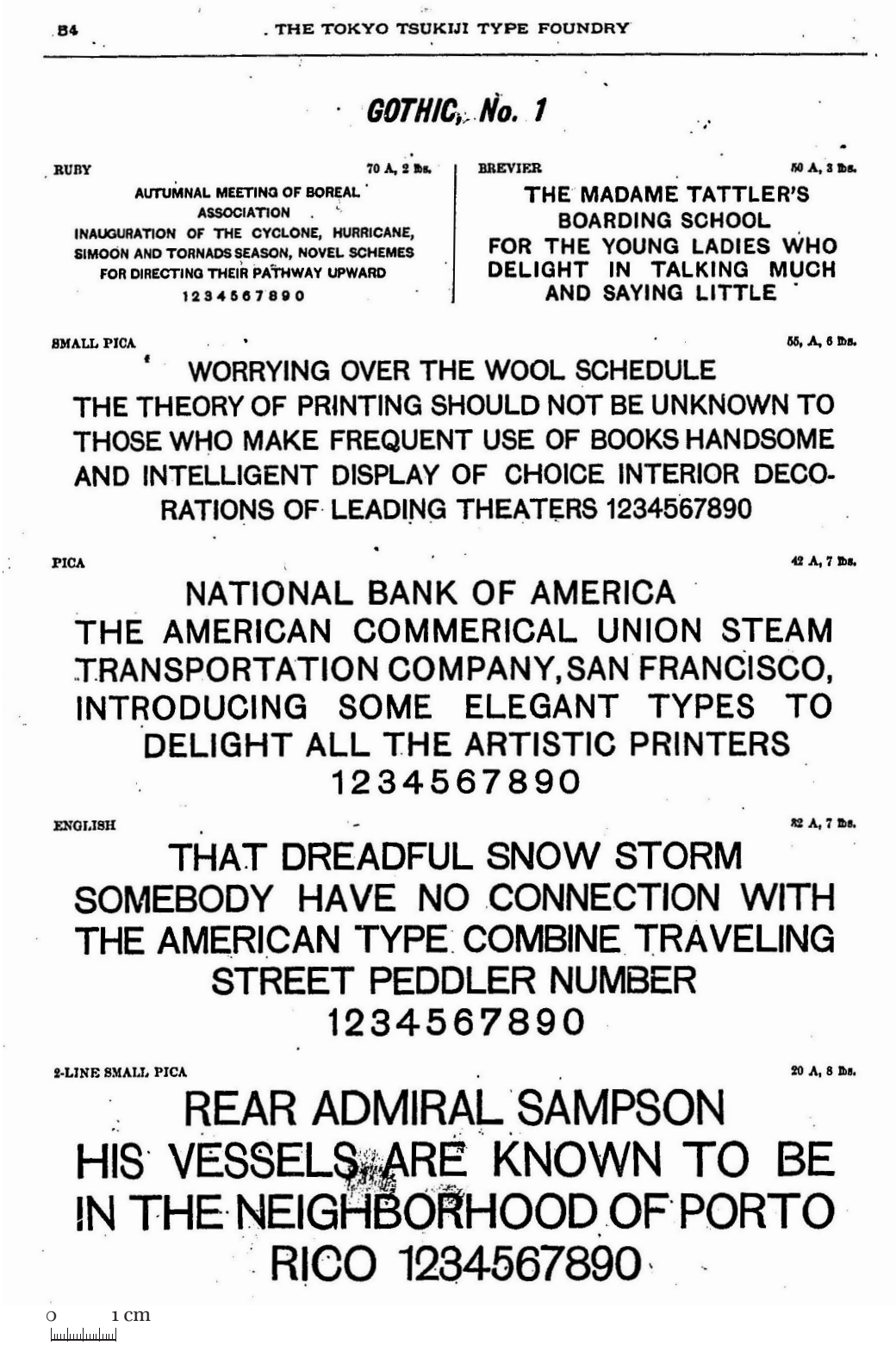
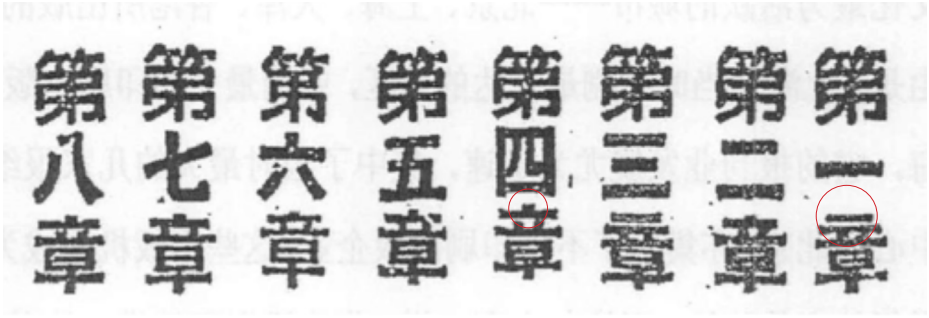


Figure 6.48
Use of Hei Ti founts appeared in the book *History of Chinese and Foreign Education* published by the Commercial Press in 1914 .
Source: Li Shaobo.



Size unknown

> was introduced to the Commercial Press by Mr. Yin Xizhang [印锡璋], who advised the Press to make the purchase. The deal was very economical, including various sizes of printing machines, copper matrices, type cutters, and materials, all in excellent condition. This acquisition greatly expanded the Commercial Press, transforming it into a large-scale printing house. In addition to using the equipment for its own printing needs, it also sold supplies for retail sales, which generated significant profits. This marked the firm establishment of the Commercial Press's business foundation.[107]

From this account, it can be inferred that the Commercial Press likely introduced the Hei Ti founts via the copper matrices acquired from the Xiuwen Library. Notably, the use of Hei Ti founts appeared in the book *History of Chinese and Foreign Education* (中外教育史), published by the Commercial Press in 1914 (figure 6.48). However, the Hei Ti fount was only used in words such as 'Chapter I' (第一章), to identify chapters. Moreover, the Hei Ti fount exhibited an issue of multiple typeforms for the same character. For instance, the first stroke, the dot, of the character '章' is represented in two distinct ways: as a vertical dot and a horizontal dot (figure 6.37).[108] This discrepancy could potentially be attributed to the Commercial Press's refinement of the Japanese Hei Ti founts after their introduction, during which the original types may have been used temporarily in the typesetting process.

In the *Chinese Education in the Last Thirty-five Years*, published in 1931, the Commercial Press incorporated a Hei Ti fount named 'Square-head Hei Ti' into 'Chinese Movable Type Size and Style', a type specimen issued by the Press itself (figure 6.49).

Figure 6.49
Specimen of the 'Square-head Hei Ti', detail enlarged from Figure 6.1.
Source: Author (private collection).

107 Gao Hanqing, 2004, 本馆创业史 [History of the Establishment of the Commercial Press]. In: 中国出版史料: 近代部分 [Chinese publishing historical materials: Modern section], 2004:3, pp. 50–51.

108 Li Shaobo, 2008, 黑体字研究 [The Research on Heiti Type] (Ph.D. Thesis, Central Academy of Fine Arts), p. 48.

Development and application of Hei Ti

With the introduction of Hei Ti founts into the Chinese printing and type-making industry, several type foundries, in addition to the Commercial Press, also began to produce Hei Ti founts. One such foundry was Zhu Tian New Song Copper Matrix Foundry (竹天新宋铜模铸字所); this foundry promoted their newly produced Hei Ti typeface through advertisements in several issues of *The Graphic Printer* (艺文印刷月刊) from 1937 to 1940. The advertisements specified the availability of the Hei Ti typeface in five different sizes, ranging from No. 1 to No. 5 (figure 6.50).[109]

However, during the early 20th century, Hei Ti typefaces were not the primary focus of type foundries, and their application was not as widespread as Fang-song Ti and Kai Ti typefaces. Nevertheless, the distinct functions and forms of Hei Ti typefaces gained recognition within the printing industry. Wang Naichang (汪乃昌) captured this in his 1937 article 'Review of Chinese and Foreign Typefaces'. He categorised Song Ti as the most popular typeface, Fang-song Ti and Kai Ti as the most aesthetically pleasing, and Hei Ti as the most suitable for headlines.[110]

Despite the slow progression in the development of Hei Ti typefaces during the early 20th century, the fundamental features of Hei Ti continued to evolve. The most notable trend in this transformation was the diminishing emphasis on calligraphic features and the increasing shift towards geometric stroke characteristics. For instance, the previously mentioned 'bell mouth' shapes at the stroke terminals, though an abstract rendition of calligraphic features, exhibit a predominantly geometric shape. Its purpose is explicit: it is a specially pre-designed detail aimed at preventing the ink from spreading under pressure during the printing process, thereby preserving the integrity of the character shape. This alteration signifies a modification and refinement of the typeface at a technical level, and it underscores the growing technical sophistication of the Hei Ti typefaces.[111] Furthermore, it laid the foundations for Hei Ti to become a commonly used text typeface in the digital age.

109 Liu Longguang, 1985, 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940).

110 Wang Naichang, 1985, 中外字体之检讨 [Review of Chinese and foreign typefaces], 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940), pp. 38–40; Li Shaobo, 2008, 黑体字研究 [The Research on Heiti Type] (Ph.D. Thesis, Central Academy of Fine Arts), p. 153.

111 Li Shaobo, 2008, 黑体字研究 [The Research on Heiti Type] (Ph.D. Thesis, Central Academy of Fine Arts), pp. 154–155.

0 1 cm

Figure 6.50
Advertisement for founts selling by the Zhu Tian New Song Copper Matrix Foundry in the *The Graphic Printer*.
Source: Liu Longguang, 1985, 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940), p. 9.

Conclusion

This chapter describes the establishment of the Chinese type size system and chronologically maps the evolution of the Song Ti, Fang-song Ti, Kai Ti and Hei Ti typefaces during the early 20th century. The development of Chinese typefaces during this epoch was predominantly spearheaded by private Chinese printing establishments centred in Shanghai, the city at the zenith of economic and cultural prosperity at the time.

At the beginning of the 20th century, the field of printing and type-making in China was dominated by the Song Ti and Hei Ti typefaces imported from Japan. Although the improved missionaries' founts of Japanese typographers were highly functional, the Chinese pioneers in the field of printing and type-making generally believed that the highly stylised Song Ti typefaces, which starkly deviated from their calligraphic roots, failed to meet the aesthetic needs of the Chinese people. They posited that Chinese founts should incorporate traditional Chinese calligraphic elements to encourage and revitalise the country's traditional culture. Consequently, Chinese typographers devised the Kai Ti and Fang-song Ti typefaces, drawing inspiration from traditional Chinese calligraphy and woodblock printing and combining these elements with the Western type-making techniques introduced by missionaries.

Moreover, the development of these founts steeped in traditional calligraphy and woodblock printing, was far from a mere imitation of form. Rather, it entailed an in-depth comprehension of Chinese characters and conventions. In the 1930s, Japanese type foundries imported ' Juzhen Fang-song Ti,' 'Han Wen Zheng Kai', and 'True Song' developed by Chinese type foundries, demonstrating the advanced level of expertise possessed by the Chinese type foundries.

Regarding Chinese typeforms, the diversity of Chinese typefaces expanded considerably in the early 20th century. On the one hand, founts incorporating traditional calligraphic features were crafted, thereby preserving traditional culture and conventions. On the other hand, Chinese founts were subject to the influence of Western sans-serif, veering towards a geometric approach. These two aspects significantly broadened the assortment of Chinese typefaces, enhancing the founts' aesthetic appeal and functional utility.

The four main styles of Chinese typeface, Song Ti, Fang-song Ti, Kai Ti and Hei TI, were also progressively established in the early 20th century. Regrettably, this evolution was halted by the outbreak of the War of Resistance against Japanese Aggression in 1937. It was not until the foundation of the People's Republic of China in 1949 that the reform of Chinese characters was recognised as a vital component of modernising and safeguarding socialism and was consequently prioritised by the central government. As a result, Chinese typeface design resumed its systematic development in tandem with the reform of Chinese characters.

Chapter 7. Conclusion

7.1 Key findings

The aim of the present research was to investigates the evolution of Chinese typeforms, spanning the invention of early Chinese movable type printing in the eleventh century to the localisation of Western mechanical metal types in China in the early 20th century. Firstly, this study examines the development of Chinese typeforms along two distinct routes: one within China and the other in Europe. The convergence point of these routes occurred in the 19th century when missionaries travelled to China, fostering further advancements in Chinese typeforms, particularly in the early 20th century. Consequently, this thesis delineated the development of Chinese typeforms into four main stages: The origin and development of early Chinese movable type, Chinese movable type in Europe, Chinese movable type in Asia and Chinese founts in the early 20th century.

Movable type printing technology originated in 11th-century China. Under this new technological medium, Chinese typeforms were primarily based on rich handwriting styles and the printed character styles of woodblock printing, resulting in no particularly noticeable changes in typeform. This was partly due to the fact that early movable type printing in China did not replace woodblock printing as the mainstream technique for printing Chinese characters before the introduction of Western typographic technology. Another probable contributing factor was that over three thousand years of writing and more than a thousand years of woodblock printing, Chinese characters had already developed diverse writing styles and highly standardised character forms. The innovation of movable type and typographical printing did not introduce new typeforms for Chinese characters. In order to adapt to early printing with type, the typeforms of Chinese characters in fact lost some of their original aesthetic attributes.

In the 18th and 19th centuries, with the establishment of sinology as a field of study, European sinologists and printers attempted to produce Chinese founts; they sought to combine Chinese characters with Western movable type printing technology. Although the shape of characters in their founts were imitations of those found in books imported from China, many attributes of Chinese characters were lost. This push to conform to Western typefounding and printing technology however also led to the invention of many new methods of making Chinese types, such as divisible type and constructed type. These new methods opened up new possibilities for the production of Chinese founts.

The 19th century marked a turning point; missionaries introduced Western typography in China and successfully addressed the technical challenges of Chinese type-making, in particular with the introduction of the electrotyping method by William Gamble. Due to technical limitations and the dominance of missionaries who were not sufficiently familiar with Chinese aesthetics, the founts that were produced tended to emphasise functionality. They created simplified imitations based on the shapes of Chinese characters found in woodblock printing of the time. While Chinese engravers gradually became involved, the production of Chinese founts was primarily controlled by missionaries and foreign businesspeople, with limited participation from Chinese individuals. As a result, the quality of these founts never fully met aesthetic standards or adhered to Chinese con-

ventions. Though these founts lacked refinement, they underwent further improvements after being introduced to Japan by William Gamble and were later reintroduced to China, eventually evolving into the distinctive Song Ti style.

This fuelled the final stage of development documented in the thesis—the emergence of refined, culturally resonant Chinese typeforms in the early 20th century. Chinese typographers devised the Kai Ti and Fang-song Ti typefaces, drawing inspiration from traditional Chinese calligraphy and woodblock printing and combining these elements with the type-making techniques introduced by missionaries. In addition to this, Chinese typeforms were also influenced by Western sans-serif, resulting in the emergence of the Hei Ti typefaces. Thus, the four main styles of Chinese typefaces, Song Ti, Fang-song Ti, Kai Ti and Hei Ti, were finally established in the early 20th century.

To summarise, this thesis has traced the journey of Chinese typeforms from their inception into movable type, illuminating the complex interplay of local conventions, technological innovations, and intercultural influences that shaped typeforms evolution. It begins with the early styles rooted in handwriting and woodblock printing, continues through the bold Western innovations and Chinese founts primarily serving religious purposes with a focus on functionality, ending with the amalgamation of aesthetics and functionality in the twentieth century, resulting in the formation of four distinct styles of Chinese typeforms.

Reviewing and summarising the scope of this thesis, it can be stated that it has assembled a comprehensive genealogy of Chinese typeforms, elucidating their origins and evolution across printing technologies and cultural boundaries. It has shown how Chinese characters were transformed into movable typographic forms, mediated by traditional conventions, technological innovations, and cross-cultural exchanges.

The findings provide an enriched perspective on Chinese typographic history and form a framework to inform future research and practice. It illuminates profound historical complexities surrounding moveable type design for non-Latin writing systems.

7.2 Contributions

The primary contribution of this study lies in its exploration of typography as an independent field dedicated to Chinese characters, distinct from branches such as the Science of Chinese Characters, calligraphy, and printing history. While typography is a clearly defined domain within Latin typefaces, it is gradually establishing itself as a distinct discipline within the realm of Chinese typefaces. Furthermore, while the advent of mechanical movable type printing technology by Gutenberg marks the genesis of Latin typography, this study expands the historical context by tracing back to Bi Sheng's invention of ceramic movable type.

Another contribution of this study is its integration of knowledge from various fields, such as the Science of Chinese characters, Chinese calligraphy and woodblock printing. This integration offers English readers a comprehensive understanding of Chinese characters themselves as well as the writing and engraving styles of the characters. Through the analysis of Chinese characters, the thesis has provided insights into the principles of Chinese character construction, thus laying the necessary foundation for the later discussion of Chinese typeform development. Moreover, it shows

how the diverse script and engraving styles of Chinese characters in various historical periods became the stylistic source of Chinese typeforms.

This research introduces a novel method of analysis. On one hand, it examines individual Chinese characters based on their structural attributes at three levels—strokes, components, and characters—while also considering the context in which the Chinese typeforms were utilised. On the other hand, it evaluates Chinese typeforms from both aesthetic and functional aspects, aiming to elucidate the distinctive features of Chinese typeforms and their stylistic origins in different historical periods.

7.3 Challenges and future research

As is often the case with historical research, gathering information for this study was challenging, with gaps in the historical archives and at times insufficient evidence to underpin certain conclusions. Such cases have been highlighted throughout the text with the intention to avoid as much as possible any inaccuracies in the historical account.

The thesis has focused on typeforms up to the 20th century, and therefore is a historical account in the first instance. However, a comprehensive understanding of contemporary influences on Chinese typography is also necessary. Future research should extend into the 21st century, particularly considering the ever-growing impact of digital media. Optimizing Chinese typeface design becomes paramount in an era dominated by websites and mobile applications. Since the 1990s, the development of Chinese fonts has experienced exponential growth, albeit with room for enhanced quality. This challenge intensified in 2022 when the Chinese government issued the *GB 18030-2022* standard,[1] expanding the character set to 87,887 characters and 228 radicals, a significant increase from the 2005 version. Consequently, production costs rose.

An opportunity still exists for more efficient Chinese font production in digital environments, essential components for a Chinese text typeface number around 50 to 100 and digital platforms today provide greater flexibility for diverse Chinese font designs. Future research aims to delve into the precise demands of digital media, pioneering novel design techniques that enhance Chinese font readability and legibility in the digital realm.

1 The full name of the *GB 18030-2022* standard is *GB 18030-2022 Information Technology — Chinese coded character set* (信息技术 中文编码字符集), the updated Chinese government standard defining the required language and character support necessary for software in China.

Appendices

Appendix 1. 'Six Writings'

The original text of 'Six writings' in Chinese:

> 一曰指事，指事者视而可识，察而见意，上下是也。二曰象形，象形者画成其物，随体诘诎，日月是也。三曰形声，形声者以事为名，取譬相成，江河是也。四曰会意，会意者比类合谊，以见指撝，武信是也。五曰转注，转注者建类一首，同意相受，考老是也。六曰假借，假借者本无其字，依声托事，令长是也。

The english translation of 'Six writings' refers to the translation of Gilbert L. Mattos and Jerry Norman in Qiu Xigui's *Chinese writing*. Xu Shen's explanation of the 'Six Writings' is relatively simple, and there is still no uniformity in the definitions of these six categories among later generations, as is attempted to be explained below:

> [Category 1. Zhi Shi (indicate things, 指事)]
> The first is called Zhi Shi. As for the Zhi Shi characters, when seen they can be recognised; when inspected their meaning becomes apparent. The characters '上' (above) and '下' (below) are such [Table A1, a & b].
>
> [Category 2. Xiang Xing (resemble form or pictograms, 象形)]
> The second is called Xiang Xing. As for the Xiang Xing characters, one makes a drawing of an object and follows the sinuosity of its physical form. The characters '日' (sun) and '月' (moon) are such [Table A1, c & d].
>
> [Category 3. Xing Sheng (form and sound, 形声)]
> The third is called Xing Sheng. As for the Xing Sheng characters, based on a thing, one creates a written word and takes a [phonetically] analogous one and combines them. The characters '江' (river) and '河' (river) are such [Table A1, e & f].
>
> [Category 4. Hui Yi (conjoining meanings or ideograms, 会意)]
> The fourth is called Hui Yi. As for the Hui Yi characters, [one] matches [semantic] types and combines their meanings in order to reveal the meaning which is indicated. The characters '武' (martial) and '信' (trust) are such [Table A1, g & h].
>
> [Category 5. Zhuan Zhu (evolving and deriving, 转注)]
> The fifth is called Zhuan Zhu. As for the Zhuan Zhu, one establishes [characters of] similar categories under one head, by the shared meanings they are mutually (connected) related. The characters '考' (deceased father) and '老' (aged) are such [Table A1, i & j].
>
> [Category 6. Jia Jie (loan-borrowing, 假借)]
> The sixth is called Jia Jie. As for the Jia Jie characters, originally having no proper characters, by just relying on the sound, it [the sound] is entrusted to the thing [referred to]. The characters '令' (to lead) and '长' (leader) are such [table A1, k–l].[1]

Regarding Xiang Xing characters, traditional linguist Duan Yucai (1735–1815, 段玉裁) of the Qing dynasty (1644–1911) in his *Shuowen Jiezi Zhu* completed in 1815, described that the difference between Zhi Shi and Xiang Xing is that

1 Xu Shen, 1963, [Shuowen Jiezi]; Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 151–153.

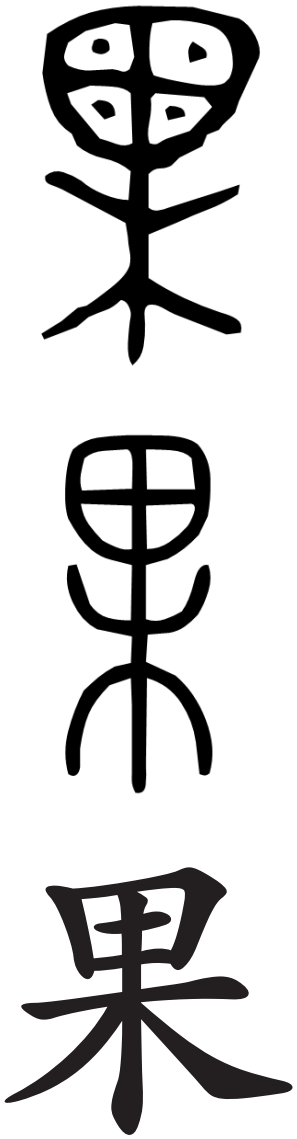


Figure A.1
Chinese character '果' (fruit) in three Chinese script styles, from top to bottom: the bronze script digitised from 'Guo Gui' (果簋) around the middle of the Western Zhou dynasty (1046–771 BC); the small seal script digitised from *Shuowen Jiezi* published in 1998, originally engraved by Chen Changzhi in the Qing dynasty (1644–1911), the script style was used in the Qin dynasty (221–207 BC); the Kai script, using the font, Kaiti SC Bold, from SinoType.

Xiang Xing refers exclusively to one kind of thing, whereas Zhi Shi refers to various things.[2] However, contemporary linguist Tang Lan (1901–1979, 唐兰) believes that Zhi Shi characters were originally signs, abstract rather than physical pictures. When signs are used as characters, they take the form of picture writing; therefore, they still belong to Xiang Xing characters (pictograms), and there is no need for a separate category for abstract pictograms.[3]

According to Xu Shen, Xiang Xing characters are shapes that depict specific things. However, Shen went beyond his definition when analysing Chinese characters in *Shuowen Jiezi*. Some Xiang Xing characters are complex and difficult to draw in isolation or are easily confused with other things when drawn in isolation. Therefore, when creating the character, the things related to it, such as the surrounding environment or the subject attached to it, are indicated together; for example, the character '果' (fruit) consists of the component '田' and '木', like the shape of a fruit on top of a tree (figure A.1). It would be easy to confuse a fruit shape with other things if it is drawn alone, so the 'tree' to which the fruit is attached was drawn along with it.[4]

Xing Sheng characters are generally considered to be composed of a semantic symbol and a phonetic symbol, for example the character '河' (river; Pinyin: he) consists of a variant of the semantic symbol '水' meaning water and the phonetic symbol '可' (Pinyin: ke).

Hui Yi characters are generally considered to be composed of two or more semantic components, which are compared and combined to form a new character, taking advantage of the semantic relationship between characters. In the examples given by Xu Shen, he explained in the *Shuowen Jiezi* that the character '武' (martial or prowess) is derived from the combination of the characters '止' (to stop) and '戈' (dagger-axe), meaning that halting weapons or putting a stop a war constitute true prowess.[5] The character '信' (trust) is derived from the combination of the characters '人' (person) and '言' (speech), which means that a person should have credit for what the person says.[6]

However, in today's perspective, Xu Shen's interpretation of the above two characters in Shuowen Jiezi is wrong. It is generally agreed that the character '信' would have been a Xing Sheng character, with the phonetic component '言'.[7] The character '武' appeared as early as the oracle bone script of the Shang dynasty when ancient Chinese writing had only pictograms and no ideograms. Therefore, the character '止' in the character '武'

2 *Shuowen Jiezi Zhu* (说文解字注) is a commentary on *Shuowen Jiezi*. Duan Yucai, 1992, 说文解字注 [Annotated *Shuowen Jiezi*].

3 Tang Lan, 2005, [The science of Chinese characters], p. 57.

4 'Six categories of Chinese characters', Encyclopaedia of China, third edition, online version. Available at: <www.zgbk.com/ecph/words?SiteID=1&ID=138399&Type=bkzyb&SubID=44720>.

5 This explanation originated in the *Zuo Zhuan* (左传), which is a chronicle of the history of the countries during the Spring and Autumn Period (770–476 BC) of ancient China. Tang, 2005, [The science of Chinese characters], p. 57.

6 This explanation originated in the *Guliang Zhuan* (穀梁传), which is one of the classic books of ancient Chinese history completed in the Han dynasty (202 BC–AD 220). Tang Lan, 2005, [The science of Chinese characters], p. 57; Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), p. 155.

7 Tang Lan, 2005, [The science of Chinese characters], p. 58.

originally means 'foot', and it cannot be taken to mean 'to stop' because 'to stop' refers to an idea or concept. Thus, the character '武' originally means 'a walker carrying dagger-axe', which was later extended to mean martial or prowess. Xu Shen's misunderstanding may be due to the fact that when he compiled Shuowen Jiezi, it was difficult for him to see the ancient writing (oracle bone script and small seal script) materials prior to the Qin dynasty (221–207 BC); therefore, he could only refer to the fabricated explanations of non-uniform glyphs from the late Warring States period (475–221 BC).[8]

The meaning of Zhuan Zhu is controversial, as in ancient Chinese scripts and Chinese proto-writing, there was often a phenomenon of one character representing multiple meanings, which is probably what Xu Shen referred to as 'by the shared meanings they are mutually (connected) related'. From the examples given by Xu Shen, the character '老' in ancient scripts denoted both itself and the character '考', which were later separated to refer to their respective meanings.[9] However, 'one establishes [characters of] similar categories under one head'; the definition of this point by Xu Shen is vague. It has been the subject of much discussion by later generations and has yet to be clearly explained.[10]

Xu Shen's definition of Jia Jie is to borrow a specific Chinese character to represent a Chinese word that is homophonic or similar in sound.[11] However, among the examples he cited, the character '令' and '长' can only be used to illustrate the phenomenon of semantic derivation, not the borrowing of characters for sound. According to the *Shuowen Jiezi*, '令' originally refers to 'issue orders' (发号) and '长' originally refers to 'far back' (久远). When '令' is used in '县令' (county magistrate) and '长' is used in '长官' (senior officer or official), Shen defined them as Jia Jie characters. However, this should be a semantic derivation: for 'issue orders' can be derived as 'directives' and 'decree', and in turn as 'a county magistrate who issues orders'; for 'far back' can be derived as 'old', and from this can be derived again as 'a senior officer or official'. By contrast, the character '豆' originally meant 'a vessel in which food is placed', and was later borrowed to mean 'beans' used in '豆麦' (beans and wheat), which should be the real Jia Jie.[12]

8 Ibid.

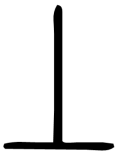
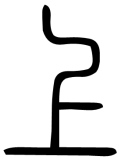
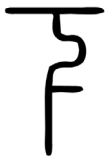
9 'Six categories of Chinese characters', Encyclopaedia of China, third edition, online version.

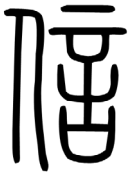
10 For more details, refer to Qiu Xigui's collation in *Chinese writing*. Qiu Xigui, 2000, *Chinese writing* (Gilbert, L. M., & Jerry, N., trans), pp. 157–163.

11 Chinese words are the basic units of Chinese language, and they represent individual meanings. A Chinese word can be a single character or a combination of characters.

12 Dai Tong, 1320, 六书故 [Liu Shu Gu] <ctext.org/datawiki.pl?if=gb&res=963990&remap=gb>; Li Xueqin, 2013, 字源 [Chinese character etymology].

Table A.1
Examples of Chinese characters listed in Xu Shen's explanation of the 'Six Writings' in four Chinese script styles, from left to right: the oracle bone script digitised from *Oracle bone script collection* (甲骨文合集); the ancient script (古文) and the small seal script from *Shuowen Jiezi Gulin Zhengbu Hebian* (说文解字诂林正补合编); the Kai script, using the font, Kaiti SC Bold, from SinoType.
Source: Guo, 1982, 甲骨文合集 [Oracle bone script collection], Zhonghua Book Company; Yang, 1997, 说文解字诂林正补合编 [Shuowen Jiezi Gulin Zhengbu Hebian], Ding Wen Book Bureau; https://xiaoxue.iis.sinica.edu.tw (accessed on 19 Sep 2023).

Oracle bone script	Ancient script (bronze script)	Small seal script	Kai script
			
a1	a2	a3	a4
			
b1	b2	b3	b4
			
c1	c2	c3	c4
			
d1	d2	d3	d4
(not found)			
e1	e2	e3	e4
			
f1	f2	f3	f4

Oracle bone script	Gu script (Bronze script)	Small seal script	Kai script
			
g1	g2	g3	g4
(not found)			
h1	h2	h3	h4
			
i1	i2	i3	i4
			
j1	j2	j3	j4
			
k1	k2	k3	k4
			
l1	l2	l3	l4

Appendix 2. A Brief Chinese Historical Timeline

This timeline includes only the major regimes of China, which cannot represent the whole history of China. 'The Brief Chinese Historical Timeline' refers to the 'Brief Chinese Historical Chronology' (中国历史纪年简表) from *The People's Republic of China Yearbook* published in 2022.
Source: 2022, *The People's Republic of China Yearbook*. Xinhua Publishing House. <www.gov.cn/test/2005-07/27/content_17445.htm>.

Years	Regimes	
c. 2070–*c.* 1600 BC	夏 Xia dynasty	
c. 1600–*c.* 1046 BC	商 Shang dynasty	
1046–771 BC	周 Zhou dynasty	西周 Western Zhou dynasty
770–256 BC		东周 Eastern Zhou dynasty
770–476 BC		春秋 Spring and Autumn period
475–221 BC		战国 Warring States period
221–207 BC	秦 Qin dynasty	
202 BC–AD 9	汉 Han dynasty	西汉 Western Han
AD 25–220		东汉 Eastern Han
AD 220–280	三国 Three Kingdoms	魏 Wei
AD 221–263		蜀 Shu
AD 222–280		吴 Wu
AD 265–316	晋 Jin dynasty	西晋 Western Jin
AD 317–420		东晋 Eastern Jin
AD 304–439	十六国 Sixteen kingdoms	
AD 386–581	南北朝 Northern and Southern Dynasties	北朝 Northern Dynasties
AD 420–589		南朝 Southern Dynasties
AD 581–618	隋 Sui dynasty	
AD 618–907	唐 Tang dynasty	
AD 907–979	五代十国 Five Dynasties and Ten Kingdoms	
AD 960–1127	宋 Song dynasty	北宋 Northern Song dynasty
AD 1127–1276		南宋 Southern Song dynasty
AD 916–1125	辽 Liao dynasty	
AD 1038–1227	西夏 Western Xia	
AD 1115–1234	金 Jin dynasty	
AD 1271–1368	元 Yuan dynasty	
AD 1368–1644	明 Ming dynasty	
AD 1644–1911	清 Qing dynasty	
AD 1912–1949	中华民国 Republic of China	
AD 1949–present	中华人民共和国 People's Republic of China	

Appendix 3. Record of Bi Sheng's invention

The original Chinese text of Bi Sheng's invention was recorded by Shen Kuo in the *Dream Pool Essays*. Source: Shen, *c.* 1086, *Dream Pool Essays*, Volume 18. The English translation given here is mainly based on that by Thomas Francis Carter in 1931, *The invention of printing in China and it spread westward*, pp. 160-161, but also informed by the translation of Tsien Tsuen-Hsuin in 1985, 'Paper and Printing,' vol. 5, part 1 of *Science and Civilisation* in China, pp. 201–202.

版印书籍，唐人尚未盛为之，自冯瀛王始印五经，已后 典籍，皆为版本。 庆历中，有布衣毕昇，又为活版。其法用胶泥刻字，薄如 钱唇，每字为一印，火烧令坚。先设一铁版，其上以松脂 腊和纸灰之类冒之。欲印则以一铁范置铁板上，乃密布字 印。满铁范为一板，持就火炀之，药稍镕，则以一平板按 其面，则字平如砥。 若止印三、二本，未为简易;若印数十百千本，则极为神 速。常作二铁板，一板印刷，一板已自布字。此印者才 毕，则第二板已具。更互用之，瞬息可就。 每一字皆有数印，如之、也等字，每字有二十余印，以备 一板内有重复者。不用则以纸贴之，每韵为一贴，木格贮之。有奇字素无备者，旋刻之，以草火烧，瞬息可成。 不以木为之者，木理有疏密，沾水则高下不平，兼与药相 粘，不可取。不若燔土，用讫再火令药镕，以手拂之，其 印自落，殊不沾污。 昇死，其印为余群从所得，至今保藏.

Under the Tang Dynasty, woodblock printing, though carried on, was not fully developed. In the time of Feng Ying-wang, first the Five Classics and then, in general, all the ancient canonical works were printed.

During the period Qingli (1041–1049), Bi Sheng, a man in a cotton cloth (i.e., a man of the common people), also made movable type. His method was as follows: he took sticky clay and cut in it characters as thin as the edge of a coin. Every single type forms each character. He baked them in the fire to make them hard. He had previously prepared an iron plate and covered this plate with a mixture of pine resin, wax and paper ashes. When he wished to print, he took an iron frame and set it on the iron plate. In this, he placed the type, set close together. When the frame was full, the whole made one solid block of type. He then placed it near the fire to warm it. When the paste (at the back) was slightly melted, he took a perfectly smooth board and rubbed over the surface. So that the block of type became as even as a whetstone.

If one were to print only two or three copies, this method would be neither convenient nor quick. However, for printing hundreds or thousands of copies, it was marvellously (lit. 'divinely') quick. As a rule, he kept two forms going. While the impression was being made from the one form, the type were being put in place on the other. When the printing of the one form was finished, the other was all ready. In this way, the two forms alternated and the printing was done with great rapidity.

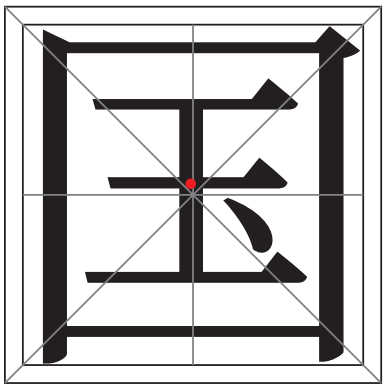
For each character, there were several types, and for certain common characters, there were twenty or more types each, in order to be prepared for the repetition of characters on the same page. When the characters were not in use, he had them arranged with paper labels, one label for each rhyme, and thus kept them in wooden cases. If any rare characters appeared that had not been prepared in advance, it was cut as needed and baked with (a fire of) straw. In a moment, it was finished.

The reason why he did not use wood is that the tissue of wood is sometimes coarse and sometimes fine, and wood also absorbs moisture, so that the form when set up would be uneven. Also, the wood would have stuck in the paste and could not readily have been pulled out. So it was better to use burnt earthenware. When the printing was finished, the form was again brought near the fire to allow the paste to melt. And then brushed with the hand, so that the type fell of themselves and were not in the least soiled with clay.

When Pi Sheng died, his font of type passed into the possession of my followers, and up to this time, it has been kept as a precious possession.

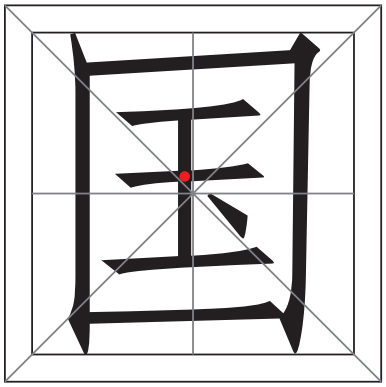
Appendix 4. Styles of Chinese text characters

Four Chinese text typeface styles: Song Ti, Fang-song Ti, Kai Ti and Hei Ti.
Source: made by the author.



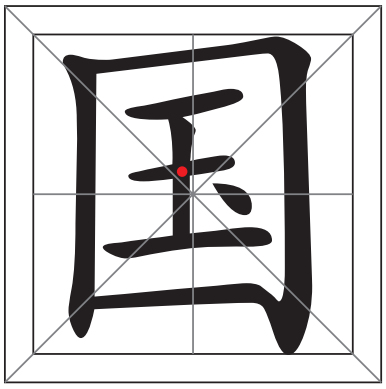
永杂晴娱逊虞树酬闷随流转十
义江日又写月记朵风九队及乃
艮山小送建专马妥公我家

Song Ti
Chinese characters in a Song Ti font. The red dot represents the Zhong Xin.
Font in use: Noto Serif CJK SC, Regular.



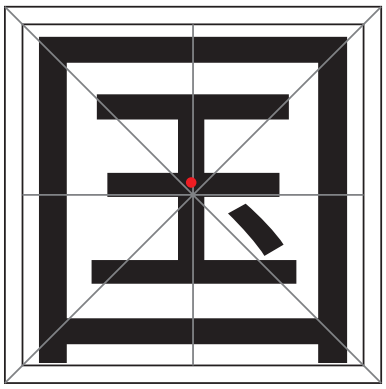
永杂晴娱逊虞树酬闷随流转十
义江日又写月记朵风九队及乃
艮山小送建专马妥公我家

Fang-song Ti
Chinese characters in a Fang-song Ti font.
Font in use: STFangsong, Regular.



永杂晴娱逊虞树酬闷随流转十
义江日又写月记朵风九队及乃
艮山小送建专马妥公我家

Kai Ti
Chinese characters in a Kai Ti font.
Font in use: STKaiti, Regular.



永杂晴娱逊虞树酬闷随流转十
义江日又写月记朵风九队及乃
艮山小送建专马妥公我家

Hei Ti
Chinese characters in a Hei Ti font.
Font in use: Noto Sans CJK SC, Regular.

Appendix 5. 'Eight Chants of Kao Gong'

Ding Sanzai's poem 'Eight Chants of Kao Gong' in Ding Zi Ju Sheng Cao records the eight processes from type making to printing; full text in Chinese:

一辨体：
北宋刊书重书法，率更字体竞临摹。
元人尚解崇松雪，变到朱明更不如。
二写样：
敢将写韵比唐人，仿宋须求面目真。
莫笑葫芦依样画，尽多复古诩翻新。
三琢坯：
祸枣灾梨世所嗤，偏教雕琢不知疲。
黄杨丁厄非关闰，望重鸡林自有时。
四刻木：
刀笔昔闻黄鲁直，而今弄笔不如刀。
及锋一试昆吾利，非复儿童篆刻劳。
五模铜：
指挥列缺作模范，天地洪炉万物铜。
消息阴阳穷变化，始知人巧夺天工。
六铸铅：
一生二复二生三，生化源流此际探。
轧轧如闻弄机杼，不须食叶听春蚕。
七排字：
二王真迹集千文，故事萧梁耳熟用。
今日聚珍传版本，个中甘苦判渊云。
八印书：
墨花楮叶作团飞，机事机心莫厚非。
比如法轮常转运，本来天地一璇玑。

Appendix 6.
Table of the Development of Chinese Typefaces

This table draws on 'A List of Movable Type Typefaces Developed by Chinese Capital Enterprises and Their Enterprises', compiled by Sun Mingyuan. Sun Mingyuan, 2021, [A study on the historical development of graphic design and typography in China: 1805–1949], pp. 191–194.

Typefaces' Chinese name	Typefaces'' English name	Year of production	Foundries' Chinese name	Foundries' English name	Head of foundry	Writer	Engraver
二号楷书体	No. 2 Kai Ti	1909	商务印书馆	Commercial Press	Xia Ruifang	Niu Junyi	Xu Xixiang
隶书体	Clerical Script Ti	1910–1915	商务印书馆	Commercial Press	Fengchi Gao		
古体活字	Gu Ti Movable Type	1915	商务印书馆	Commercial Press	Fengchi Gao		Tao Zilin
聚珍仿宋体	Ju Zhen Fang Song Ti	1915	聚珍仿宋印书局、中华书局	Commercial Press, Zhonghua Book Company	Ding Sanzai, Lu Feikui	Ding Sanzai, Ding Fuzhi	Xu Xixiang, etc.
仿宋活字	Fang Song movable type	1917			Zhuang Youcheng		
仿古活字	Fang Gu Movable Type	1919	商务印书馆	Commercial Press	Gao Fengchi	Han Youzhi	
注音连接字	Phonetic Linking Type	1919	商务印书馆	Commercial Press	Gao Fengchi		
华丰楷书体	Wah Foong Kai Script Ti	1922–1923	华丰印刷铸字所	Wah Foong Printing Supplies & Printers	Wu Tieshan	Chao Dechun, etc.	
真宋	True Song	1927	华丰印刷铸字所	Wah Foong Printing Supplies & Printers		Zhu Yibao	
汉文正楷书足体	Han Wen Zheng Kai Zu Ti	1929	汉文正楷印书局	Han Wen Zheng Kai Printing House	Zheng Wuchang	Gao Yuncheng	Zhu Yunshou, etc.
专用楷书体	Zhuan Yong Kai Script Ti	1920–1929	商业印字房	Commercial Print Room		Tang Haiping	
华丰行楷书体	Wah foong Semi-cursive Ti	1920s	华丰印刷铸字所	Wah Foong Printing Supplies & Printers	Qiao Yuting	Zhang Shumin	
北魏体	Beiwei Ti	1920–1928			Zhang Zuolin, Su Shangda	Xu Jifu, Zhong Shiguang	
仿古宋体	Fang Gu Song Ti	1931	仿古书局	Fang Gu Bookstore		Yao Zhutian	
南宋	Southern Song	1932	百宋铸字印刷局	Pai Sung Type Founding & Printing co.ltd	Han Youzhi	Han Youzhi	Zou Genpei
北宋	Northern Song	1932	百宋铸字印刷局	Pai Sung Type Founding & Printing co.ltd	Han Youzhi	Han Youzhi	Zou Genpei
华文正楷书体	Hua Wen Zheng Kai Ti	1930–1939	华文正楷铜模铸字所	Hua Wen Zheng Kai Copper Matrix Foundry	Zhou Huanbin	Chen Lvtan	Zhou Huanbin

Typefaces' Chinese name	Typefaces'' English name	Year of production	Foundries' Chinese name	Foundries' English name	Head of foundry	Writer	Engraver
芸文正楷书体	Yun Wen Zheng Kai Ti	1934	芸文印刷所	Yun Wen Printing House	Lin Heqin	Zhou Yisan	Zhang Yongquan
新宋	New Song	1935	竹天新宋铜模铸字所	Zhu Tian New Song Copper Matrix Foundry	Yao Zhutian	Yao Zhutian	
汉云正楷书体	Han Yun Zheng Kai Ti	1935	汉云铸字制模所	Han Yun Casting and Matrix Foundry		Gao Yuncheng	Zhang Kaijing
长仿宋注音连接字	Condensed Fang Song Phonetic Linking Type	1936	中华书局	Zhonghua Book Company	Lu Feikui		
摹宋	Mo Song	1930s	求古斋铸字所	Qiu Gu Zhai Foundry	Qiu Peiyue	Wang Zhenzhou	Zhuang Youren, etc.
长摹宋	Condensed Mo Song	1930s	求古斋铸字所	Qiu Gu Zhai Foundry	Qiu Peiyue		
汉文正楷书疏体	Han Wen Zheng Kai Shu Ti	1930s	汉文正楷印书局	Han Wen Zheng Kai Printing House	Zheng Wuchang	Gao Yuncheng	
汉文正楷书长体	Han Wen Zheng Kai Condensed Ti	1930s	汉文正楷印书局	Han Wen Zheng Kai Printing House	Zheng Wuchang		
洪武正楷书体	Hong Wu Zheng Kai Ti	1930s	张云记铸字所	Zhang Yunji Foundry	Zhang Buyun		
仿古字	Fang Gu Type	1930s	世界书局	World Bookstore	Shen Zhifang		Zhou Huanbin
4号长仿宋注音连接字	No. 4 Condensed Fang Song Phonetic Linking Type	1930s	世界书局	World Bookstore	Shen Zhifang		
标准正楷书体	Standard Zheng Kai Ti	1930–1937	求古斋铸字所	Qiu Gu Zhai Foundry	Qiu Peiyue	Zhang Qijun	Zhang Zhonghao
千顷堂楷书体	Qian Qing Tang Kai Ti	1920s–1930s	千顷堂	Qian Qing Tang			
长仿宋注音连接字	Condensed Fang Song Phonetic Linking Type	1920s–1930s	商务印书馆	Commercial Press	Wang Yunwu		
文岚簃仿宋体	Wen Lan Yi Fang Song Ti	1920s–1930s	文岚簃铸字所	Wen Lan Yi Foundry			
楷书体	Kai Script Ti	1920s–1930s	开明书店	Kai Ming Bookstore	Zhang Xichen	Hong Yi	
魏碑字	Weibei Type	1920s–1930s	华南书社	Hua Nan Bookstore	Yi Daan		
行书体	Semi-cursive Script Ti	1920s–1930s	商务印书馆	Commercial Press	Wang Yunwu		
草书体	Cursive Script Ti	1920s–1930s	商务印书馆	Commercial Press	Wang Yunwu		

Appendix 7.
Image notes and lists of provenance

The images shown in this thesis have rulers next to them to indicate the size of the images. The provenance of the images is mainly from institutions, private and online digital collections, which indicated in the caption. The names of institutions, individual collectors and online digital libraries are listed below.

INSTITUTIONS

British Library, London
Hubei Provincial Museum, Wuhan
Imprimerie Nationale, Douai
Leiden University Library, Leiden
Museum of English Rural Life and Special Collections, Reading
National Library of Australia, Australia
National Library of China, Beijing
The Palace Museum, Beijing
School of Oriental and African Studies (SOAS), London
Shanghai Museum, Shanghai
St Bride Library, London
The Type Archive, London
Tianyi Ge Museum, Ningbo
Wenzhou Museum, Wenzhou

ONLINE DIGITAL COLLECTIONS

California Digital Library (cdlib.org)
Digital Commonwealth (digitalcommonwealth.org)
Gallica (gallica.bnf.fr)
Google Books (books.google.com)
HathiTrust (hathitrust.org)
Internet Archive (archive.org)
Library of Congress (loc.gov)
Museum of the Institute of History and Philology (museum.sinica.edu.tw/en)
National Diet Library Digital Collection (dl.ndl.go.jp)
National Library of Australia (nla.gov.au)
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SOAS Digital Collections (digital.soas.ac.uk)
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Wang Wen 汪文
Xing Li 邢立
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Bibliography

In this thesis, the referencing style for English literature follows the APA 7th Edition guidelines. For Chinese literature, the referencing style is based on APA 7th Edition with modifications to suit the characteristics of Chinese sources. Chinese author's names, titles of works, and publishers are presented in Chinese characters, with translations provided within square brackets. Parentheses are used to indicate official English titles or English names of publishers whenever available. The translation of Chinese authors' names follows the 'Chinese transliteration scheme' introduced at the beginning of this thesis.

Abel-Rémusat, J. P. (1811). *Essai sur la langue et la littérature chinoises: avec cinq planches, contenant des textes chinois, accompagnés de traductions, de remarques et d'un commentaire littéraire et grammatical. Suivi de notes et d'une table alphabétique des mots chinois*. Treuttel et Wurtz

Abel-Rémusat, J. P. (1857). *Élémens de la Grammaire chinoise, ou Principes généraux du Kouwen ou Style antique, et du Kouan-hoa, c'est-à-dire, de la langue commune généralement usitée dans l'empire chinois*. Maisonneuve et Cie

Ai Junchuan 艾俊川 (2012). 文中象外 [Wenzhong Xiangwai]. 杭州: 浙江大学出版社 (Hangzhou: Zhejiang University Press).

App, U. (2011). *The birth of orientalism*. University of Pennsylvania Press

Bai Xuesong 白雪松 (2010). 浅谈汉字的形成与发展 [On the formation and development of Chinese characters]. In: 学理论 (Theory Research). 哈尔滨: 哈尔滨市社会科学院 (Harbin: Harbin Academy of Social Sciences). 2010:19, p. 19

Baptist Missionary Society. (1800–1817). *Periodical accounts relative to the Baptist Missionary Society*

Barnett, S. W. (1971). Silent Evangelism: Presbyterians and the Mission Press in China, 1807–1860, *Journal of Presbyterian History* (1962–1985)*, 49*(4), pp. 287–302

Bauer, F., & Mori, G. (1928). *Chronik der Schriftgießereien in Deutschland und den deutschsprachigen Nachbarländern*. Verein Deutscher Schriftgiessereien

Bridgman, E. C., & Willaims, S. W. (1845). Characters formed by the divisible type belonging to the Chinese Mission of the Board of Foreign Missions of the Presbyterian Church in the United States of America. *The Chinese Repository, 14*, pp. 124–129

Brown, G. T. (1997). *Earthen vessels and transcendent power: American Presbyterians in China, 1837–1952*. New York: Orbis Books

Buchanan, C. (1811). *Two discourses preached before the University of Cambridge*. Cambridge: University Press

Cao Ruping 曹汝平 (2017). 抉择与启蒙: 宁波华花圣经书房及中文金属活字印刷技术 [Choice and enlightenment: The Huahua Bible Bookstore in Ningbo and Chinese movable metal type printing technology]. 北京: 现代出版 (Beijing: Modern Publishing). 2017:5, pp. 72–77

Cao Jiongzhen 曹炯鎮 (1986). 中韩两国古活字印刷技术之比较研究 [A comparative study of Chinese and Korean ancient type printing technology]. 高雄: 學海出版社 [Kaohsiung: Syueh Hai Publishing]

Carey, W. (1792). *An enquiry into the obligations of Christians to use means for the conversion of the heathens*. London: Carey Kingsgate Press

Carey, W. (1816). *Memoir relative to the progress of the translations of the Sacred Scriptures, in the year 1815*. Serampore: Printed at the Mission Press
Carter, T. F. (1925). *The invention of printing in China and its spread westward*. New York: Columbia University Press
Castrillón, D. (2012). *The abolition of the Imperial Examination System and the Xinhai Revolution of 1911*
Chan Wing-tsit 陈荣捷 (1976). The study of Chu Hsi in the west, *The Journal of Asian Studies.* Duke University Press. *35*(4), pp. 555–577
Chandler, D., & Munday, R. (2011). *A dictionary of media and communication*. Oxford University Press
Chen Gang 陈钢 (2010). 印刷术在晚清的剧变及其原因分析 [An analysis of the dramatic changes in printing and their causes in the late Qing Dynasty]. In: 中国出版 (China Publishing Journal). 北京: 中国新闻出版传媒 (Beijing: China Press and Publishing Media Group). 2010:16, pp. 67–70
Chen Mengjia 陈梦家 (1988). 殷虚卜辞综述 [Review of Yin Ruins oracle inscriptions]. 北京: 中华书局 (Beijing: Zhonghua Book Company)
Chen Nan 陈楠 (2021). 中国汉字设计史 (History of Chinese character design). 武汉: 湖北美术出版社 (Wuhan: Hubei Fine Arts Publishing House)
Chen Weizhan & Tang Yuming 陈炜湛 & 唐钰明 (1988). 古文字学纲要 [An outline of Chinese paleography]. 广州: 中山大学出版社 (Guangzhou: Sun Yat-sen University Press)
Chen Wenliang 陈文亮 (2021). 基于文献学的六书发展浅论 [A brief discussion on the development of the 'Six Writings' based on Philology]. In: 群文天地 [Qunwen Tiandi]. 西宁: 青海省文化馆 [Xining: Qinghai Cultural Center]. 2021:1. <m.fx361.com/news/2021/0308/7667270.html>
Cost, P. A. (1986). *The contributions of Linn Boyd Benton and Morris Fuller Benton to the technology of typesetting and typeface design*. <api.semanticscholar.org/CorpusID:106467774>
Cost, P. (1994). Linn Boyd Benton, Morris Fuller Benton, and typemaking at ATF. *Printing History, 16*(1–2), pp. 27–44. <d3eb7xfyht02et.cloudfront.net/wp-content/uploads/2011/12/31-32-Cost-Benton1.pdf>
Coulmas, F. (2003). *Writing systems: an introduction to their linguistic analysis*. Cambridge University Press
汉文正楷活字的创制 [Creation of Han Wen Zheng Kai typeface] (1932). In: 中国出版月刊 [Chinese Publishing Monthly]. 杭州: 浙江流通图书馆 [Hangzhou: Zhejiang Circulating Library]. 1932:1, p. 78
Daily, C. (2013). *Robert Morrison and the Protestant plan for China.* Hong Kong University Press
Dai Tong 戴侗 (1320). 六书故 [Liu Shu Gu]. <ctext.org/datawiki.pl?if=gb&res=963990&remap=gb>
Dai Zhen 戴震 (2009). 戴震集 [Collected works of Dai Zhen]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)
Davies, E. (1846). *Memoir of the Rev. Samuel Dyer: Sixteen Years Missionary to the Chinese*. London: John Snow
DeFrancis, J. (1984). *The Chinese language: fact and fantasy*. University of Hawaii Press
De Guignes, J. (1787). *Essai historique sur la typographie orientale et grecque de l'imprimerie royale*. Imprimerie royale

De Guignes, J. (1790). *Principes de composition typographique: pour diriger un compositeurdans l'usage des caractères orientaux de l'imprimerie royale.* de Guignes
Ding Licheng 丁立誠 (1919). 小槐簃吟稿 [Xiao Huai Yi Yin Gao]. 錢塘丁氏嘉惠堂 [Qian Tang Ding Shi Jia Hui Tang]
Ding Sanzai 丁三在 (1916). 缘起 [Origins]. In: 聚珍仿宋版式各种样张 [Various samples of Juzhen Fang-song Ti]. 聚珍仿宋印书局 [Juzhen Fang-song printing house].
Ding Sanzai 丁三在 (1921). 考工八咏 [Eight chants of Kao Gong], 丁子居剩草 [Ding Zi Ju Sheng Cao], pp. 15-16.
Dong Haiying 董海樱 (2005). 西人汉语研究述论 — 16–19 世纪初期 [A monographic research on the study of Chinese language by westerners from the 16th to the early 19th century] (Ph.D. Thesis, Zhejiang University). <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CDFD9908&filename=2005052350.nh>
Dong Gao, Ruan Yuan & Xu Song (Eds.) 董诰, 阮元 & 徐松 等编 (1819). 钦定全唐文 [Qin Ding Quan Tang Wen]. <ctext.org/wiki.pl?if=gb&res=425915>
Dong Kang 董康 (1934). 创制百宋活字序 [Preface to the creation of Pai Sung movable type]
Duan Yucai 段玉裁 (1992). 说文解字注 [Annotated *Shuowen Jiezi*]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)
Dyer, S. (1834). *A selection of three thousand characters being the most important in the Chinese Language*. Malacca: Anglo-Chinese College
Dyer, S. (1834). Chinese metal type. *Chinese Repository*. Canton: Printed for the Proprietors. vol. 2, pp. 477–478
Eichhorn, J. G. (1804). *Geschichte der neueren Sprachenkunde*
Encyclopædia Britannica, inc. (n.d.). Chinese writing. Encyclopædia Britannica. <www.britannica.com/topic/Chinese-writing>
Fan Muhan 范慕韩 (1995). 中国印刷近代史: 初稿 [Preliminary draft of modern Chinese printing history]. 北京: 印刷工业出版社. [Beijing: Printing Industry Press]
Faulmann, K. (2013). *Illustrierte Geschichte der Buchdruckerkunst*. BoD–Books on Demand
Fung Kamwing 馮錦榮 (2009). 姜别利 (William Gamble, 1830–1886) 与上海美华书馆 [William Gamble and the Shanghai American Presbyterian Mission Press]. In: 复旦大学历史系 & 出版博物馆 编 (Fudan University Department of History & Publishing Museum of Shanghai) (Eds.), 历史上的中国出版与东亚文化交流 [Chinese publishing and East Asian cultural circulation in history]. 上海: 上海百家出版社 [Shanghai: Shanghai Baijia Publishing House]. pp. 271–320
Fung Kamwing 馮錦榮 (2011). 约翰·劳理·马蒂尔 (John L. Mateer, 1848–1900) 与上海美华书馆 [John L. Mateer (1848–1900) and the Shanghai American Presbyterian Mission Press]. In: 关西大学文化交涉学教育研究中心 & 出版博物馆 编 (Institute for Cultural Interaction Studies, Kansai University & Publishing Museum of Shanghai) (Eds.), 印刷出版与知识环流: 十六世纪以后的东亚 (Printing, publishing, and circulating the knowledge: focusing on the East Asia from the 16th century onward). 上海: 上海人民出版社 (Shanghai: Shanghai People's Press). pp. 199–221

Fu Yonghe, Liu Lianyuan, Wang Cuiye & Wang Danhui 傅永和, 刘连元, 王翠叶 & 王丹卉 (2001). GB 13000.1 字符集汉字折笔规范 (Chinese character turning stroke standard of GB 13000.1 character set). 中华人民共和国教育部 & 国家语言文字工作委员会 (Ministry of Education of the People's Republic of China & National Language Commission)

Fu Yonghe 傅永和 (1993). 汉字七题 [Seven questions on Chinese characters]. 郑州: 河南教育出版社 [Zhengzhou: Henan Education Press]

Fu Yonghe, Wang Min & He Rui 傅永和, 王敏 & 何瑞(2020). 通用规范汉字笔顺规范 (Stroke orders of the commonly used standard chinese characters). 中华人民共和国教育部 & 国家语言文字工作委员会 (Ministry of Education of the People's Republic of China & National Language Commission)

Gamble, W. (1859). *Specimen of Chinese type belonging to the Chinese Mission of Board of Foreign Missions of Presbyterian Church in the U.S.A.* Ningpo: Presbyterian Mission Press

Gamble, W. (1861). *Two lists of selected characters, containing all in the Bible and twenty seven other books, with introductory remarks*. Shanghai: Presbyterian Mission Press

Gamble, W. (1861). *Two lists of selected characters containing all in the Bible and twenty seven other books*. Shanghai: Presbyterian Mission Press

Gamble, W. (1862). *List of Chinese characters formed by the combination of the divisible type of the Berlin font used at the Shanghai Mission Press of the Board of Foreign Mission of the Presbyterian Church in the United States of America.* Shanghai. <nla.gov.au/nla.obj-46435274/view?partId=nla.obj-46435380#page/n1/mode/1up>

Gao Hanqing 高翰卿 (2004). 本馆创业史 [History of the Establishment of the Commercial Press]. In: 中国出版史料: 近代部分 [Chinese publishing historical materials: Modern section]. 武汉: 湖北教育出版社 (Wuhan: Hubei Education Publishing House). 2004:3, pp. 48–59

Gelb, I. J. (1963). *A study of writing*. University of Chicago Press

印刷通用汉字字形表 [The glyph list of commonly used Chinese characters for printing] (1965). 北京: 中华人民共和国文化部 & 中国文字改革委员会 (Beijing: The Ministry of Culture of the People's Republic of China & the Committee for Language Reform of China)

Gonzalez, J. L. (2010). *The Story of Christianity: Volume 2: The Reformation to the Present Day*. Zondervan

Griffiths, R., & Griffiths, G. E. (Eds.). (1822). *Monthly review,* p. 470

Gu Jun 顾钧 & Miyazawa Shinichi 宫泽真一 (2012). 美国耶鲁大学图书馆藏卫三畏未刊往来书信集 [Unpublished Letters from and to Samuel Wells Williams in Yale University Library, U.S.A.]. 桂林: 广西师范大学出版社 (Guilin: Guangxi Normal University Press)

Guo Moruo 郭沫若 (1972). 古代文字之辩证的发展 [The dialectical development of ancient writing]. In: 考古学报 (Acta Archaeologica Sinica). 北京: 考古杂志社 [Beijing: Archaeological Magazine Publisher] 1972:1, pp. 2–13

Guo Moruo 郭沫若 (1982). 甲骨文合集 [Oracle bone script collection]. 北京: 中华书局 (Beijing: Zhonghua Book Company)

Gu Yanwu 顾炎武 (*c.* 17th century). 亭林文集 [Ting Lin Wen Ji]. vol. 3

Gützlaff, K. F. A. 愛漢者 (1836). 全人矩矱 [Quan Ren Ju Yue]. 新加坡: 堅夏書院 [Singapore: Jian Xia Shu Yuan]

Han Qi 韩琦 (1992). 西方人研制中文活字史略 (A brief history of the development of movable Chinese characters by Westerners). In: 文献 (WENXIAN). 1992:1, pp. 223–230
He Shengnai 贺圣鼐 (1931). 三十五年来中国之印刷术 [The printing techniques of China in the past thirty-five years]. In: 最近三十五年之中国教育 [Chinese education in the last thirty-five years]. 上海: 商务印书馆 (Shanghai: The Commercial Press). pp. 173–258
He Shengnai & Lai Yanyu 贺圣鼐 & 赖彦于 (1933). 近代印刷术 [Modern printing]. 上海: 商务印书馆 (Shanghai: The Commercial Press)
He Buyun 何步云 (1989). 中国活字小史 [A short history of Chinese movable type]. In: 活字印刷源流 [The origin of movable type printing]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]. pp. 66–88
Heinrich, H. (1938). The discovery of galvanoplasty and electrotyping. *Journal of Chemical Education*, *15*(12), pp. 566–575
Heijdra, M. J. (2004). The Development of Modern Typography in East Asia, 1850–2000. *The East Asian Library Journal*, *11*(2), pp. 100–168
Heijdra, M. J. (2004). Technology, Culture and Economics: Movable Type versus Woodblock Printing in East Asia. *Studies of Publishing Culture in East Asia*, pp. 223–240.
Heijdra, M. J. (2006). A Tale of Two Aesthetics: Typography versus Calligraphy in the Premodern Chinese Book. In: Ming Wilson and Stacey Pierson ed., *The Art of the Book in China* (Colloquies on Arts & Archaeology in Asia No. 23), London: University of London, Percival David Foundation of Chinese Art, School of Oriental and African Studies, pp. 15–27.
Heijdra, M. J. (2009). Typography and the East Asian Book: The Evolution of the Grid. *The Scholar's Mind: Essays in Honor of Frederick W. Mote,* pp. 115–146.
Hepburn, J. C. (1867). *A Japanese and English dictionary: with an English and Japanese index*. Shanghai: The American Presbyterian Mission Press
Hiroshi Komiyama 小宫山博史 (2023). 19世纪欧洲·中国的明朝体金属活字开发及其向日本的传播 [The development of the Mincho Ti movable metal type in the 19th century European, China and its dissemination to China]. In: 方寸之间——汉字文字设计文集 [Between the inches - an anthology of Chinese character typography]. 北京: 文化艺术出版社 (Beijing: Culture and Art Publishing House)
Hiroshi Komiyama 小宫山博史 (2017–2019). 小宫山博史的活字百宝箱 [Mr Hiroshi Komiyama's treasure chest of movable type], 2017–2019:1–25. <https://www.dynacw.com.cn/fontstory/fontstory.aspx?ftag=小宫山博史的活字百宝箱>
Hiroshi Komiyama 小宫山博史 (2014). 黑体字的现状与未来新世界的构建(上) [The present state of Hei Ti and the construction of a new world (Part 1)]. In: 设计艺术(Art of Design). 2014:4, pp. 89–95
Hiroshi Komiyama 小宫山博史 (2014). 黑体字的现状与未来新世界的构建(下) [The present state of Hei Ti and the construction of a new world (Part 2)]. In: 设计艺术 (Art of Design). 2014:5, pp. 26–30
Hiroshi Komiyama 小宫山博史 (2009). 日本語活字ものがたり: 草創期 の人と書体 [The story of Japanese movable type: the people and typefaces of the early days]. 東京: 誠文堂新光社 (Tokyo: Seibundo Shinkosha Publishing Co.,LTD)

Huang Yaping & Meng Hua 黄亚平 & 孟华 (2001). 汉字符号学 [Semiotics of Chinese characters]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)
Hubner, T. W. (1956). Walter Lowrie (1784–1863), educator, United States senator, and secretary of the United States Senate. *The Western Pennsylvania Historical Magazine*, vol. 39, no. 3, pp. 145–162
Hu Guoxiang 胡国祥 (2008). 传教士与近代活字印刷的引入 (Missionaries and the introduction of modern movable type). In: 华中师范大学学报(人文社会科学版) [Journal of Central China Normal University (Humanities and Social Sciences)]. 47:3, pp. 84–89
Hu Xiongwei 胡雄伟 (2009). 清朝木活字印刷标准——解读《钦定武英殿聚珍版程式》(Standards of wooden movable type printing in the Qing dynasty: Interpreting 'Qin Ding Wu Ying Dian Juzhen Ban Cheng Shi'). In: 标准科学 (Standard Science), 2009:4, pp. 4–11
Hu Yuanjie & Jing Zhiyu 胡远杰 & 景智宇 (2003). 中西文化交流的桥梁——美华书馆 (Presbyterian Mission Press: The bridge for cultural intercommunication between China and the west). In: 档案与史学 (Archives and History). 2003:3, pp. 63–65
Imprimerie royale (Paris, France). (1830). *Album typographique de l'Imprimerie royale: exécuté pour LL. MM. Siciliennes*. Imprimerie royale
Imprimerie royale. (1845). *Spécimen typographique de l'Imprimerie royale*
Institute of Archaeology, Chinese Academy of Social Sciences (Ed.) 中国社会科学院考古研究所 编 (1965). 甲骨文编 [Compilation of oracle bone script inscriptions]. 中华书局 (Zhonghua Book Company)
International Organization for Standardization. (2015). ISO 7098: 2015 *Information and documentation – romanization of Chinese*. <https://www.iso.org/obp/ui/en/#iso:std:iso:7098:ed-3:v1:en>
ISMAIL, I. B. I. N. (1982). *Missionary printing in Malacca 1815–1843*. Libri, 32(Jahresband), pp. 177–206. <https://doi.org/doi:10.1515/libr.1982.32.1.177>
Jiang Boyi 江柏毅 (2022). 文字的前世今生 (上): 漢字在楷書以前的發展歷程 [The past and present life of Chinese characters: the development of Chinese characters before Kai script]. <https://case.ntu.edu.tw/blog/?p=39766>
Jiang Shan'guo 蒋善国 (1987). 汉字学 [Chinese character studies]. 上海: 上海教育出版社 (Shanghai: Shanghai Educational Publishing House)
江苏教育旬刊 [Jiangsu Education Periodical] (1934). 9:7, p. 12
Jiang Xun 蒋勋 (2010). 汉字书法之美 [The beauty of Chinese calligraphy]. 广西师范大学出版社 (Guangxi Normal University Press.)
Jin Bodong 金柏东 (2006). 现存最早活字印刷品的发现和研究 [Discovery and research of the earliest existing movable type printed matter]. In: 东方博物 (Journal of Cultural Relics of the East), 2006:1
Kang Taiyi 康太一 (2014). 19世纪初驻印新教传教士之中文印刷出版——马士曼与塞兰坡传道出版社 [Chinese printing and publishing of Protestant missionaries in India in the early 19th century–Mashman and Serampo Mission Press]. In: 国际汉学 (International Sinology), 2014:1, pp. 246–264
Keinosuke Sato 佐藤敬之輔 (1973). 漢字 (Kanji). 東京: 丸善 (Tokyo: Maruzen Publishing Co., Ltd.)
Kelly, R. R., & Shields, D. (1969). *American wood type: 1828-1900*. New York: Van Nostrand Reinhold

Klaproth, J. H. (1828). Sur les Clefs chinoises. *Nouveau Journal Asiatique* 1, pp. 233–237
Kwa, C. G., & Kua, B. L. (2019). *A general history of the Chinese in Singapore*. World Scientific.
Latourette, K. S. (2009). *A history of Christian missions in China*. Gorgias Press
Ledderose, L., & Foundation, B. (2000). *Ten thousand things: module and mass production in Chinese art*. Princeton University Press Princeton, NJ
Legrand, M. (1845). *Tableau des 214 clefs et de leurs variantes*. Paris: Plon frères
Legrand, M. (1859). *Spécimen de caractères chinois: gravés sur acier et fondus en types mobiles*. Paris
Lehner, G. (2004). *Der Druck chinesischer Zeichen in Europa: Entwicklungen im 19. Jahrhundert*. Otto Harrassowitz Verlag
Leung, C. (2002). *Etienne Fourmont (1683–1745),* vol. 13. Leuven University Press
Lin Lvbin (Ed.) 林履彬 编 (1934). 简易的电镀 [Sample Electrotype]. 上海: 商务印书馆 (Shanghai: The Commercial Press)
Lin Yijun 林怡君 (2015). 遇見全台最美的風行正楷字 [Encounter with the most beautiful Feng Xing Zheng Kai typeface in Taiwan]. In: 台灣高鐵車上刊物 (T Life). 台北: 台灣高速鐵路股份有限公司 (Taipei: Taiwan High-Speed Rail Corporation). 2015:69, pp. 40–42.
Li Shaobo 李少波 (2008). 黑体字研究 [The research on Heiti Type] (Ph.D. Thesis, Central Academy of Fine Arts)
Li Shaobo 李少波 (2011). 中国黑体字源流考 [Investigation on the origination of Chinese Heiti]. In: 装饰 (ZHUANGSHI). 2011:3, pp. 38–43. <www.izhsh.com.cn/doc/4/2_1609.html>
Liu Bingbing 刘兵兵 (2010). 清代宫廷木活字印刷则例 (The study of printing rules of wooden-movable type in Qing dynasty palace). (Ph.D. Thesis, Department of Design Art, Chinese National Academy of Arts)
Liu Gaolei & Li Sunan 刘高磊 & 李苏南 (2010). 汉字字体的演变与印刷术的发展 [The evolution of Chinese character fonts and the development of printing technology]. In: 美与时代 [Beauty and Times]. 2010:8
Liu Li & Chen Xingchan 刘莉 陈星灿 (2012). *The Archaeology of China: from the late paleolithic to the early Bronze age* (*Cambridge World Archaeology*). Cambridge: Cambridge University Press
Liu Longguang 刘龙光 (1985). 艺文印刷月刊 1937–1940 (The Graphic Printer 1937–1940). 上海市新四军历史研究会印刷印钞组 翻印 [Reprinted by the Printing and Banknotes Printing Group of the Shanghai New Fourth Army Historical Research Association]
Liu Yu 刘雨 (2015). 唐兰先生的治学之路 [Mr Tang Lan's academic path]. In: 故宫博物院院刊 [Palace Museum Journal]. 北京: 故宫出版社 [Palace Museum Press]. 2015:5, pp. 138–155
Liu Zhao 刘钊 (2013). 汉字字体设计的表象与背后 [The representation and behind of Chinese character font design]. In: 山东工艺美术学院学报 (Journal of Shandong University of Art and Design). 2013:4, pp. 18–26
Liu Zhao 刘钊 (2007). 汉字印刷字体发展, 设计与应用研究 [The development, design, and application of Chinese characters] (Ph.D. Thesis, Central Academy of Fine Arts)
Li Xiaobing (2007). *A history of the modern Chinese army*. University Press of Kentucky. <www.jstor.org/stable/j.ctt2jcq4k>

Li Xueqin 李学勤 (2013). 字源 [Chinese character etymology]. 天津: 天津古籍出版社 [Tianjin: Tianjin Ancient Books Publishing House] & 沈阳: 辽宁人民出版社 (Liaoning People's Publishing House)
Li Zhizhong 李致忠 (2002). 《梦溪笔谈》所记毕昇泥活字印书法释论 [An explanation of Bi Sheng's method of printing books with ceramic movable type as recorded in Dream Pool Essays]. In: 中国印刷 (China Print). 2002:8, pp. 53–57
Lowrie, W. (1896). *Memoirs of the Hon. Walter Lowrie*. United States: Baker & Taylor Company
Lu Danlin 陆丹林 (1932). 正楷活字版之创制者 [The creator of the Zheng Kai movable type plate]. In: 申报 [Shenbao]. 1932:16
Lu Jian 鲁坚 (1919). 小槐簃吟稿 跋二 [Xiao Huai Yi Yin Gao Ba 2]. 錢塘丁氏嘉惠堂 [Qian Tang Ding Shi Jia Hui Tang]
Lu Jiye 卢冀野 (2006). 书林别话 [Some talks on the sector of books]. In: 卢前笔记杂钞 [Various writing of Luqian]. 中华书局 Zhonghua Book Company.
Lundbaek, K. (1992). Notes on Abel Rémusat and the Beginning of Academic Sinology in Europe, *In Actes du VIIe Colloque International de Sinologie de Chantilly*, pp. 207–220
Luo Shubao 罗树宝 (2003). 印刷字体史话 (1–12) [History of printed founts, 1–12]. In: 印刷杂志 (Printing Field). 2003–2004:209–221
Luo Zhenyu 罗振玉 (1910). 殷商貞卜文字考 [Textual research on divination characters of Yin Shang]
Lu Yongfang 卢永芳 (2016). 汉字书写 [Writing of Chinese characters]. 西南交通大学出版社 (Southwest Jiaotong University Press)
Martin. W. A. P. 丁韙良 (13 August 1886). A Pioneer Printer, *North China Herald*, pp. 172–173. <https://archive.org/details/north-china-herald-1886.08.13/page/172/mode/2up>
Marshman, J. (1814). *Clavis Sinica, or elements of Chinese grammar, with an Appendix containing the Ta-Hyoh of Confucius, with a translation*. Serampore: The Mission Press
Marshman, J. C. (1859). *The life and times of Carey, Marshman, and Ward: embracing the history of the Serampore Mission*, vol. 1. Longman, Brown, Green, Longmans, & Roberts
Marshman, J. (1809). *Dissertation on the Characters and sounds of the Chinese language: Including tables of the elementary characters and of the Chinese monosyllables*. Bengal Mission Press
Marshman, J., & others. (1809). *The works of Confucius: Containing the Original Text, with a Translation. vol. 1. To which is prefixed a dissertation on the Chinese language and character, part 1*. Serampore: Printed at the Mission Press
Mateer, J. L. (1873). *Lists of Chinese characters in the fonts of the Presbyterian Mission Press*. Shanghai: The Presbyterian Mission Press
Matthews, S., & Matthews, R. (2014). *The concise Oxford dictionary of linguistics*. Oxford University Press. (Entry for "phonetic loan", 330)
McConaughy, D. (ed.) (1908). *The world-call to men of to-day*. New York: Board of Foreign Missions of the Presbyterian Church, U.S.A. pp. 85–88
McIntosh, G. (1895). *The Mission Press in China: being a jubilee retrospect of the American Presbyterian Mission Press, with sketches of other mission presses in China, as well as accounts of the Bible and tract societies at work in China*. American Presbyterian Mission Press

McIntosh, G. (1904). *A Mission Press sexagenary, 1844 to 1904*. Shanghai: The American Presbyterian Mission Press
Medhurst, W. H. (1838). *China: its state and prospects. Crocker & Brewster*. Memory of the World. <https://books.google.co.uk/books?id=uX4fAAAAYAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false>
Medhurst, W. H. 麦都思 (1845). 真理通道 [Zhen Li Tong Dao]. 上海: 墨海书馆 [Shanghai: Mohai Bookstore (The London Missionary Society Press)]. <nla.gov.au/nla.obj-45421175>
Michela, B., & Isabelle, L.-D. (2019). 法国中文印刷与汉字活字 (18—19世纪) [French Chinese printing and Chinese movable type (18th–19th century)]. In: 法国汉学 [FRENCH SINOLOGY], 2019:18. 中华书局 (Zhonghua Book Company)
Ministry of Education of the Republic of China 中華民國教育部 (1935). 第三號注音漢字字模表 (The third list of Chinese matrices with Bopomofo symbols)
Morrison, E., & Kidd, S. (1839). *Memoirs of the life and labours of Robert Morrison, DD compiled by his widow with critical notices of his Chinese works, by Samuel Kidd, and An appendix containing original documents,* (Vol. 1). Longman, Orme, Brown, Green, and Longmans
Morrison, R. (1825). *The Chinese Miscellany*. Dowall
Morrison, R. (1815). *A Grammar of the Chinese language*. Mission Press
Morrison, R. (1808). *Journal of Robert Morrison*, Canton, 1 Apr–28 Nov 1808. Council for World Mission Archive. School of Oriental and African Studies (SOAS) Archives, University of London. GB 102 CWM/LMS/16/05/06
Mosley, J. (1997). French academicians and modern typography: designing new types in the 1690s. *Typography papers*, no.2, pp. 5–29
Mungello, D. E. (2019). *The Silencing of Jesuit Figurist Joseph de Prémare in Eighteenth-century China*. Rowman & Littlefield
National Language Commission & Ministry of Education of the People's Republic of China 中华人民共和国教育部 & 国家语言文字工作委员会 (2003). 基础教学用现代汉语常用字部件规范 [Modern Chinese common character component standard of elementary teaching].
Pan Jixing 潘吉星 (2000). 中国金属活字印刷技术史 [A history of movable metal-type printing technique in China]. 沈阳: 辽宁科学技术出版社 (Shenyang: Liaoning Science and Technology Publishing House)
Pouillon, F. (2008). *Dictionnaire des orientalistes de langue française*. KARTHALA Editions
Postgate, N., Wang, T., & Wilkinson, T. (1995). The evidence for early writing: utilitarian or ceremonial ?. *Antiquity*, *69*(264), 459–480
Presbyterian Church in the U. S. A. (1841). *The Fourth Annual Report of the Board of Foreign Missions of the Presbyterian Church in the United States of America*. New York: Publish for the Board
Presbyterian Church in the U. S. A. (1851). *The fourteenth annual report of the board of foreign missions of the Presbyterian Church in the United States of America*. New York: Publish for the Board
Qiu Xigui 裘錫圭 (2017). 文字学概要 [Chinese writing]. 北京: 商务印书馆 (Beijing: The Commercial Press)
Qiu Xigui 裘錫圭 (2000). *Chinese writing* (Gilbert, L. M., & Jerry, N., trans). The Society for the Study of Early China and The Institute of East Asian Studies, University of California

Qiu Xigui 裘錫圭 (2012). 裘锡圭学术文集 [The collected works of Qiu Xigui]. 上海: 复旦大学出版社 (Shanghai: Fudan University Press)
Reed, C. A. (2011). *Gutenberg in Shanghai: Chinese print capitalism, 1876-1937*. Canada: UBC Press
Ren, S. (2012). *The decline and fall of the Mohai bookstore during the tenure of William Gamble*. The World of Culture, vol. 10
Robinson, A. (2009). *Writing and script: a very short introduction*. New York: Oxford University Press
Rong Geng 容庚 (1925). 金文编 [Compilation of Chinese bronze inscriptions]. 商务印书馆 (The Commercial Press)
Ross, F. G. E. (1988). *The evolution of the printed Bengali character from 1778 to 1978.* School of Oriental and African Studies, University of London
Rosny, L. D. (1854). *Notice sur l'écriture chinoise et les principales phases de son histoire, comprenant une suite de spécimens de caractères chinois de diverses époques, de fragments de textes et d'inscriptions, de fac-similé, de tables, etc. Accompagnés d'un texte explicatif par Léon de Rosny.*
Royal Asiatic Society of Great Britain and Ireland. North-China Branch., Shanghai Literary and Scientific Society., Royal Asiatic Society of Great Britain and Ireland. China Branch. (1864). *Journal of the North China Branch of the Royal Asiatic Society*. Shanghai: Kelly & Walsh. <babel.hathitrust.org/cgi/pt?id=mdp.39015019076572&view=1up&seq=186&q1=Gamble>
Saussure, F. D. (1959). *Course in general linguistics*. (Wade, B., trans). New York: The Philosophical Library
Shao Aiji 邵靄吉 (2021).《通用规范汉字表》独体字统计与思考 [The undecomposable characters in the General Standard Chinese Characters Table]. In: 盐城师范学院学报(人文社会科学版) [Journal of Yancheng Teachers University (Humanities & Social Sciences Edition)]. 41:3, pp. 33–43
Shaughnessy, Edward L. (2013). Paleography. *obo* in Chinese Studies. doi: 10.1093/obo/9780199920082-0043
Sha Zongyuan 沙宗元 (2008). 文字学术语规范研究 [A study of the norms of Chinese grammatology terminology]. 合肥: 安徽大学出版社 (Hefei: Anhui University Press)
Shen Guowei 沈國威 (2004). 1819年的兩本西方地理書《西遊地球聞見略傳》與《地理便童略傳》[Two Western geography books in 1819, 'A tour round the world' and 'Di Li Bian Tong Lue Zhuan']. In: 或問 (WAKUMON). 2004:8, pp. 161–166
Shen Kuo 沈括 (1305). 古迂陈氏家藏梦溪笔谈: 二十六卷 [The dream pool essays or Jottings at the Dream Brook Studio, in the family collection of Chen Guyu, in 26 Juan]. 茶陵: 东山书院 [Chaling: Dongshan Shuyuan]. [Pdf] Retrieved from the Library of Congress, <https://www.loc.gov/item/2021666451/>
Shi Baoli 史宝莉 (2020). 汉字书体的演变 (The evolution of Chinese character styles). 牡丹 [Peony]. 2020:14
Shi Xiang 石祥 (2006). 杭州丁氏八千卷楼书事新考 [A new study on the Ding Family's Eight-Thousand-Scroll Building in Hangzhou]. (Ph.D. Thesis, Research Center for Classical Chinese Literature, Fudan University)
Silbermann, G. (1840). *Album typographique, publ. a l'occasion de la quatrieme fete seculaire de l'invention de l'imprimerie*
Sivin, N. (1995). *Science in ancient China: Researches and reflections.* 506. Variorum

Society, B. M., British, Society, F. B., & Marshman, J. (1815). *A Memoir of the Serampore Translations for 1813: To which is added, an Extract of a Letter from Dr. Marshman to Dr. Ryland, Concerning the Chinese. J.G. Fuller*. <https://books.google.co.uk/books?id=SFDHnQEACAAJ>

Stahl, C. (2010). 西汉字, 东字母 [Western Hanzi, Eastern Alphabet] (Ph.D. Thesis, Central Academy of Fine Arts). <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CDFD0911&filename=2010133826.nh>

Starr, B. P. (1879). *A history of the Starr Family of new England: From the ancestor, Dr. Comfort Starr of Ashford, County of Kent, England, who Emigrated to Boston, Mass., in 1635: Containing the names of 6766 of his descendants, and the record and history of 1794 families*. New England Historic Genealogical Society

Starr, T. W. (1845). *Improvement in preparing matrices for type by the electrotyping process* (United States Patent No. 4, 130)

Su Ching 苏精 (2010). 基督教与新加坡华人 1819–1846 [Christianity and the Chinese in Singapore 1819–1846]. 新竹: 國立清華大學出版社 (Hsinchu: National Tsing Hua University Press). pp. 97–130

Su Ching 苏精 (2011). 初期的墨海书馆 (1843–1847) [The early period of the Mohai bookstore (1843–1847)]. In: 印刷出版与知识环流: 十六世纪以后的东亚 [Printing and publishing and the circulation of knowledge, East Asia after the Sixteenth Century]. 上海: 上海人民出版社 (Shanghai: Shanghai People's Press). pp. 153–180

Su Ching 苏精 (2019). 美华书馆二号(柏林)活字的起源与发展 (Origin and Development of No. 2 (Berlin) Types of The American Presbyterian Mission Press). In: 中国出版史研究 (Research on the History of Publishing in China), 2019:2, pp. 163–176

Su Ching 苏精 (1997). *The printing presses of the London Missionary Society among the Chinese.* (Ph.D. Thesis, University of London)

Su Ching 苏精 (2000). 马礼逊与中文印刷出版 [Robert Morrision and Chinese printing publishing]. 台北: 台灣學生書局 (Taipei: Taiwan Student Book)

Su Ching 苏精 (2020). 卫三畏与中文活字 (Samuel Wells Williams and Chinese movable types). In: 印刷文化 (中英文) (Print Culture). 2020:1, pp. 56–70

Su Ching 苏精 (2022). 小刻工、大成就: 王凤甲的故事 (Small carvings, great achievements: the story of Wong Feng-Dzia). In: 艺术与设计 (Art and Design), 2022:6, pp. 171-174

Su Ching 苏精 (2015). 铸以代刻——十九世纪中文印刷变局 [Zhu Yi Dai ke: Missionaries and Chinese printing changes in the 19th century]. 中华书局 (Zhonghua Book Company)

Sun Mingyuan (Ed.) 孙明远 编 (2023). 方寸之间——汉字文字设计文集 [Between the inches - an anthology of Chinese character typography]. 北京: 文化艺术出版社 (Beijing: Culture and Art Publishing House)

Sun Mingyuan 孙明远 (2016). 聚珍仿宋体的开发技术与蓝本考辩 [Development techniques and blueprint argumentation of the Juzhen Fang-song Typeface]. In: 陕西教育 (高教版) (Shanxi Education: Higher Education Edition), 2016:10, pp. 15–16

Sun Mingyuan, Li Bingshi & Huang Ying 孙明远, 李冰湜 & 黄莹 (2015). 易木为铅——聚珍仿宋体的开发及其周边 (Substituting lead plates for wood ones: The development of Juzhen Imitation Song Typeface and relevant issues). In: 装饰 (ZHUANGSHI). 2015:9, pp. 106–109

Sun Mingyuan 孙明远 (2018). 聚珍仿宋体研究 (The research of Juzhen Fangsong Ti). 北京: 科学出版社 (Beijing: Science Press)
Sun Mingyuan 孙明远 (2021). 中国近现代平面设计和文字设计发展历程研究—从一八〇五年至一九四九年 [A Study on the historical development of graphic design and typography in China: 1805–1949]. 厦门: 厦门大学出版社 (Xiamen: Xiamen University Press)
Sun Qijun 孙启军 (2018). 六种还是七种？ ——姜别利创制中文铅活字略论 (Six or Seven? —Sketch of invention of Chinese lead types by William Gamble). 中国出版史研究 (Research on the History of Publishing in China). 2018:1, pp. 91–99
Sun Qikang 孙启康 (1996). 温州白象塔出土的北宋"佛经"残叶为活字捺印 [The fragments of the Buddhist texts of the Northern Song Dynasty unearthed from the White Elephant Pagoda in Wenzhou are printed in type]. 出版科学 (Publishing Journal). 1996:4, p. 45
Sun Qikang 孙启康 (2018). 活字印刷术的发明者——毕昇轶事考论 [An anecdotal study of Bi Sheng, the inventor of movable type printing]. 出版科学 (Publishing Journal). 2018:4, pp. 121–126
Su Peicheng 苏培成 (2017). 汉字的性质 [The nature of Chinese characters]. In: 中国文字 (Journal of Chinese Writing Systems). 2017:2, pp. 109–115
Symington, D., & Symington, S. (n.d.). *The treaty of Nanking* (1842)
Tae-w**-u. (1826). On Chinese metallic type, *The Evangelical Magazine* (March 1826), pp. 144–145; Expense of Chinese metal type, *The Evangelical Magazine* (August 1826), pp. 334–335
Tam, K. (2014). *Typography: theory in practice* (*notes & thoughts*). Hongkong: The Hong Kong Polytechnic University. [Brochure]
Tang Lan 唐兰 (2005). 中国文字学 [The science of Chinese characters]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)
Tang Lan 唐兰 (2015). 唐兰全集 [The complete collection of Tang Lan]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)
Tang Yi 唐译 (2014). 图解说文解字 (Illustrated Shuowen Jiezi). 北京: 企业管理出版社 (Enterprise Management Publishing House).
Tao Baoqing 陶宝庆 (1989). 是磁版还是磁活字版？[Porcelain Printing Plate or Procelain Movable Type] & 一部珍贵的磁版印本《周易说略》[A Precious Porcelain Printed Book of Zhou Yi Shuo Lue] In: 活字印刷源流 [The origin of movable type printing]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press], pp. 249–255
The Type Heritage Project. (2019, October 23). *Design piracy*. <https://history.typeheritage.com/price-wars/piracy/#easy-footnote-bottom-1-775>
Tian Li 田力 (2012). 华花圣经书房考 (A study on Chinese and American sacred classic book establishment). In: 历史教学 (History Teaching). 2012:16
Tsien Tsuen-hsuin 錢存訓 (1989). 現存最早的印刷品和雕版略評 [A brief review of the earliest existing prints and engravings]. In: *Journal of National Central Library*, no. 22, pp. 1–10
Tsien Tsuen-hsuin 钱存训 (1985). Paper and Printing, vol. 5, part 1 of *Science and Civilisation in China*, Joseph Needham (Ed.). Cambridge: Cambridge University Press
Tsien Tsuen-hsuin 錢存訓 (1992). 中國書籍、紙墨及印刷史論文集 [Studies on the history of the Chinese book, paper, ink and printing]. 香港: 香港中文大学出版社 Hongkong: (The Chinese University of Hong Kong Press)

Tsien Tsuen-hsuin 钱存训 (2002). *Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions.* Chicago: The University of Chicago Press
Tsien Tsuen-hsuin 钱存训 (2003). 书于竹帛 中国古代的文字记录 (Written on Bamboo and Silk: The Beginnings of Chinese Books and Inscriptions). 上海: 上海书店出版社 Shanghai: (Century Library of Shanghai)
Uher, D. (2005). Six categories of Chinese characters. In L. Pecha (Ed.), *Orientalia Antiqua Nova V*. 125–37
Vinne, T. L. De. (1900). *The Practice of Typography, A treatise on the processes of type-making the Point system, the names, sizes styles and prices of plain printing types*. The Century Co
Wah Foong Printing Supplies & Printers 華豐印刷鑄字所 (1935). 拓制真宋字之經過 [The process of making True Song]. In: 各種中文鉛字樣本 [Various specimens of Chinese typefaces]
Wang Jialing 汪嘉玲 (1995). 戴震文字學述論 [An exposition on Dai Zhen's philology]. In: 東吳中文研究集刊 (Soochow Journal of the Graduate School of Chinese). 1995:2, pp. 57–73
Wang Naichang 汪乃昌 (1985). 中外字体之检讨 [Review of Chinese and foreign typefaces]. In: 艺文印刷月刊 (The Graphic Printer). 上海市新四军历史研究会印刷印钞组 翻印 [Reprinted by the Printing and Banknotes Printing Group of the Shanghai New Fourth Army Historical Research Association]. pp. 38–40
Wang Ning 王宁 (2016). 汉字构形学导论 [Introduction to Grapheme formation of Chinese characters]. 上海: 商务印书馆 (Shanghai: The Commercial Press).
Wang Quan 王泉 (2013). 历代印刷汉字及相关规范问题 (Study on the Printed Chinese Characters of Successive Dynasties and Related Standardization). (Ph.D. Thesis, East China Normal University)
Wang Yong 王镛 (Ed.) (2004). 中国书法简史 [A brief history of Chinese calligraphy]. 北京: 高等教育出版社 (Beijing: Higher Education Press).
Wang Zhen 王祯 (1530). 造活字印书法 [A method of making moveable wooden types for printing books] In: 农书 [Nong Shu]. 山东布政司刊本 [Edition of Shandong Bu Zheng Si], vol. 22
William Miller Gamble compiled. (1938). *The Brief Sketch of the Life and achievements of William Gamble* (*1830–1886*), Unpublished manuscript
Williams, S. W. (1875). Movable Types for Printing Chinese, *The Chinese Recorder*, VI, pp. 22–30
Wu Qingdi 吴庆坻 (1919). 小槐簃吟稿 跋一 [Xiao Huai Yi Yin Gao Ba 1]. 錢塘丁氏嘉惠堂 [Qiantang Dingshi Jiahuitang]
Wu Tiesheng 吴铁生 (2001). 我所知道的中华人 [The Zhonghua staffs I know]. In: 回忆中华书局 [Memories of Zhonghua Book Company]. 北京: 中华书局 (Beijing, China: Zhonghua Book Company). pp. 24–36
Wu Tiesheng & Zhu Shengyu 吳鐵聲 & 朱勝愉 (1939). 广告和现代印刷术（一）[Advertising and modern printing technology (Part 1)]. In: 艺文印刷月刊 (The Graphic Printer). 上海市新四军历史研究会印刷印钞组 翻印 [Reprinted by the Printing and Banknotes Printing Group of the Shanghai New Fourth Army Historical Research Association]. 2:6, pp. 21–32
Wu Yonggui & Peng Chunyan 吴永贵 & 彭春艳 (2017). 复制信仰: 华花圣经书房的印刷术与印刷品 [Reproducing faith: printing and print in the Huahua Bible Study] In: 现代出版 (Modern Publishing). 2017:6, pp. 59–62

Wylie, A. (1867). *Memorials of protestant missionaries to the Chinese: Giving a List of Their Publications, and Obituary Notices of the Deceased*. Shanghai.21

Xiao Zhang 肖璋 (1989). 谈《说文》说假借 [Discussing the Jia Jie in *Shuowen*]. In: 古汉语研究 (Research in Ancient Chinese language). 1989:1, pp. 1–11

Xue Shanggong 薛尚功 (1935). 历代钟鼎彝器款识法帖 [Inscriptions and rubbings of inscriptions on bells, cauldrons, ritual vessels, and seals from various dynasties]. <https://old.shuge.org/ebook/zhong-ding-kuan-shi/>

Xue Xi 薛熙 (1936). 明文在 [Ming Wen Zai]. 上海: 商务印书馆 (Shanghai: The Commercial Press). Preface.

Xu Lili 徐莉莉 (2005). 现行汉字笔画规范札记 [Reading notes on standardization of the strokes of current Chinese characters]. In: 中国文字研究 (The Study of Chinese Characters). 上海: 华东师范大学中国文字研究与应用中心 [Center for Study of Chinese Characters and Their Applications, Shanghai: East China Normal University]. 2005:1, pp. 222–225.

Xu Minglong 许明龙 (1986). 中法文化交流的先驱黄嘉略——一位被埋没二百多年的文化使者 [Arcadio Huang, the pioneer of Sino-French cultural exchanges – a cultural messenger who was unsung for more than 200 years]. In: 社会科学战线 [Social Science Front], 1986:3, pp. 244–255

Xu Minglong 许明龙 (2004). 黄嘉略与早期法国汉学 [Arcadio Huang and early Sinology in France]. 中华书局 (Zhonghua Book Company)

Xun Lin & Liu Zhisheng 寻霖 & 刘志盛 (2013). 湖南刻书史略 [A brief history of Hu'nan engraved books]. 岳麓书社 [Yuelu Publishing House]

Xu Shen 许慎 (1963). 说文解字 [Shuowen Jiezi]. 中华书局 (Zhonghua Book Company)

Xu Shiyi 徐时仪 (2016). 汉语语文辞书发展史 [History of Chinese language dictionaries]. 上海: 上海辞书出版社 [Shanghai: Shanghai Lexicography Publishing House]

Xu Xuecheng 徐学成 (1998). 美术字技法与应用 [Artistic lettering techniques and applications]. 上海: 上海书店出版社 (Shanghai: Shanghai Bookstore Publishing House)

Yang Jialuo 杨家骆 (1997). 说文解字诂林正补合编 [Shuowen Jiezi Gulin Zhengbu Hebian]. 鼎文书局 [Ding Wen Book Bureau]

Yan Xishen, Cheng Cheng & Li Wenzao 颜希深, 成城 & 李文藻 (1760). 选举制 [Xuan Ju Zhi]. In: 泰安府志 [Tai An Fu Zhi], vol. 21

Yan Zhenqing 顏真卿 (1819). 永字八法頌 [Praise to the Eight Principles of 'Yong']. In: 全唐文 [Quan Tang Wen]. <zh.wikisource.org/wiki/永字八法頌>

Yao Sui 姚燧 (*c.* 1310). 牧庵集 [Mu An Ji]. <https://ctext.org/wiki.pl?if=gb&chapter=132379&remap=gb>

Ye Dehui 叶德辉 (2008). 书林清话 [Shu Lin Qing Hua]. 上海: 上海古籍出版社 (Shanghai: Shanghai Classics Publishing House)

Yeh, C. (2015). Recasting the Chinese Novel: Ernest Major's Shenbao Publishing House (1872–1890). *The Journal of Transcultural Studies, 6*(1), 171–289. <https://doi.org/10.11588/ts.2015.1.22205>

Yuan Guangkuo 袁广阔 (2021). 观迹定书: 考古学视野下夏商文字的传承与发展 [Observing the traces and defining the book: the inheritance and development of Xia and Shang scripts in archaeological perspective]. In: 光明日报 (Guangming Daily). 2021:11. <https://epaper.gmw.cn/gmrb/html/2021-05/12/nw.D110000gmrb_20210512_1-11.htm>

Yuan Jiahong, Wang Zhikun & Zeng Yan 袁佳红, 王志昆 & 曾妍 (2017). 中国战时首都档案文献: 战时文化 [Chinese wartime capital archives: wartime culture]. 重庆: 西南师范大学出版社 (Chongqing: Southwest China Normal University Press)

Yuan Jin 袁进 (2014). 试论近代西方传教士创作的中文新小说 [An experimental study of new Chinese novels written by modern Western missionaries]. In: 明清小说研究 (Journal of Ming – Qing Fiction Studies), 2014:1, pp. 241–250

Yu Youren 于右任 (*c.* 1933). 汉文正楷活字版 [Advertisement of Han Wen Zheng Kai movable type]. 上海: 上海汉文文正楷印书局 [Shanghai Han Wen Zheng Kai Printing Bureau]

Zhai Ming & Yang Xinlan 翟铭 & 杨新岚 (2004). 当代排版技术概论 [Introduction to contemporary typographic techniques]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]

Zhang Binglun 张秉伦 (1989). 关于翟氏泥活字的制造工艺问题 [About manufacturing Process problems of Zhai's movable types] & 关于翟金生的泥活字问题的初步研究 [Preliminary study on Zhai Jinsheng's ceramic movable types]. In: 活字印刷源流 [The origin of movable type printing]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]. pp. 223–232

Zhang Chen Yiping & Dai Shaozeng 张陈一萍 & 戴绍曾 (2015). 虽至于死(台约尔传) [Sui Zhi Yu Si: A biography of Samuel Dyer]. 桂林: 广西师范大学出版社 (Guilin: Guangxi Normal University Press)

Zhang Erqi 张尔岐 (1719). 周易说略 [Zhou Yi Shuo Lue]

Zhang Erqi 张尔岐 (1730). 蒿庵闲话 [Hao An Xian Hua]

Zhang Jinglu 张静庐 (1957). 聚珍仿宋印书局招股启 [Chronology of events at the Zhonghua Book Company]. In: 中国出版史料·补编 [Supplement to the History of Publishing in China]. 北京: 中华书局 (Beijing: Zhonghua Book Company). p. 565.

Zhang Jinglu 张静庐 (2003). 中国近现代出版史料 [History of publishing in modern China]. 上海: 上海书店出版社 (Shanghai: Shanghai Bookstore Publishing House)

Zhang Shaoxun 张绍勋 (1997). 中国印刷史话 [Chinese printing history]. 上海: 商务印书馆 (Shanghai: The Commercial Press).

Zhang Shudong, Pang Duoyi & Zheng Rusi 张树栋, 庞多益, 郑如斯 (1998). 中华印刷通史 [Zhonghua yin shua tong shi]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]

Zhang Xiping & Hu Wenting 張西平 & 胡文婷 (2015). 十七世紀漢字在歐洲的傳播 [The Spread of Chinese Characters in the 17th Century in Europe]. In: 文化雜誌 (Review of Culture). 2015:96, 149–169. <www.icm.gov.mo/rc/viewer/10096>

Zhang Xiumin 张秀民 (1989). 中国印刷史 [Chinese Printing History]. 上海: 上海人民出版社 (Shanghai: Shanghai People's Press).

Zhang Xiumin 张秀民 (1989). 中国活字印刷简史 [A brief history of Chinese movable type printing]. In: 活字印刷源流 [The origin of movable type printing]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]. pp. 6–65

Zhao Jian 赵健 (2011). 范式革命 (中国现代书籍设计的发端1862-1937) [The beginning of Chinese modern Book design paradigm (1862–1937)]. 北京: 人民美术出版社 [Beijing: People's Fine Arts Publishing House]
Zhao Yiwen 赵仪文 (2009). 中国研究中的文化对话——反思与挑战 (Cultural Dialogue through Chinese Studies: Reflections and Challenges). In: 世界汉学大会 (The World Conference on Sinology 2009). 中国人民大学汉语国际推广研究所 & 汉学研究中心 (The Institute for the Promotion of Chinese Language and Culture & the Chinese Studies Research Centre, Renmin University of China)
Zheng Wuchang 郑午昌 (1935). 呈请奖励汉文正楷活字版并请分令各属各机关相应推用, 以资提倡固有文化而振兴民族观感事 [Requesting the reward for Han Wen Zheng Kai movable type and requesting each department to use it accordingly to promote national cultural revival and foster national sentiments]. In: 河南省政府公报 [Henan Provincial Government Gazette]. 洛阳: 河南省政府秘书处 [Luoyang: Henan Provincial Government Secretariat]
Zhong Yurou 钟雨柔 (2019). *Chinese grammatology, script revolution and literary modernity, 1916–1958*. New York City: Columbia University Press
Zhou Bida 周必大 (1792). 文忠集 卷198 [Wen Zhong Ji, vol. 198]. In: 钦定四库全书 集部1149 [Qinding Siku Quanshu, Ji section 1149].
Zhou Bo 周博 (2013). 字体家国—汉文正楷与现代中文字体设计中的民族国家意识 [Typeface and patriotism – Hanwen Zheng-Kai and the Chinese nationality in modern Chinese typeface design]. In: 美术研究 (Art Research). 2013:1, pp. 16–27
Zhou Bo 周博 (2018). 中国现代文字设计图史 (The story of modern Chinese typography). 北京: 北京大学出版社 (Peking University Press)
Zhou Chengmin 周承民 (1993). 活字排版工艺 [Typesetting with movable type]. 北京: 印刷工业出版社. [Beijing: Printing Industry Press]
Zhou Guangxue & Song Qingmei 周广学 & 宋青梅 (2005). 从泥活字板到泥活字泥板—中国泥活字印刷技术的变迁 [From clay-type plate to type clay-matrix: a history of Chinese clay-type printing technology]. In: 河南图书馆学刊 (The Library Journal of Henan). 2005:2, pp. 67–70
Zhou Youguang 周有光 (1998).《汉语拼音方案》的制订过程 [The development process of the Hanyu Pinyin Programme]. In: 语文建设 (Language Planning). 1998:4, pp. 11–14
Zhou Zumo 周祖谟 (2023). 六书说 (Six categories of Chinese characters). In: 中国大百科全书 第三版网络版 (Encyclopaedia of China, the third edition, online version). <www.zgbk.com/ecph/words?SiteID=1&ID=138399&Type=bkzyb>
Zhu Jialian 朱家濂 (1989). 清代泰山徐氏的磁活字印刷 [Porcelain movable type printing of the Xu family of Tarzon in the Qing dynasty]. In: 活字印刷源流 [The origin of movable type printing]. 北京: 印刷工业出版社 [Beijing: Printing Industry Press]. pp. 243–248
Zou Dahai 邹大海 (2007). Shuihudi's bamboo strips of Qin dynasty and mathematics in Pre-Qin period. In: *Chinese Archaeology*, *7*(1), pp. 132–136
Zou Fudu 邹芙都 (2020). 汉字印象: 汉字源流与汉字文化 [Chinese character impressions: the origin and culture of Chinese characters]. 重庆: 重庆大学出版社 (Chongqing: Chongqing University Press)

Collected periodicals consulted:

(1816). *The Evangelical Magazine and Missionary Chronicle.* <https://catalog.hathitrust.org/Record/000054677>

(1826). *The Evangelical Magazine and Missionary Chronicle.* Federick Westley and A. H. Davis. <https://catalog.hathitrust.org/Record/000054677>

(1834). China - Increased Facilities for Printing, *The Evangelical Magazine and Missionary Chronicle*, pp. 469–472. <https://catalog.hathitrust.org/Record/000054677>

(1832). *The Chinese repository.* Printed for the proprietors. <file://catalog.hathitrust.org/Record/000541105>

(1845). *The Chinese repository,* vol. 14. Printed for the proprietors. <https://play.google.com/books/reader?id=lgEMAAAAYAAJ&pg=GBS.PP6&hl=en>