

# THE ROUTLEDGE HANDBOOK OF CHINESE LANGUAGE AND CULTURE

*Edited by Liwei Jiao*

WITH CONSULTING EDITORS VICTOR H. MAIR AND WILLIAM SHIYUAN WANG

Designed cover image: Jiyi via Getty Images

First published 2024  
by Routledge  
4 Park Square, Milton Park, Abingdon, Oxon OX14 4RN

and by Routledge  
605 Third Avenue, New York, NY 10158

*Routledge is an imprint of the Taylor & Francis Group, an informa business*

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*British Library Cataloguing-in-Publication Data*

A catalogue record for this book is available from the British Library

*Library of Congress Cataloging-in-Publication Data*

Names: Jiao, Liwei, editor.

Title: The Routledge handbook of Chinese language and culture / edited by Liwei Jiao.

Description: Abingdon, Oxon ; New York, NY : Routledge, 2024. | Series: Routledge language handbooks | Includes bibliographical references and index.

Identifiers: LCCN 2023041196 (print) | LCCN 2023041197 (ebook) | ISBN 9781138052475 (hardback) | ISBN 9781032687674 (paperback) | ISBN 9781315167800 (ebook)

Subjects: LCSH: Language and culture—China. | Chinese language—Social aspects. | LCGFT: Essays.

Classification: LCC P35.5.C6 R68 2024 (print) | LCC P35.5.C6 (ebook) | DDC 495.1—dc23/eng/20231206

LC record available at <https://lccn.loc.gov/2023041196>

LC ebook record available at <https://lccn.loc.gov/2023041197>

ISBN: 978-1-138-05247-5 (hbk)

ISBN: 978-1-032-68767-4 (pbk)

ISBN: 978-1-315-16780-0 (ebk)

DOI: 10.4324/9781315167800

Typeset in Times New Roman  
by Apex CoVantage, LLC

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### 3

## CHINESE PHONOLOGY AND CROSS-CULTURAL EXCHANGE IN HISTORY

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UNIVERSITY OF WALES

#### **1. The Influence of Ancient Sino-Indian Cultural Exchange on the Historical Chinese Phonology**

##### **(1) The Translation of Buddhist Scriptures and the Birth of the Rhyme Table**

Throughout its long history, Chinese phonology has been influenced twice by the introduction of foreign ideas, resulting in significant changes.

The first time was the introduction of Buddhism from India in the Eastern Han dynasty. The cultural contact with India had a tremendous influence on Chinese literature and philosophy. It also infiltrated the religious beliefs of Chinese society, thereby affecting the way people lived in China.

Buddhism, an Indian cultural system of beliefs, was brought to China by Central Asian traders and Buddhist monks as early as the first century CE. During the Eastern Han dynasty (148 CE), the Parthian prince An Shigao (安世高) was one of the first to translate Buddhist scriptures into Chinese. Buddhists borrowed ideas from original Chinese philosophy Daoism (Chinese philosophy to signify the fundamental or true nature of the world) via the Chinese language to help the Chinese comprehend this foreign concept. As a result, Buddhist scriptures spread widely in major cities in China and were accepted by most of the Chinese scholars, the common people, and even the emperor. The translation of Buddhist scriptures enriched Chinese culture and contributed significantly to the development of Chinese vocabulary, grammar, and phonetic techniques, as well as improving Chinese phonology in multiple ways.

During this time and over the course of the next period of the Three Kingdoms (三國時代), the popularity of Buddhist scriptures opened the window for other Indian literary studies in China. The study of ancient Indian rhymes such as “śabda-vidyā 聲明論” (the science of phonology of ancient Indian) and “siddham 悉曇章” (phonemic analysis of ancient Indian) are the knowledge in this respect. Sanskrit, an Indo-European Indic language used as the religious and classical literary language of India since circa 1200 BCE, is also a phonetic text that features precise sound analysis. With the spread of the Buddhist texts, Chinese intellectuals from the upper class had the opportunity to study Sanskrit and understand the phonology of Indian language. This stimulated the rapid

growth of Chinese phonology, and the enthusiasm for Sanskrit continued until the end of the Tang dynasty. The idea of the “rhyme table” (等韻圖) also originated from Indian Buddhism and represents the highest achievement of linguistics during that time.

The second cultural and phonological influence on Chinese came from modern Western linguistics over the past centuries. We discuss this in a later chapter.

## (2) Organization of the Rhyme Table

A “rhyme table” is a Chinese phonological model that consists of a series of charts arranging Chinese characters in large tables based on their tones and syllable structures to indicate their proper pronunciations. The basic structure of the rhyme table involves “horizontal arrangement by TSIMU (字母), vertically divided into four tones (四聲), four grades (四等)”, and then one by one, fill each character in the appropriate grid according to its pronunciation. To create such a chart may seem to be a simple task in modern times, but in an era lacking phonetic analysis capabilities, it was considered a remarkable breakthrough.

As we all know, Chinese characters do not inherently represent sounds like English alphabetic words do. In Chinese, each character represents a complete “syllable”, and the phonetic components are not explicitly visible. However, through the study of Sanskrit texts, Chinese scholars discovered the precision of phonetic analysis found in Sanskrit spelling. This led them to focus on designing a Chinese phonetic chart, known as a rhyme table (see Figure 3.1).

|      | 齒音舌 |   | 音 喉 |   | 音 齒 |   | 音 牙 |   | 音 舌 |   | 音 唇 |   | 外轉第十四合 |
|------|-----|---|-----|---|-----|---|-----|---|-----|---|-----|---|--------|
|      | 清濁  | 濁 | 清濁  | 濁 | 清濁  | 濁 | 清濁  | 濁 | 清濁  | 濁 | 清濁  | 濁 |        |
| 灰皆   | ○   | 雷 | ○   | 回 | 灰   | 隈 | ○   | 雁 | 摧   | 崔 | 唯   | ○ | ○      |
| 齊    | ○   | 膠 | ○   | 懷 | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○      |
| 賄駭   | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○      |
| 隊怪祭霽 | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○      |
| 夬    | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○   | ○ | ○      |

Figure 3.1 A sample page of a rhyme table.

Chu Chia Ning

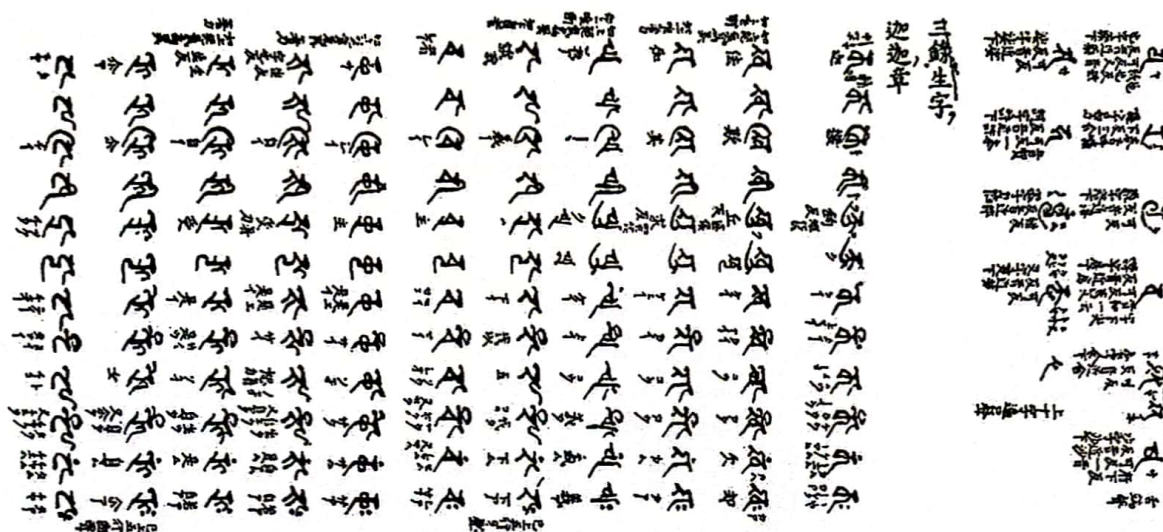


Figure 3.2 A sample page of Siddham of ancient India.

To improve their knowledge of Chinese phonetic analysis, scholars first divided the pronunciation of Chinese characters into two halves. The first half is called “SHENGMU 聲母” (initial consonants) and the second half “YUNMU 韻母” (finals). This recognition led to a great revolution in the handling of phonetic analysis. In the Eastern Han dynasty, Chinese scholars invented the FANQIE (反切) phonetic method to indicate the pronunciation of Chinese characters. However, it was not until the Six Dynasties period<sup>1</sup> that the FANQIE method gained popularity and became widely used for the pronunciation of Chinese characters.

During that time, the use of the repetition of a beginning consonant sound SHUANGSHENG talk (雙聲語) was common in daily conversations, and it became a trend and a prominent feature of social interaction. This method or knowledge of the SHUANGSHENG pronunciation originated and was introduced through Buddhist texts.

For example, an ancient book called *Luoyangqielanji* (洛陽伽藍記 532–534) recorded the following:

Li Yuanqian (李元謙) was skilled at SHUANGSHENG talk. Once, he passed by Guo Wenyan's (郭文遠) home and asked, “Whose home is this?” A servant named Chunfeng (春風) replied, “This is the home of ‘Guo Guan Gun Ga’ (郭冠軍家)”. Li Yuanqian was very surprised and said, “Bi Bi Shuang Sheng” (彼婢雙聲, How can this servant speak SHUANGSHENG talk?). Chunfeng replied, “Ning Nu Man Ma” (寧奴慢罵, You must be joking. How can I be so skilled?).

From the Eastern Han dynasty to the Tang dynasty, people perceived that the pronunciation of Chinese characters could be divided into two parts: an initial consonant and a final. But it was not yet possible for a more subtle speech analysis at that time. In the early years of the Tang dynasty, with the emergence of the concept of “ZIMU 字母”<sup>2</sup> and “FOUR GRADES 四等”,<sup>3</sup> the technique of phonemic analysis was finally further developed. This led to the creation of the “RHYME TABLE 等韻圖”, a type of phonetic chart.

### (3) The Creation of “ZIMU (字母)”

The concept of ZIMU refers to a series of “initial sounds”, and its development was completely influenced by Buddhism.

The earliest “ZIMU” that appeared in Buddhist scriptures was introduced by the Buddhist master ZHUFUHU (竺法護) during the years 265–289 CE. He used Chinese characters to represent the pronunciation of certain Sanskrit consonants. Therefore, people began to think, “Why not use Chinese characters to mark every initial sound of Chinese characters?”

The earliest set of ZIMU is the “Thirty Letters of Initials (三十字母)”, which emerged at the end of the Tang dynasty. The original document of “Thirty Letters of Initials (三十字母)” was discovered in the Dunhuang Stone Cave (敦煌石室) at the end of the Guangxu (光緒) period in the Qing dynasty. The documents found in this cave are a handwritten version dating back to the Tang dynasty.

Here are the “Thirty Letters of Initials (三十字母)” unearthed from the Dunhuang Stone Cave:

|                    |       |                                                         |
|--------------------|-------|---------------------------------------------------------|
| 唇音(bilabial)       | 不芳並明  | (p-, ph-, b-, m-)                                       |
| 舌音(dental)         | 端透定泥  | (t-, th-, d-, n-)                                       |
| (alveolo-palatal)  | 知徹澄日  | (tʃ-, thʃ-, dʃ-, nʃ-)                                   |
| 牙音(velar)          | 見溪群來疑 | (k-, kh-, g-, l-, ng-)                                  |
| 齒音(sibilant)       | 精清從   | (ts-, tsh-, dz-)                                        |
| (palatal alveolar) | 審穿禪照  | (ʃ-, ʃh-, dʒ-, ʒ-)                                      |
| 喉音(glottal)        | 心邪曉   | (s-, z-, x-)                                            |
|                    | 匣喻影   | (ɣ- velar fricative, Ø - zero initial, ʔ- glottal stop) |

Before the discovery of the “Thirty Letters of Initials (三十字母)” from Dunhuang during the Qing dynasty, scholars and students only knew the 36-initials system (三十六字母). Traditional rhyme tables were all based on the 36-letter system. The prototype of “Thirty Letters of Initials” has long been forgotten. However, the 36-letter system was retained through traditional school teaching and was passed down from the Song dynasty to the nineteenth century.

### (4) The Relationship Between “FOUR TONES (四聲)”<sup>4</sup> and Indian Buddhism

The discovery of the four tones of “PING, SHANG, QU, RU (平上去入)” is also closely related to Buddhism, and the distinction of the “FOUR TONES” is a fundamental component of the structure of the RHYME TABLE.

Tone is a fundamental element of the Chinese language. In ancient times, it was a traditional practice for people to use four tones in spoken language. During the Eastern Han dynasty, with the introduction of Buddhism, people gradually became familiar with Sanskrit. Upon comparing the two languages, monks and scholars found a unique phonological aspect in Chinese known as “different pitches”, which plays a role in distinguishing meanings and was absent in Sanskrit. These different pitch patterns were analyzed and classified into four categories (called “FOUR TONES 四聲”), and each tone has its own distinctive pitch contour.

### (5) The Relationship Between “FOUR GRADES (四等)” and Buddhism

The rhyme table classifies all Chinese characters into four “grades” based on the degree of mouth opening of the syllable final. The characters with the widest mouth opening in pronunciation are

|      | 齒音舌 |   | 音喉 |   | 音齒 |   | 音牙 |   | 音舌 |   | 音唇 |   | 外轉第二十三開 |
|------|-----|---|----|---|----|---|----|---|----|---|----|---|---------|
|      | 清   | 濁 | 清  | 濁 | 清  | 濁 | 清  | 濁 | 清  | 濁 | 清  | 濁 |         |
| 寒刪仙先 | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | 外轉第二十三開 |
| 早潛獮銑 | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| 翰諫線霰 | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| 曷黠薛屑 | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | 外轉第二十三開 |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | 外轉第二十三開 |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | 外轉第二十三開 |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |
| ○    | ○   | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ | ○  | ○ |         |

Figure 3.3 A sample page of “Four Grades (四等)” of a rhyme table. (For example, in ancient Chinese the characters “千, 姦, 甄, 堅” in the chart are pronounced in first-grade, second-grade, third-grade, and fourth-grade words, respectively).

referred to as “first-grade words 一等字”, which are positioned at the upper line in the rhyme table. Conversely, the characters with the smallest mouth opening are referred to as “fourth-grade words 四等字”. The earliest document which recorded the design of “four grades” was dated back to the Tang dynasty. It was a brilliant design by Buddhist monks who were proficient in the phonology of Indian Sanskrit. This document was unearthed at Dunhuang Cavern in the nineteenth century.

#### (6) The Phonological Terms “ZHUAN 轉”, “SHE 攝”, and “MENFA 門法”

In the rhyme table, each chart is called a “~zhuan 轉” or a “~she 攝”. For example, the early rhyme tables “Qiyinlue 七音略” and “Yunjing 韻鏡” have 43 charts, which are called 43 “zhuan-ans”. Rhyme tables such as “Sishengdenzi 四聲等子” and “Qieyunzhinan 切韻指南”, created in the Song and Yuan dynasties, have “16 she” (meaning “16 rhyme groups”).

The term “zhuan 轉” originated from the concept of reincarnation in Buddhism, signifying “a turn of rotation”. Each rhyme table contains 12 vowels and matching consonants, akin to a rotating consonant wheel that matches each of the 12 vowels. The term “~she 攝” also came from Buddhism, meaning “to take and hold”. In Buddhist texts, the word *she* is an important term that was frequently used. The term “Menfa 門法” in the rhyme table refers to the arrangement rules of the rhyme table. It is derived from the “Famen 法門” in the Buddhist texts.

Figure 3.4 A sample of a “ $\sim$ she 攝” rhyme table (marked at right).

Figure 3.5 A sample of a “ZHUAN 轉” rhyme table (marked at right).

The preface of “Yunjing 韻鏡” records that the book was originally written by Indian monks, and the latter edition was completed by Chinese monks who imitated the writing style of the Indian monks. This preface reveals the close relationship between ancient Chinese rhyme tables and Indian Buddhist monks.

四聲等子

並依偏寒門法於本母下三等求之居容切恭字居懷切拱字

辨內外轉例

內轉者唇舌牙喉四音更無第二等字唯齒音方具足外轉者五音四等都具足今以深曾止宕果遇流通括內轉六十七韻江山梗假效蟹咸臻括外轉一百三十九韻

辨窠切門

知母第三爲切韻逢精等影喻第四並切第三等是也如中

通切朝字

辨振救門

精等五母下爲切韻逢諸母第三並切第四是名振救門

法例如蒼夏切秋字

辨正音憑切寄韻門法例

照等五母下爲切切逢第二韻逢二三四並切第二名正

[illegible]

48

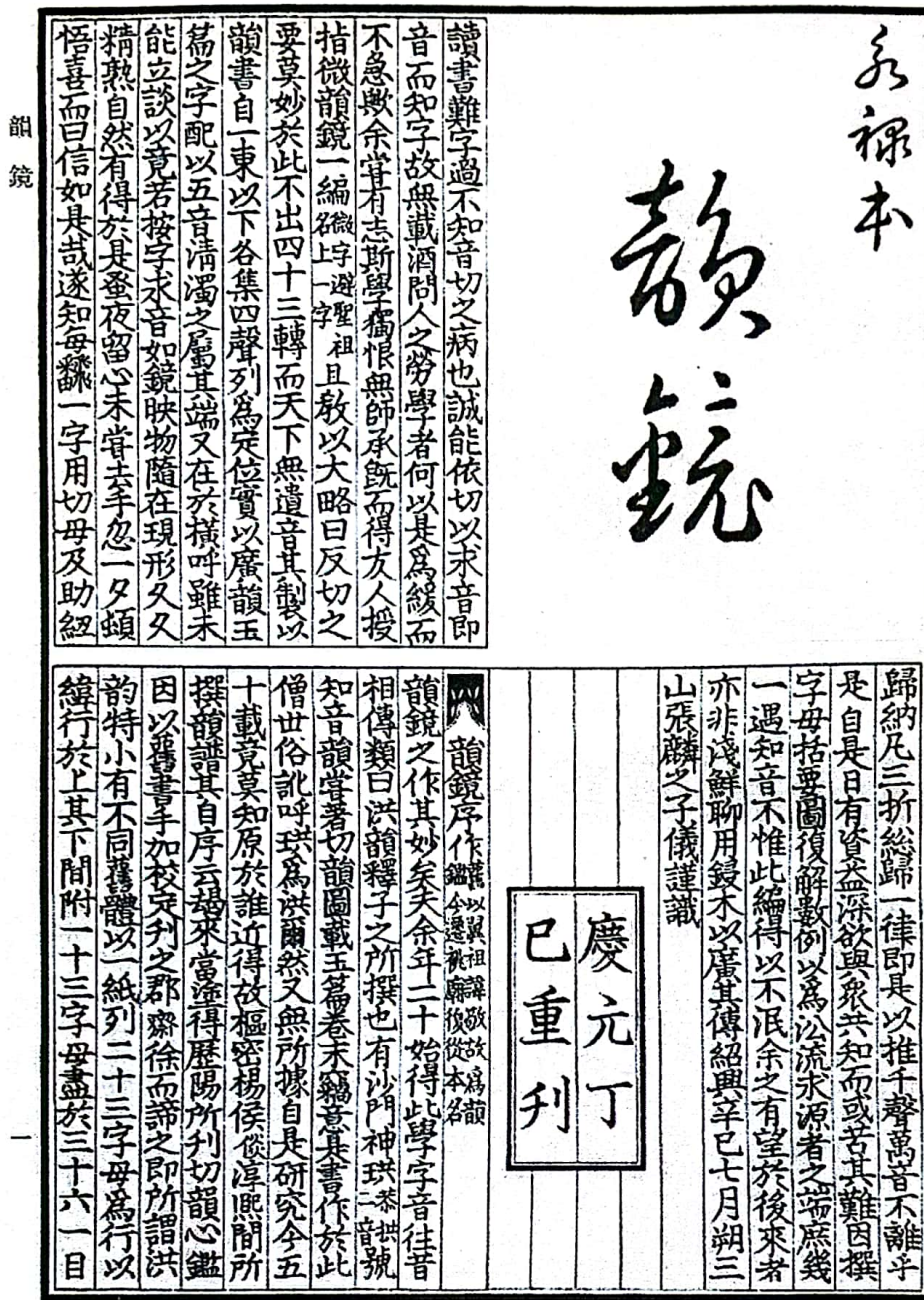


Figure 3.8 The first page of an early rhyme table: Yunjing 韻鏡.

#### (8) The Relationship Between the “Song Yuan Rhyme Table” (宋元韻圖) and Buddhism

The so-called Song Yuan rhyme table includes three books: “Sishengdengzi 四聲等子”, “Qieyunzhizhangtu 切韻指掌圖”, and “Qieyunzhinan 切韻指南”.

“Sishengdengzi 四聲等子” was established by the monk Zhiguang (智光大師) and was compiled at the end of the Buddhist Scriptures (or “Buddhist Canon” 大藏經).

The first page of the book “Qieyunzhizhangtu 切韻指掌圖” features a palm pattern with marked graphics of five fingers. This icon is similar to that found in the Buddhist scriptures. The handprint (手印) is a distinct Buddhist symbol.

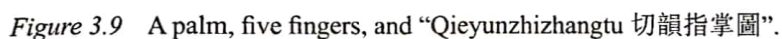
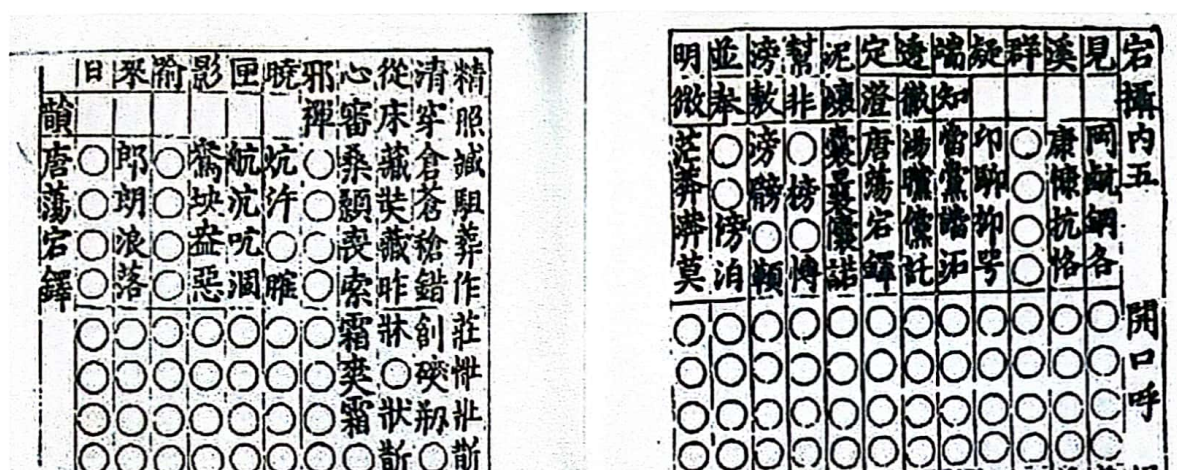


Figure 3.10 A sample page of the Song Yuan rhyme table “Sishengdengzi 四聲等子”.

|     |   |   |   |   |     |     |     |     |    |
|-----|---|---|---|---|-----|-----|-----|-----|----|
| 知   | 泥 | 定 | 透 | 端 | 疑   | 羣   | 溪   | 見   | 四  |
| ○ 轉 | 孺 | 頭 | 偷 | 兜 | 齟   | ○ 求 | ○ 丘 | 鉤   | 平聲 |
|     | ○ | ○ | ○ | ○ | ○ 牛 | ○ 蚪 | ○ 怵 | ○ 鳩 |    |
|     |   |   |   |   | ○ 聲 |     |     | ○ 樛 |    |
| ○ 肘 | 穀 | 蓀 | 蕤 | 斗 | 藕   | ○ 舅 | 口   | 苟   | 上聲 |
|     | ○ | ○ | ○ | ○ | ○   | ○ 蟻 | ○ 糗 | ○ 久 |    |
|     |   |   |   |   | ○   |     | ○   | ○ 糾 |    |
| ○ 晝 | 耨 | 豆 | 透 | 鬪 | 偶   | ○ 舊 | 寇   | 邁   | 去聲 |
|     | ○ | ○ | ○ | ○ | ○ 胤 | ○ 𪗇 | ○ 𪗇 | ○ 救 |    |
|     |   |   |   |   | ○   |     |     | ○   |    |
| ○ 窒 | 𪗇 | 特 | 忒 | 德 | ○   | ○ 𪗇 | 刻   | 祇   | 入聲 |
|     | ○ | ○ | ○ | ○ | ○ 𪗇 | ○ 𪗇 | ○ 乞 | ○ 訖 |    |
|     |   |   |   |   | ○ 𪗇 | ○ 𪗇 | ○ 詰 | ○ 吉 |    |

Figure 3.11 A sample page of the Song Yuan rhyme table “Qieyunzhizhangtu 切韻指掌圖”.

Versions of “Qieyunzhinan 切韻指南” are mostly associated with monks and temples. They record the name of the monks and temples of the Ming dynasty, such as “Monk Jueheng 覺恒法師”, “Monk Benzan 本讚法師”, “Dalongfu Temple 大隆福寺”, “Zhishankaiyun Temple 芝山開元寺”, and “Yanfa Temple 衍法寺”. This reflects that Indian Buddhism has great influence on these works.



## 2. The Differences Between and the Characteristics of Modern Western Linguistics and the Scholars of the Qing Dynasty in the Study of Phonology

Scholars in the Qing dynasty had their own unique research style in Chinese phonology, which differed from Western linguistics in terms of study methods and concepts. Although Chinese scholars were dedicated to the study of phonology, the cultural exchange with modern Western linguistics inevitably brought new ways of reconstructing the sound system of Old Chinese. These influences enriched Chinese phonology in many ways during the late Qing dynasty.

There are five significant breakthroughs in the field of phonology:

A similar pattern can be observed in the XINGSHENG structure (形聲字<sup>11</sup>) of Chinese characters. There was always a consistent pronunciation when a YINSHENG character (陰聲字) was followed by a sound component (聲符 phonetic radical):

| <i>YINSHENG character 陰聲字 of<br/>XINGSHING 形聲 structure</i> | <i>入聲字 RUSHENG character<br/>as a sound component</i> |
|-------------------------------------------------------------|-------------------------------------------------------|
| 代-g (人+弋)                                                   | 弋 -k                                                  |
| 否-d (不+口)、杯-d (不+木)                                         | 不 -t                                                  |
| 秘-d (禾+必)                                                   | 必 -t                                                  |

The table on the previous page demonstrates that the rhyming harmony sound of “代否杯秘” is always accompanied by the RUSHENG character (弋不必) of the same ending; that is to say, the sound relationship between the YINSHENG character and the RUSHENG character has consistent pronunciation, and this happened in the period of Old Chinese—also called Archaic Chinese by some scholars, which was used from 1300 BCE to the second century CE.

All archaic YINSHENG characters ended with a consonant, such as -b, -d, -g, -r, and they would match with RUSHENG characters that have a plosive ending such as -p, -t, and -k. As for the YANGSHENG characters, they have nasal endings -m, -n -ŋ, which are not suitable for matching with stop endings -p, -t, and -k.

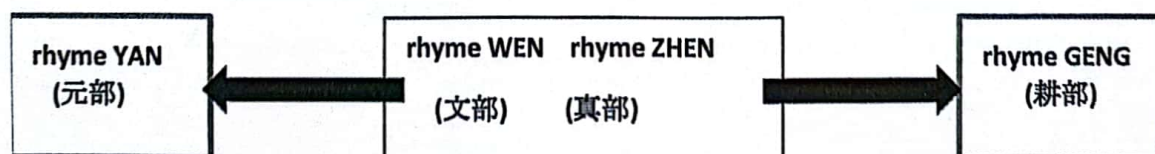
Examples of the syllable endings of RUSHENG and YINSHENG characters:

| <i>RUSHENG</i><br>character 入聲字 | <i>YINSHENG</i><br>character 陰聲字 |
|---------------------------------|----------------------------------|
| -p                              | -b                               |
| -t                              | -d, -r                           |
| -k                              | -g                               |

Gu Yanwu (顧炎武) made the second significant breakthrough in Chinese phonology by denying a rhyme of “Guang Yun 廣韻”<sup>12</sup> as an inseparable rhyme unit. While analyzing the archaic rhymes, Gu Yanwu found that a rhyme in “Guang Yun 廣韻” of Middle Chinese<sup>13</sup> may come from different rhyme categories of Old Chinese. For example, some words in the “Zhi Yun 支韻”<sup>14</sup> in the rhyme book “Guang Yun 廣韻” were believed to come from the “GE 歌部”<sup>15</sup> section of the archaic period, while other words came from the “Yu 魚部” section of the archaic times. This research deepened our understanding of the nature of “Guang Yun 廣韻” and the evolution of Chinese speech.

The third significant breakthrough in Chinese phonology was by made by Duan Yucai (段玉裁<sup>16</sup>) in his research on the rhyming rules (韻例) of archaic ballads. Duan discovered that each chapter of the SHIJING (詩經 Book of Songs) was a distinct and independent rhyme unit, not associated with any other subsequent chapter in the book. This discovery led to the establishment of a new phonological rule in archaic ballads known as “theory of ZHIZHIZHI separation” (支脂之分部說).<sup>17</sup> As a result, the rhyme system was separated into three different parts, each with a different pronunciation in Old Chinese.

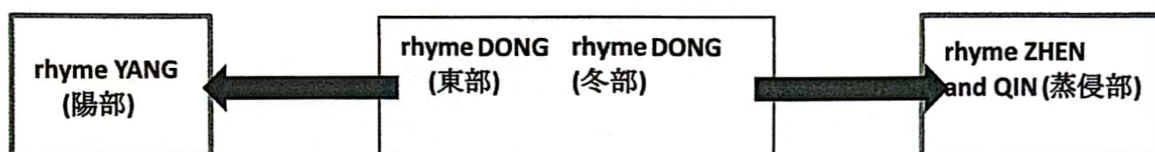
The fourth significant breakthrough in Chinese phonology was the identification of rhyme group boundaries based on the relationship between different rhyme categories in OLD Chinese. Duan Yucai proposed the theory of “ZHEN and WEN rhyme Divisions 真文分部說”,<sup>18</sup> stating that the rhyme ZHEN Division (真部, such as the characters “秦人身旬辛天田千令因 . . .”) always rhymed together with the rhyme GENG Division (耕部), and the rhyme WEN Division (文部, such as the characters “昏先春屯門分孫君雲存 . . .”) always rhymed together with the rhyme



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YAN Division (元部). By analyzing their pronunciation relationship, the difference in pronunciation between the ZHEN Division and WEN Division could be determined, revealing the boundaries between the two rhyme categories.

Another example is Kong Guangsen's (孔廣森 1752–1786)<sup>19</sup> theory of “DONGDONG Division 東冬分部說”. He found that the rhyme DONG (東部, such as the characters “東公同叢從封容凶充 . . .”) always rhymed with the rhyme YANG (陽部) in OLD Chinese, and the rhyme DONG (冬部, such as the characters “中蟲冬宗農眾宋 . . .”) always rhymed with the rhyme ZHENG (蒸部, such as the characters “弓夢升朋興增承雄勝 . . .”) and QIN (侵部, such as the characters “林心三今風音南琴錦甚 . . .”). This allowed the boundaries between the DONG 1 Division (東部) of rhyme and DONG 2 Division (冬部) of rhyme in Old Chinese to be determined.



The fifth significant breakthrough in Chinese phonology was the recognition that the tone of RUSHENG (入聲) can also be an independent rhyme category in Old Chinese. RUSHENG words often form a separate and independent rhyming unit. This discovery challenged the traditional notion that every rhyme category in Middle Chinese must have all four tones (PING, SHANG, QU, RU 平上去入). Scholars in the Qing dynasty established some independent rhyme Divisions of RUSHENG (入聲), breaking the traditional concept that the four tones must be paired together as a group.

These research results surpassed the Western linguistics of that era. For example, Qing dynasty scholars in the eighteenth century discovered the law that [p] evolved into [f] earlier than Western linguists (Grimm's Law in the nineteenth century). However, by the nineteenth century, Chinese phonology had fallen slightly behind, and scholars began to incorporate a lot of Western progressive phonetic analysis skills and introduced new linguistic concepts to China.

The methods employed in the study of Historical Chinese phonology differ considerably from those used in Indo-European linguistics due to the logographic nature of the Chinese writing system. Unlike Indo-European languages, Chinese did not have a phonetic spelling system, making the reconstruction of specific pronunciation more challenging.

Originally, Western societies were similar to China in terms of language research, with scholars primarily focused on interpreting ancient classics and literature. However, with the rise of historical comparative linguistics in the nineteenth century, Western scholars developed a clearer and more precise understanding of language. In the twentieth century, structural linguistics emerged, further advancing Western scholars' understanding of language.

In the past 100 years, a significant milestone in Chinese phonology was achieved by the Swedish sinologist Karlgren (1889–1978). His work *Études sur la phonologie chinoise* (1915) marked a giant leap in the reconstruction of ancient Chinese, leading to updated research ideas and techniques among Chinese phoneticians. Phonology study became more objective, scientific, and systematic during this period, influenced by Karlgren's contributions.

One of the significant achievements influenced by Western linguistics was that Chinese phonologists found and studied consonant clusters in Old Chinese, and this research lasted for 100 years from the nineteenth century. Let's delve into the research development over the past 100 years and how Chinese scholars were influenced by the West in terms of theory and methodology.

As early as 1874, the British sinologist Joseph Edkins<sup>20</sup> presented a paper at the Second Far East Conference proposing the existence of complex initials in Old Chinese based on harmonic words reflected in Chinese characters and recorded in classical documents. However, his view-point did not garner much attention from Chinese scholars at that time.

In the early twentieth century, Swedish sinologist Karlgren (高本漢 1889–1978)<sup>21</sup> constructed a set of initial consonant clusters in Old Chinese. This work laid the foundation for further research in the field (See Chao et al. 1940). Following Karlgren, renowned Chinese scholar Lin Yutang (林語堂 1895–1976)<sup>22</sup> published “The Theory of Consonant Clusters in Old Chinese” in 1924.

During the 1960s and 1970s, the study of the consonant clusters in Old Chinese reached its peak. The focus during this period was on the structure of the Cl/r type (e.g., gl-, pl-, bl-), the SC type (e.g., sb-, sg-, sk-, sl-), and the NC type (e.g., mb-, nt-, ngl-).

The research findings were compiled in a proceeding titled *Collection of Theses of Consonant Clusters in Old Chinese*, edited by Zhao Bingxuan (趙秉璇)<sup>23</sup> and Chu Chia Ning (竺家寧)<sup>24</sup> (Beijing Language and Culture University Press, 1998). This collection included 22 selected papers, with the majority being published after the 1960s.

Based on the research results, scholars confirmed the existence of the consonant clusters in Old Chinese through various aspects.

#### (a) Commonality of Language Evolution

Phonetic evolution often involves the loss of phonemes, and this is evident in both ancient and modern Chinese. For example, in the transition from Old Chinese to Middle Chinese, the initial dental flap [r-] was lost at the beginning of words. Similarly, in the shift from Middle Chinese to modern Mandarin, initial consonants such as [g- 羽雨雲王永有], [ng- 魚牛語宜危玉五], [m- 巫無亡武文望], and [n- 而兒耳爾二] were lost and eventually became zero initials.

After the Song dynasty, the glottal stops were subsequently lost and became zero initials (於央伊衣憂一握). Therefore, the number of the zero initials gradually expanded.

The same is true for Tibetan, which belongs to the same language family as Chinese. The simple consonants of Tibetan always came from consonant clusters. For example:

Ancient Tibetan [dkafi] > modern Tibetan [ka] Chinese cognate 苦 [ku] hard  
Ancient Tibetan [mdafi] > modern Tibetan [ta] 箭 [jian] arrow  
Ancient Tibetan [gnis] > modern Tibetan [ni] Chinese cognate 二 [ni>er] two

Judged from their same origin, the Chinese and Tibetan’s ancestral form, that is, Proto-Sino-Tibetan (PST), must have a cluster initial in its sound system.

Indeed, the disappearance of phonemes in syllables is a common phenomenon in language change. In English, *speak* was from ancient *sprecan*, *feeble* from *flebilis*, and *laugh* from *hliehhan*. And the initial letters of *k* in the word *knee*, *p* in *psychology*, and *g* in *gnaw* are not pronounced. They were all derived from the loss of phonemes.

In the *Webster’s Dictionary*, Old English initial clusters [hr, hl, hn, kn, gn, wr] have lost their initial consonants, such as

hring > ring  
hleapan > leap  
cneow > knee  
hnecca > neck

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The initial [k-] is still preserved in some Germanic languages: Danish [kne:ʔ] and Swedish [kne].

Based on the trend of this language change, we have no doubt about the possibility that consonant clusters once existed in ancient Chinese.

We can list a phonological rule that all languages have experienced:

consonant cluster >>> single consonant >>> zero initials  
(e.g., Evenness 勻 O.C. gr- >>> r- >>> Mandarin Ø - )<sup>25</sup>

It would be very unreasonable and contrary to common sense if we assumed that Chinese is the only language in the world that never had initial consonant clusters and maintained a single-consonant initial for thousands of years. It is difficult for us to come up with convincing explanations why the evolution of Chinese consonants has been stopped and why there has never been a sound lost in Chinese for thousands of years.

These achievements in the study of Chinese phonological history have benefited from the cultural exchange between China and the West from the nineteenth century on.

#### (b) *Traces of Consonant Clusters Within Chinese Records*

Many remnants of the consonant clusters can often be found in texts and ancient documents. The most obvious and abundant materials are the XINGSHENG characters (形聲字 phonetic compounds, or translated as phono-semantic compounds, ideophone words, picto-phonetic character, ideogram plus phonetic). In each XINGSHENG character, a half of the character indicates pronunciation, and the other half indicates meaning. When the XINGSHENG characters were first formed, the pronunciation should have been very close between the character itself and its phonetic radicals (聲符). As XINGSHENG characters were used for more than 3,000 years, the pronunciation of the character or its phonetic radicals may have changed. However, by examining the structure of XINGSHENG characters, we can reveal the phonetic sound of that time.

We have observed that the same Chinese character had different pronunciations during different time periods, and these changes are also reflected in XINGSHENG compounds. For example, the character 果 (fruit) was pronounced [kl-] in Old Chinese, but people later changed its pronunciation to [k-] in Middle Chinese. The pronunciation [ 果kl-] became the phonetic radicals of other characters in the age of character creation (the period of Old Chinese), such as 裸 ([gl-] naked), because they had a similar pronunciation.

Here are a few examples to illustrate the KL-type consonant clusters reflected in the XINGSHENG system: (O.C.= Old Chinese, M.C.= Middle Chinese)

fruit 果 O.C. [kl-] > M.C. [k-]; naked 裸 O.C. [gl-] > M.C. [l-]  
each 各 O.C. [kl-] > M.C. [k-]; road 路 O.C. [gl-] > M.C. [l-]  
both 兼 O.C. [kl-] > M.C. [k-]; honest 廉 O.C. [gl-] > M.C. [l-]  
supervisor 監 O.C. [kl-] > M.C. [k-]; blue 藍 O.C. [gl-] > M.C. [l-]  
drop 降 O.C. [kl-] > M.C. [k-]; thriving 隆 O.C. [gl-] > M.C. [l-]  
capital city 京 O.C. [kl-] > M.C. [k-]; cool 涼 O.C. [gl-] > M.C. [l-]

In these examples, the phonetic radicals always have a similar pronunciation to the XINGSHENG character. Their relationship was established during the OLD Chinese period.

Another example is Shengxun (聲訓). Shengxun is an ancient practice of explaining a character by using a homophone or near homophone. The selected homophone is a character that is pronounced the same (to varying extents) as another character. Here are a few examples:

neck 頸 O.C.[gl-] > M.C. [l-]: 頸也 O.C.[ kl-] > M.C.[ k-]  
old 老 O.C.[gl-] > M.C. [l-]: 考也 O.C.[ kl-] > M.C.[ k-]

In the previous case, “老[gl-] old” and “考[ kl-] old” have similar pronunciation and the same meaning in OLD Chinese, so they could interpret each other. This phenomenon is called Shengxun (聲訓).

Multi-pronunciation words also reflected the pronunciations of Old Chinese. Unlike some languages, where each word may have a unique pronunciation, certain Chinese characters may have more than one pronunciation. For example,

tripod 鬲, pronounced 隔 O.C.[ kl-] > M.C.[ k-], also pronounced 歷 O.C.[gl-] > M.C. [l-]  
volume 卷, O.C.[ kl-] > M.C.[ k-] (居晚切), also pronounced O.C.[gl-] > M.C. [l-]  
(又力轉切)

The phenomenon of multi-pronunciation in Chinese originates from words with the same pronunciation, which later developed into two different pronunciations. For instance, volume 卷 gl- > kl- > k- (has become [juan] today), l- (recorded in ancient document, and the sound is not used today).

Phonetic transcription in ancient documents also serves as traces of the ancient language. Scholars have discovered evidence of consonant cluster initials in ancient texts such as “SHUIJINGZHU” (《水經注》<sup>26</sup>—a work on the ancient geography of China that mapped the Chinese waterways and ancient canals) compiled by Li Daoyuan during the Northern Wei dynasty (386–534 CE), and “SHIJIZHUAN” (《詩集傳》—an annotation of SHIJING 詩經) compiled by Zhu Xi 朱熹 (1130–1200). For example, the character “角” was pronounced as [lak] in Zhu Xi’s book. It reflected the sound in Old Chinese:

“角” Old Chinese [klak] > Middle Chinese [kak], [lak] in Zhu Xi’s language.

Let’s examine another trace: loanwords of ancient times (通假字). *Loanword* refers to a character that acquires a new meaning because it is pronounced the same as another word, allowing it to be used as a substitute. Wu Qichang (吳其昌 1904–1944), a scholar from the early twentieth century, proposed the [ml-] consonant cluster from loanwords of ancient-time materials. In recent years, scholars have also discovered traces of the consonant cluster initials in loanword readings from unearthed documents.<sup>27</sup> For example, “惠[hui] benefit” and “慧[hui] wisdom” are often used as loanwords and can replace each other due to their same (or similar) pronunciations.

In addition, LIANMIAN words (連綿詞, or LIANMIAN doublets) in ancient Chinese are another important proof for reconstructing consonant cluster initials. For example, 孔 (kong, meaning “holes”) [klong] (holes 窟窿 [kulong] is a derived form from O.C. 孔 [klong]), and 角 (jiao, meaning “corners”) [klak] (corners 角落 [kaklak] is a derived form from O.C. 角 [klak]), etc. 窟窿 [kulong] and 角落 [kaklak] are LIANMIAN doublets that originate from the consonant cluster [kl-].

Clues from ancient and modern dialects in Chinese also provide evidence for reconstructing consonant clusters. Prof. Paul Fu-mien Yang (楊福綿) of Georgetown University, in the United States proposed a paper titled “Reconstruction of the Archaic Chinese sk-, skl- Consonants”

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where he found traces of the cluster initials in the MIN (闽方言) dialect. Mei Tsu-lin (梅祖麟), an American scholar from Cornell University, published the paper “Study on the [s-] Clusters in the Proto Northern MIN Dialects”, and Zhao Bingzhen (趙秉璇), a linguist of Shanxi, China, conducted a study on the JIN dialect (晉方言), all revealing remnants of consonant clusters in Old Chinese.

(c) *Clues From Cognate Words in the Sino-Tibetan Language Family*

The Chinese language is a member of the Sino-Tibetan language family, which shares an etymological origin. Although modern Chinese dialects do not have any consonant cluster initials at all, other languages in this family, such as Tibetan, Burmese, and Miao-Yao, have preserved consonant clusters to varying degrees. This is the most powerful evidence for the existence of consonant clusters in Old Chinese. For example:

Consonant cluster in QIANG language (羌語):

心 heart, Mandarin [xin], Mawo Dialect 麻窩話、Luhua Dialect 蘆花話 [sti:mi]  
二 two, Mandarin [er], Mawo Dialect、Luhua Dialect [ynə]

Consonant cluster in Atu Dialect of Yi language (彝語阿都話):

九 nine, Mandarin [jiu], Atu Dialect [gbu]

Consonant cluster in Geshizha Dialect of Ganzi county, Sichuan province (四川甘孜州格什扎話):

角 corner, Mandarin [jiao], Geshizha Dialect [grə]

If we could find that consonant clusters existed in the same language family, only two assumptions could be inferred:

1. There was no consonant cluster originally and some languages in the family developed consonant clusters at a later period.
2. All languages in this family had consonant clusters originally, but only the Chinese language lost them over time.

So which one is more realistic? If we consider factors such as the universal rules of phonological evolution, the geographical environment in which the language is located (secluded region or urban area), the frequency of language contact (a language is in contact with many peoples or always isolated?), I believe that the answer would become more obvious.

Early scholars could only provide some clues for the existence of the consonant cluster or make assumptions about the possibility of their presence. However, in the twentieth century, studies began to focus on the structural types and forms in which consonant clusters existed. In 1981, a comprehensive and systematic study was conducted, incorporating all Chinese characters into a consonant cluster system. This study was made possible by scholars such as Yan Xuequn (嚴學窘), a professor at Wuhan University, China, who published a paper on “The Traces of the Consonant Clusters in Proto Chinese”, and Chu Chia Ning (竺家寧), a professor at National Cheng Chi University, Taipei, who published a paper on “Research on the Consonant Clusters in Old Chinese”.

So far, several types of consonant cluster reconstruction have been proposed by scholars, but two types have been confirmed by most researchers:

(a) *Consonant Clusters with Dental Lateral [-l-] (or Dental Flap [-r-])*

We can examine the phonetic structure of the following characters:

|                                      |                                         |
|--------------------------------------|-----------------------------------------|
| 剥 Old Ch. [pl-] > Middle Ch. [p-]:   | 录 Old Ch. [bl-] > Middle Ch. [l-]       |
| 嵐 Old Ch. [bl-] > Middle Ch. [l-]:   | 風 Old Ch. [pl-] > Middle Ch. [p-]       |
| 龐 Old Ch. [br-] > Middle Ch. [b-]:   | 龍 Old Ch. [bl-] > Middle Ch. [l-]       |
| 獺 Old Ch. [thl-] > Middle Ch. [th-]: | 賴 Old Ch. [dl-] > Middle Ch. [l-]       |
| 豐 Old Ch. [dl-] > Middle Ch. [l-]:   | 體 Old Ch. [thl-] > Middle Ch. [th-]     |
| 龍 Old Ch. [l-] > Middle Ch. [l-]:    | 童 Old Ch. [dhl-] > Middle Ch. [dh-]     |
| 莒 Old Ch. [kl-] > Middle Ch. [k-]:   | 呂 Old Ch. [gl-] > Middle Ch. [l-]       |
| 泣 Old Ch. [khl-] > Middle Ch. [kh-]: | 立 [l-]: Old Ch. [gl-] > Middle Ch. [l-] |

Another example of consonant clusters is the word “行李 baggage”. Its early meaning was “messenger with luggage”. The original writing form of this word was “行使 messenger”, but over time, the character “使” was replaced by “李” due to their similar pronunciation. This phenomenon is called “JIAJIE 假借” (loanword) by traditional scholars.

As for the meaning of the word “行李”, it has changed from “messenger” to “baggage” in recent centuries. But a question arises: How was the pronunciation of the character “使” ([shi] in Mandarin) similar to that of the character “李” ([li] in Mandarin)?

The reasons are as follows: first, the phonetic symbol of “李[li]” was “子[tsi]”, and the pronunciations of the two characters in Old Chinese were “李”[dzli>li] and “子”[tsi]; both sounds were very close. Second, the phonetic symbol of “使” [shi] was “吏” [li], and the pronunciations of the two characters in Old Chinese were “使[sli>si]” and “吏[li]”; both sounds were very close. These similar pronunciations in the two sets of words caused the substitution over time, with “行使 [O.C. sli]” being replaced by “行李 [O.C. dzli]” in its written form.

Another example is the word “角 corner”, which was pronounced [klak] in Old Chinese and later changed to [kak] in Middle Chinese. The LIANMIAN word (連綿詞) “角落 [kak lak] corner” used today is a variant form of “角 corner”. It preserves a residual trace of the original pronunciation of “角[klak]”. Another residual trace can be found in the character “鰌” (the variant writing form of “角”), where its phonetic symbol (phonetic radical) is “录[l-]” (at the right side of this character), which is derived from [kl- > l-]. The scholar Zhu Xi (朱熹 1130–1200) labeled the pronunciation of the word “角” as [l-], in his famous work “SHIJIZHUAN” (詩集傳), providing evidence of the Old Chinese pronunciation of “角[klak>lak]”.

(b) *Consonant Clusters with [s-]*

In addition to the [-l-] cluster, another cluster accepted by most scholars is [s-]. We can observe the relationship of the character 支 [O.C. sk-/M.C. tɕ-] and 妓 [O.C. k-/ M.C. k-], which reflects the cluster type of [sk-]. The character 支 [sk-/tɕ-] is the phonetic symbol (or phonetic radical) of 妓 [k-/k-], and they share a similar pronunciation in Old Chinese. Furthermore, let's consider the change of consonant cluster sb-(>sβ->s-):

必 must, O.C. [p-]/ M.C. [p-]: “瑟 Musical instrument” O.C. [sb-] > [sβ-] > M.C. [s-]  
“必[p-]” is the phonetic symbol of “瑟[sb-]” (put beneath it), and they have similar pronunciations in Old Chinese.

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The exchanges between Chinese and Western cultures has greatly contributed to the study of various aspects of Old Chinese, including its phonetics. These achievements have made it possible to understand ancient phonology and have improved the research methods of Chinese phonology since the Qing dynasty.

### 3. The Application of Phonological Knowledge in Teaching Chinese as a Foreign Language

Chinese is the most widely spoken language in the world. Not only does the largest population in China speak Chinese Mandarin, but the language is also spoken in most Southeast Asian countries. Roughly 14% of the global population communicates in Chinese on a daily basis. Learning Chinese is fun and interesting, and it offers many benefits for personal and professional growth.

In recent years, teaching Chinese has become a popular career. Starting at the elementary level, foreign students have to learn Chinese Mandarin pinyin (a method of Chinese pronunciation) and Radicals of Chinese Characters.

At the next level, students are introduced to the basics of linguistic and philology for more comprehensive studies in later courses. The goal of teaching phonology is for students to understand the language changes and developments from ancient to modern Chinese. Foreign students not only learn the modern customary usage but also need to know why it is used in this way and how it formed in language history. For this reason, Chinese phonology has become a crucial curriculum in Chinese teaching.

Here are some examples of how phonology can be applied to Chinese teaching.

#### (1) Chinese Appellation—the Formation of “爸爸 baba (Dad)”

Nowadays, Chinese children call their father “爸 [ba]” or “爹 [da] daddy”. However, these two characters cannot be found in the book “SHUOWEN JIEZI” (說文解字, a classic dictionary by the HAN scholar XUSHEN 許慎). It was not until after the third century that the two Chinese characters “爸” and “爹” appeared in Chinese. So what did Chinese children call their father in the time of Confucius (Old Chinese dated 600 BCE to 200 BCE)? Why is there no such word as “爸” or “爹” in the Confucius era? Let’s examine some evolution rules of phonology.

In ancient Chinese, the word “父 [fu]” was used for “father”. Why was a father called “父 [fu]” not “爸 or 爹”? Why were Chinese fathers not called “papa” in ancient times, just like in other civilizations today? The answer can be revealed in the history of phonology.

Chinese scholar QIAN DAXIN (錢大昕 1728–1804) of the Qing dynasty made a great discovery in the evolution of pronunciation over a long period of time. He believed that the current [f] sound was originally the [p] sound in ancient times. When his theory is applied to this case, the initial consonant of “父 [f-]” originated from the Old Chinese [p-]. Another rule in the evolution of Chinese phonology is that today’s [u] vowel was originally pronounced as [a] sound. Therefore, “父 [fu]” in Old Chinese should be pronounced as [pa]. When these two rules are applied in the pronounce of the character “父”, we can tell students that in ancient China, children also called their father [papa], just like in many other languages in the world.

Another German philologist, Jacob Ludwig Karl Grimm (1785–1863), also put forward the same theory that English [f] came from [p]. The word *father* came from the Old English *pater*. The evolution of [p>f] is a universal principle of languages.

The character “父” was used in the era of Confucius. As mentioned previously, it was pronounced as [pa] before the third century. After the third century, a new character “爸 [pa]” was

created by adding the sound symbol “巴” below the “父”. Since the pronunciation of character “父” changed to [fu], it was no longer suitable for recording the appellation of father [pa].

There are many ways of saying father in Chinese dialects, and some of them are not [pa] or [papa] but [ta] or [tata]. They added the symbol “多” ([ta] in Old Chinese, which later changed to [tuo] in Mandarin) below the original character “父”, resulting in the creation of a new character “爹”.

Here is the evolution of the Chinese word *father*:

“父” Old Chinese [pa] > Mandarin [fu] “father”

“爸” 父+巴 pa=爸, Mandarin “pa, papa” (refer to English “papa”)

“爹” 父+多 ta=爹, ancient Chinese “ta, tata” (>southern dialect [tia] >Mandarin [tie])  
(refer to English “daddy”, “dada, dad” as variants)

There are many variants of [pa] (father or elder) in Chinese dialects:

爸 pa, 爸爸 papa, 老爸 lao pa, 阿爸 a pa (lao-, a- are prefixes)

爹 ta>tie, 老爹 lao tie, 阿爹 a tie, 阿大 a ta, 達達 tata, 大大 tata

There are cognates of 父、爸[pa] and 爹[ta>tia>tie].

Teaching Chinese becomes easy and effective when we reference the traits in the evolution of Chinese phonology into modern Chinese speaking and writing. Once the distinctive characteristic or property of Chinese words and their pronunciation are identified through Chinese phonology, the same rules can be applied to other similar Chinese words. This knowledge makes Chinese teaching much more efficient.

## (2) Phonology and Chinese “Tea Culture”

For centuries, tea has been the most common drink for every Chinese household. People believe tea is a major source of health and consider it a necessity in their daily lives. Due to its popularity, Western students often have a strong interest in tea and any information related to tea, including the Chinese character “茶 tea”.

There are two cognate words for tea in Chinese: “茶[cha]” and “荼[tu]”. Over a thousand years ago, Chinese ancestors discovered a bitter and cool herbal plant, which they called “荼[tu]”. They later fermented the leaves of “荼[tu]” and turned it into a mellow and relaxing drink. They further refined their fermentation techniques and produced a new type of fine drink, which they called “茶[cha]”. Eventually, many varieties of fine tea were produced. The word for tea was written as “茶[cha]”, slightly differentiating it from “荼[tu]”.

This is the story of the birth of the word “茶 tea”. Furthermore, the tea ceremony (茶道) and tea culture developed during the Tang dynasty. This tea culture gradually spread from China to the rest of the world. Up to the present time, the words used to refer to tea in all languages originated from Chinese.

In Korean, the “tea” in “tea house 茶房다방” is pronounced [da]; in the Min dialect of China (spoken in Fujian and Taiwan), and in French, “tea” is pronounced as [de] and [thé], respectively; in English, “tea” is pronounced as [ti:], which evolved from the ancient Chinese cognate words “茶[cha]” and “荼[tu]”.

From this example, we can observe the gradual shift of the low vowel [a] to the high vowel [i] in languages.

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[a]>[e]>[i]

This pronunciation shift in the Chinese language coincides with the change of vowels in the English language, known as the “Great Vowel Shift” in English history. This similar change is considered a language universal in the study of speech.

How did the pronunciation change from [da] to [de] and eventually to [ti]? The Chinese “茶 Mandarin [tu], 茶 Mandarin [cha]” were originally from the same pronunciation of [da]. In modern Chinese, the word “茶” retains the original final [-a], while the word “茶” retains the original initial [t-]. They still reveal their homologous relationship.

The evolution of the words for “tea” is as follows:

“茶, 茶” Old Chinese[da]> Southern Min dialect[de], French [thé] >English tea[ti]  
>Mandarin [茶cha], [茶tu]

By summarizing the examples we have described and introduced, we can see how Chinese phonology plays an important role in language teaching and cultural exchanges. Understanding the principles of Chinese phonology can greatly enhance the teaching and learning of the language and facilitate cross-cultural communication.

### Notes

- 1 Six Dynasties is a collective term for the six Han-ruled dynasties in China during the periods of the Three Kingdoms, Jin dynasty, and Southern and Northern dynasties. Period 220–589 CE.
- 2 Using Chinese characters treated as phonetic symbols to express initial consonants, such as 幫p-, 滂ph-, 並b-, 明m-.
- 3 Dividing Chinese pronunciation into four categories according to finals, such as 蕭sieu, 宵sjeu, 肴yau, 豪hau, [a] is more open than [a].
- 4 For example, “東董送屋” are pronounced with the tones PING, SHANG, QU, RU, respectively.
- 5 An outstanding Chinese philologist and geographer of the late Ming and early Qing dynasties 1613–1682.
- 6 The word pronounced with ending -p, -t, -k.
- 7 The word pronounced with ending -b, -d, -g in Old Chinese.
- 8 The word pronounced with ending -m, -n, -ng.
- 9 There are 206 rhyme categories in the rhyme book “GUANGYUN 廣韻”.
- 10 The Classic of Poetry, also Shijing or Shih-ching, translated variously as the Book of Songs, Book of Odes, or simply known as the Odes or Poetry (Chinese: 詩; pinyin: Shī) is the oldest existing collection of Chinese poetry, comprising 305 works dating from the eleventh to seventh centuries BC ([https://en.wikipedia.org/wiki/Classic\\_of\\_Poetry](https://en.wikipedia.org/wiki/Classic_of_Poetry)).
- 11 Ideogram plus phonetic (one of the Six Methods 六書 of forming Chinese characters) also known as a phonogram, phonetic compound, or picto-phonetic character. A type of character that combines a semantic element (called a radical) with a phonetic element intended to remind the reader of the word's pronunciation (Britannica.com).
- 12 Guangyun 廣韻 is a character dictionary from the Northern Song period 北宋 (960–1126). The characters are arranged according to pronunciation and in rhyme groups. It was compiled by Chen Pengnian 陳彭年 on the basis of earlier rhyme dictionaries, Qieyun 切韻 and Tangyun 唐韻 (“An Encyclopedia on Chinese History, Literature and Art”).
- 13 From about the sixth century CE through to twelfth century CE.
- 14 One of the 206 rhyme groups in GUANGYUN.
- 15 There are ten rhyme sections of Archaic Chinese (OLD Chinese) in GU's system. For example, “GE section 歌部, Yu section 魚部”, and others.
- 16 1735–1815, a Chinese philologist of the Qing dynasty. He made great contributions to the study of historical Chinese phonology and is known for his annotated edition of Shouwen Jiezi 《說文解字注》.
- 17 Compiled in Duan's work: “LIU SHU YIN YUN BIAO” (六書音韻表).

- 18 Compiled in Duan's work: "LIU SHU YIN YUN BIAO" (六書音韻表).
- 19 He was a famous scholar of the Qing dynasty and was the 68th-generation descendant of Confucius.
- 20 Joseph Edkins (艾約瑟 1823–1905) was a British Protestant missionary who spent 57 years in China, 30 of them in Beijing. As a sinologue, he specialized in Chinese religions. He was also a linguist, a translator, and a philologist ([https://en.wikipedia.org/wiki/Joseph\\_Edkins](https://en.wikipedia.org/wiki/Joseph_Edkins)).
- 21 Klas Bernhard Johannes Karlgren (1889–1978) was a Swedish sinologist and linguist who pioneered the study of Chinese historical phonology using modern comparative methods ([https://en.wikipedia.org/wiki/Bernhard\\_Karlgren](https://en.wikipedia.org/wiki/Bernhard_Karlgren)).
- 22 Lin Yutang was a renowned Hokkien Chinese writer, translator, linguist, philosopher, and inventor ([https://en.wikipedia.org/wiki/Lin\\_Yutang](https://en.wikipedia.org/wiki/Lin_Yutang)).
- 23 A linguist of Shanxi, China.
- 24 Professor of Chinese linguistics, National Cheng-Chi University, Taipei. Previously, he was president of the Chinese Phonology Association (Taiwan).
- 25 The character 勻 gr- is the phonetic radical of 均 k-.
- 26 According to the research of Professor Chen Xin Xiong (陳新雄, professor of Taiwan Normal University), there are consonant clusters such as "慮 \*gl > l, 子 \*tsl > ts" reflected in "SHUIJINGZHU".
- 27 For example, the Mawangdui (馬王堆) silk book, unearthed at Changsha, China, from a tomb of Han dynasty, in 1973.

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