“Regularities” and “irregularities” in Chinese historical phonology

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ABSTRACT

With a combination of methodologies from Western and Chinese traditional historical linguistics, this thesis is an attempt to survey and synthetically analyze the major sound changes in Chinese phonological history. It addresses two hypotheses – the Neogrammarian regularity hypothesis and the unidirectionality hypothesis – and tries to question their validity and applicability. Drawing from fourteen types of “regular” and “irregular” processes, the thesis argues that the origins and impetuses of sound change is far from just phonetic environment (“regular” changes) and lexical diffusion (“irregular” changes), and that sound change is not unidirectional because of the existence and significance of fortifying and bi/multidirectional changes. The thesis also examines the sociopolitical aspect of sound change through the discussion of language changes resulting from social, geographical and historical factors, suggesting that the study of sound change should be more interdisciplinary and miscellaneous in order to explain the phenomena more thoroughly and reach a better understanding of how human languages function both synchronically and diachronically.

KEY WORDS: Chinese, historical, phonology, sound change
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List of abbreviations and keys

IPA: International Phonetic Alphabet. All phonetic transcriptions would be given in IPA.

*: reconstructed values

MC: Middle Chinese (EMC: Early Middle Chinese, LMC = Late Middle Chinese)

OC: Old Chinese


*YJ: Yunjing韻鏡 reconstructions

Tone Markers (even-numbered tones are only used if there are two or more modern tones in a single MC tonal category):

T1: 平聲/陰平 (dark) level

T2: 陽平 light level

T3: 上聲/陰上 (dark) rising

T4: 陽上 light rising

T5: 去聲/陰去 (dark) departing

T6: 陽去 light departing

T7: 入聲/陰入 (dark) entering

T8: 陽入 light entering (T8a: 全濁入 with obstruent initials, T8b: 次濁入 with sonorant initials)

Individual tone values are marked with Chao’s五度標記法 (five-degree notation).

For example, Middle Chinese only has T1, 3, 5 and 7. After the tone split there are 8 tones (T1–8). Further tone mergers and tone splits create different tones: for example, Standard Mandarin only has T1/2/3/5 while Guangzhou Cantonese develops T7a and T7b based on vowel length).
Abbreviations of language varieties:

G: Mandarin 官话  J: Jin 晋语  W: Wu 吴语
Hu: Huizhou 徽语  Ga: Gan 赣语  X: Xiang 湘语
M: Min 闽语  H: Hakka 客语  Y: Yue 粤语.

GB-BJ: 北京官话-北京话  Beijing dialect (Beijing Mandarin)
GL-JN: 冀鲁官话-济南话  Jinan dialect (Jilu Mandarin)
GJ-DL: 胶辽官话-大连话  Dalian dialect (Jiaoliao Mandarin)
GZ-WN: 中原官话-渭南话  Weinan dialect (Zhongyuan/Central Plains Mandarin)
GY-LZ: 蘭銀官话-蘭州話  Lanzhou dialect (Lan-yin Mandarin)
GX-CD: 西南官话-成都话  Chengdu dialect (Xinan/Southwestern Mandarin)
GX-CQ: 西南官话-重慶話  Chongqing dialect (Xinan/Southwestern Mandarin)
GH-YZ: 江淮官话-揚州話  Yangzhou dialect (Jianghuai/Lower Yangtze Mandarin)
GH-HF: 江淮官话-合肥話  Hefei dialect (Jianghuai/Lower Yangtze Mandarin)

J-TY: 晉語-太原話  Taiyuan dialect (Jin)

W-SH: 吳語-上海話  Shanghai dialect (Wu)
W-SZ: 吳語-蘇州話  Suzhou dialect (Wu)
W-WX: 吳語-無錫話  Wuxi dialect (Wu)
W-JH: 吳語-金華話  Jinhua dialect (Wu)
W-WZ: 吳語-溫州話  Wenzhou dialect (Wu)

Hu-YX: 徽語-黟縣話  Yixian dialect (Hui)

Ga-NC: 贛語-南昌話  Nanchang dialect (Gan)

X-CS: 湘語-長沙話  Changsha dialect (New Xiang)
X-YY: 湘語-益陽話  Yiyang dialect (New Xiang)
X-SF: 湘語-雙峰話  Shuangfeng dialect (Old Xiang)
MD-FZ: 闽东语-福州话  Fuzhou dialect (Min-dong/Eastern Min)
MN-XM: 闽南语-厦门话  Xiamen dialect (Min-nan/Southern Min)
MN-CZ 闽南语-潮州话  Chaozhou dialect (Min-nan/Southern Min)
MH-HK: 闽语-海口话  Haikou dialect (Hainan Min)

H-MX: 客语-梅县话  Meixian dialect (Hakka)
H-HY: 客语-惠阳话  Huiyang dialect (Hakka)

Y-GZ: 粤语-广州话  Guangzhou dialect (Yue/Cantonese)
Y-HK: 粤语-香港话  Hong Kong dialect (Yue/Cantonese)
Y-TS: 粤语-台山话  Taishan dialect (Yue/Toishanese)
Y-XY: 粤语-信宜话  Xinyi dialect (Yue)
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1. Introduction

Chinese languages, or the Sinitic branch of Sino-Tibetan language family, are a group of genetically related but possibly mutually unintelligible language varieties spoken by the ethnic Han majority in China, as well as most Chinese overseas. Known by their large population of native speakers, complex tonal systems, analytic morphology as well as rich culture and literature under its command, Chinese languages exhibit a similar degree (or even more) of internal diversity when compared to the Romance languages in the Indo-European family (DeFrancis 1984). This kind of enormous variability can be best testified by the synchronic phonology of all varieties of Chinese: although they share the common trait that each syllable consists of three parts – initial, final and tone – the number and quality of these segments display a wide array of phonological variants. For example, the number of initials ranges from a low of 15 (e.g. Fuzhou dialect of Eastern Min) to a high of 35 (Chongming dialect of Wu), and the number of tones range from 3 (Lanyin Mandarin, and Jiaoliao Mandarin in Shandong Peninsula) to possibly 12 (Wujiang dialect of Wu) (Kurpaska 2010) (Wang 2008); on the aspect of vowel phonemes, there is also a huge range from the debatable two-vowel system of Standard Mandarin only distinguishing height (Hashimoto 1970) to the 20 vowel phonemes of Jinhui dialect of Wu distinguishing height, backness and rounding (Jinhui Xuzhi).

Given these seemingly distantly related or even synchronically far-apart phonological phenomena, it is inevitable to start tracing back the history of Chinese phonology: since language is such a fluid and ever-changing construct with
phonology arguably being one of the most sensitive and flexible part susceptible to change, the study of diachronic phonological change is crucial to the question of how the Chinese languages evolved and in what directions they would continue to change. Therefore, this thesis focuses on the interface between ancient Chinese and modern Chinese phonology, with special regard to the “regularity” and “irregularity” of diachronic phonological changes – by trying to synthesize modern dialectal data with reconstructive work as well as provide a theoretical or social linguistic analysis, this thesis strives to question the Neogrammarian hypothesis of the regularity of sound change (2.1.2, 5.1), explore instances of different kinds of sound changes to question the validity of the unidirectionality hypothesis (2.1.3, 5.2), as well as discuss the possible social reasoning and motivations behind the various sound changes.

To give a brief overview of the thesis’ structure: Section 2 addresses the theoretical and historical background, paving the path for understanding the latter sections; Section 3 and Section 4 take on particular cases of change and their linguistic analyses, being an attempt attending to the regular and irregular phonological changes happening in various varieties of Chinese languages respectively; Section 5 provides more miscellaneous discussions of sound change and addresses the social reasons for them; while the final Section 6 concludes the thesis and proposes future research directions.

More specifically, Section 2 is divided into two subsections: 2.1 focuses on the history of historical linguistics as a discipline, with particular focuses on the comparative method – one of the main methodologies of the thesis, as well as the
Neogrammarian regularity hypothesis and the unidirectionality hypothesis which this thesis would question and critique. 2.2 serves as a surface-level introduction to Chinese historical linguistics: it tries to span the important concepts in this unique discipline, such as 韻書 (rime book), 反切系聯法 (the Fanqie connection method), 等韻 (rime grades), and the most comprehensive phonological record of Middle Chinese 廣韻 (Guangyun) which serves as a basis for the diachronic comparison. 2.3 is a brief diachronic survey of the Chinese languages, including its historical and phonological developments.

Using examples from various Chinese varieties juxtaposed with their counterparts in Guangyun, Section 3 and Section 4 attempts to describe the extensive and variegated sound changes happened to different Chinese languages, shedding light on their similarities and differences. These two sections are separate from each other with the intention to also indicate the relative occurrence and proportionality of regular versus irregular sound changes, according to Neogrammarians. Section 3 discusses regular processes including devoicing, apocope, frictivization, palatalization, debuccalization, lateralization, denasalization and chain shift, while Section 4 tackles irregular changes such as free variation, lexical diffusion/analogy, development of syllabic consonants and morphophonological changes.

Section 5 summarizes the previous discussion, discussing the match and mismatch between evidence and hypotheses: it discusses the comparative prevalence of lenitive and fortifying changes, regularity versus irregularity, and the general directionality of sound changes. It also takes a more comprehensive approach,
considering possible reasons of sound change in general with a socio-geographical lens, addressing themes like shared areal traits, linguistic layering and the colloquial/literary readings.
2. **Backgrounds**

Before doing an analysis of Chinese historical phonology, it is crucial to clear the ground and establish a firm foundation by introducing the relevant historical and theoretical backgrounds. Therefore, this section is divided into three parts: a brief overview of history and theories in historical linguistics (2.1), an introduction to the cobblestones in the field of Chinese historical phonology (2.2), and an examination of diachronic Chinese phonologies (2.3).

2.1. **Overview of historical linguistics**

2.1.1. A brief history of historical linguistics

As an academic discipline, historical linguistics seeks to investigate and describe the way in which languages change or maintain their structure during the course of time; therefore its domain is language in its diachronic aspect, hence the other name diachronic linguistics (Bynon 1977). The distinction between synchronic and diachronic linguistics has long been noticed by linguists because they have long been conscious of the fact that language has a temporal dimension and it is constantly changing. The earliest instance of such can be traced back to the speculative etymologies and discussion of Plato’s Cratylus, in the time when linguistics was still considered a tip of the iceberg of philology, the study of ancient texts and documents (Bowern and Evans 2015: 45, Campbell 1998: 391). As more data from different languages became more available due to European colonial expeditions and occupations, cross-linguistic comparisons and connections were made more and more
frequently, announcing the dawn of comparative linguistics and the study of language
typology, which were the main focus of scholars back in late 18th century when
historical linguistics as a modern field emerged. The most famous case in which the
pivotal comparative method and internal reconstruction method were applied was the
Indo-European languages, which remains a significant field in historical linguistics
(Bowern and Evans 2015: 645). In 1786 Sir William Jones first lectured on the
similarities among Latin, Greek and Sanskrit, while Thomas Young coined the term
Indo-European in 1813 (Poser and Campbell 1992: 214). In 1822, Grimm’s Law, the
first systematic rule of sound change, was put forth by Jacob Grimm, which has
served as a cornerstone of later Indo-European studies. Comparative linguistics and
reconstruction comprised the bulk of historical linguistics from 19th century to the
first half of 20th century, with further research on the Indo-European family, as well as
the expansion to other major language families, such as the Austronesian family and
various Native American families (Campbell 2013: 107, Poser and Campbell 2008: ix
+ 536).

Nowadays, historical linguistics does not only focus on the typological and
reconstructive aspects: with the development of other related fields in theoretical
linguistics, historical linguistics now includes a wider range of interdisciplinary
studies, including etymology, dialectology, as well as phonology, morphology, syntax
through a diachronic lens. Historical phonology, as the center of this thesis, composes
a great and relatively developed part of discipline, where sound change – any
processes of language change concerning pronunciation, sound values and sound
system – is studied, in order to better describe the phonological systems in the past and draw the connection between ancient and modern languages. The study of sound change depends heavily on the Neogrammian regularity hypothesis, which will be discussed in the next subsection.

2.1.2. Neogrammian regularity hypothesis and the comparative method

The Neogrammarians (German: Junggrammatiker) were a school of German linguists who proposed the hypothesis of the regularity of sound change. The Neogrammian model of sound change follows the following principles (Seymour and Jankowsky 1976: 125):

- **Sound changes are unstoppable.** All languages change diachronically and nothing can prevent the change.

- **All sound changes are regular with no exceptions.** For a particular sound change, there should be a corresponding “sound law”\(^1\) governing the change. Apparent exceptions would be justified by the process of analogy, another sound change, or an unrecognized conditioning factor.

- **All sound changes are conditioned only by phonetic environments.** Sound change can only have phonological constraints (e.g. /p/ > /b/ between two vowels): It is not governed by any grammatical traits (e.g. the word being an adjective, a past participle, etc.).

- **All sound changes happen independently of other sound changes.** In other words,

\(^1\) “Sound law” is the original term coined by Neogrammarians (potentially a borrowing from natural science), implicating the ideology that all sound changes behave universally under these laws.
a current sound change has no memory of previous sound changes (e.g. If /p/ and /b/ merged into /p/ in the first sound change, the second sound change after it would not concern anything about /b/ which had already disappeared).

These four guiding principles are still widely adopted by historical linguists and used in the comparative method to study sound change and the development of genetically related languages. The comparative method is a feature-to-feature comparison of multiple languages with possible common genealogical ancestor, in order to deduce the typological relationship between the languages and also the phonemic values of proto-languages. Though no universal consensus of the steps of the comparative method is agreed upon, Campbell (2013: 109-128) suggests a five-step procedure that is concise and easy to follow:

1) Assemble potential cognate lists: Make a list of morphemes that correspond to each other phonetically.

2) Establish correspondence sets: Narrow down to one feature (alveolar, nasality, voicelessness, etc.) and gather the cognate data of the particular feature from all languages.

3) Discover which sets are in complementary distribution: since sound changes are conditioned by phonetic contexts, look into the correspondence sets in Step 2 and examine if any of the sets are in complementary distribution; if so they can be assumed to reflect a single original phoneme.

4) Reconstruct proto-phonemes: try to decide which value works best originally.

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2 It is originally a seven-step procedure, but steps 6-7 are omitted because they are more relevant in the realm of morphophonology and morphology.
according to the phonetic environment of the change and the principle of economy that individual sound changes should appear as minimally as possible.

5) Examine the reconstructed system typologically: reconsider anomalies compared to the usual cross-linguistic patterns of phonological inventories.

Nevertheless, this seemingly scientific method can have several limitations:

Firstly, the comparative method is based on the assumption of Neogrammarian hypothesis, but sound changes are not always regular throughout the phonological development of all languages at all times. This thesis dedicates a whole section on irregular\(^3\) sound changes which cannot be effectively generalized using the comparative method, and it attempts to address the question of irregularity by multiple explanations, some of which are completely out of the scope of the Neogrammarian hypothesis (see Section 4).

Secondly, the comparative method is mostly applied to modern languages or reconstructed languages, where the determination of proto-phonemes does not rely on available historical sources. This is a huge limitation with special regards to the Chinese languages because it fails to recognize the significance of written phonological records in the processes of reconstruction, which is a huge part of historical Chinese phonology (see 2.2).

Thirdly, reconstructions are subjective in nature: the confirmation of cognates depend heavily on the particular linguists’ knowledge, and factors like borrowing and areal contacts often veils cognate relationships even more. Furthermore, there may be

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\(^3\) “Regular” and “irregular” are used in Neogrammarian’s sense throughout the thesis.
semantic shifts which seemingly disrupt the form-meaning correspondences in particular cognate sets, therefore putting the overall sound change in question.

Thus, in reality, the comparative method is often combined with the examination of critical historical and archaeological materials to help identify the sound change and reconstruct the proto-language phonology. The methodology of Chinese historical phonology, in particular the reconstruction of Middle Chinese which utilizes historical records more than the comparative method, will be discussed in 2.2.

2.1.3. Unidirectionality hypothesis and its application in phonology

Unidirectionality hypothesis is another significant proposition in light of the diachronic changes of language, which states that “grammaticalization (the development of lexical elements into grammatical ones) is a unidirectional process, that is, it leads from less grammatical to more grammatical forms and constructions” (Heine and Kuteva 2002: 4). Joan Bybee, an advocate of this theory, also asserts strongly that “there has been much discussion of whether or not grammaticalization is unidirectional, with the conclusion being that, with a few relatively well-defined exceptions, it is” (2011: 77). She discusses the phonological aspect of grammaticalization in her 2017 chapter and frequency of use is the common driving force of both grammaticalization and sound change, following Heine’s idea that “once a lexeme is conventionalized as a grammatical marker, it tends to undergo erosion; that is, the phonological substance is likely to be reduced in some way and to be more dependent on surrounding phonetic material” (1993: 106). Since Bybee believes that
grammaticalization as a process favors lenition (weakening \( \rightarrow \) deletion) rather than fortition (strengthening) (2017: 467), the unidirectionality of grammaticalization would correspond to more and more reduced morphophonological structures, hence more and more reductive sound changes, a result from the augmented usage which increases the token frequency of the word next to other random sound segments.

A common critique of this hypothesis is the “cherry-picking” nature – its lack of comprehensiveness composed of the deliberate neglect of degrammaticalization and fortition. Campbell (2000: 125) accuses the advocates for minimizing and redefining the potential lexicalization counterexamples as irrelevant to the grammaticalization cline – he gives the example of English verbalized “to up” and refutes Hopper and Traugott’s claim that the preposition is not fully degrammaticalized: Hopper and Traugott (1993) give the example of “to up the ante” to argue that this whole phrase functions as a verb without lexicalization of “up”, while Campbell gives counterexamples of vernacular usages like “to up the payment”, “to up the medication”, “to up the bid” to prove that “up” is degrammaticalized and grammaticalization does not necessarily go in a single direction. To respond to the claimed cline of phonological reduction, although from Bybee’s statistics (2017) only 3.5% of all sound changes are fortifying in nature (Allophon Database at University of New Mexico, out of samples from 82 languages), the thesis would provide and evaluate the many examples and counterexamples to the claim – it would try to examine the role of fortition in sound changes and question the unidirectionality hypothesis (5.2), as well as suggest the possible causes of sound changes in Chinese
2.2. Overview of historical Chinese phonology

2.2.1 Rime books 韻書 and the Fanqie connection method 反切系聯法

The study of historical Chinese phonology differs greatly from its academic European counterpart: it started much earlier and took a more historical record heavy approach rather than starting from the comparison of modern languages. Chinese languages use a logographic character (漢字) system which include no phonetic spelling at all. Therefore, a single written character can be the overarching representation of a group of cognates, which often has multiple readings both diachronically and synchronically. Take the character 一 “one” for an example:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>[i\textdegree55]</td>
<td>[j\textdegree5t]</td>
<td>[i\textdegree2t]</td>
<td>[i\textdegree2]</td>
<td>[ai\textdegree2⁴]</td>
<td>[i\textdegree3²]</td>
<td>[i\textdegree3³²]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Pronunciations of “一 one”

All the readings are valid in the local varieties with the same written component but different phonetic materials – however all of them have a common etymological origin from Middle Chinese. Merely applying the comparative method to reconstruct the phonetic value of Middle Chinese merely applying comparative method would be ineffective since such phonetic diversity is present even in a single cognate set. Thus, Chinese historical linguists depend heavily on a particular type of phonological record...
called 韻書 “rime books”. They are a type of dictionary that orders characters through rimes and tones rather than by radicals, which in turn provides precious phonetic and phonological data for the time it was written (or before). This tradition began with 切韻 Qieyun (lit. “Correspondence Rimes”) in year 601, which served as a codification of the “correct” pronunciation throughout China to standardize the language in order to read classical and literary Chinese. It was popularized in Tang dynasty (618-907), with multiple later editions, revisions and expansions, the most famous of which being 廣韻 Guanyun (lit. Broad Rimes) in 1004 (Song dynasty), which has long served as a reference point for Middle Chinese phonology. Later rime books like 中原音韻 Zhongyuan Yinyun in 1324 and 洪武正韻 Hongwu Zhengyun in 1375 inherits the structure of Guanyun to record the later changes in phonologies and the developments into Early Mandarin as a standard for reading (讀書音).

Since nothing like the IPA was developed in China prior to the introduction of Western formal linguistics, these rime books use a unique method of denoting pronunciations called 反切 Fanqie (lit. “back/inverse + match/correspondence”) instead of the previous pronunciation guide of using homophones only. The Fanqie method involves two characters called 上字 (“upper character”) and 下字 (“lower character”), where the upper character indicates the entry’s initial and the lower character is responsible for the final and the tone (Branner 2010). For example, the character 東 (east) was spelled with 德 (morality) and 紅 (red): the first character 德 */tək/ gives the initial */t/ while the second character 紅 */uŋ/ gives the final */uŋ/ and the level tone. This combination has the output */tuŋ/ with level tone.
In this example, however, the two characters 德 and 紅 has its own pronunciation which are yet to be determined, given that */tək/ and */yəŋ/ come from later established reconstructions. Scholar 陳澧 Chen Li, in his 1842 study of Guangyun, proposed a method called 系聯法 (“connection method”), using sets of Fanqie collections to group the characters into different initials (rimes were a part of the basic structures of the rime books so they were classified together). For example, 東 was spelled 德 and 紅; 德 was spelled 多 and 特; and 多 was spelled as 德 and 河. This implies that 東, 德 and 多 has the same initial since they form a chain of upper characters. Then using the comparative method, one can easily reconstruct that they share the initial /t/ given the evidence from most modern [t] reflexes of this initial. This is the most widespread method determining the phonological systems from the rime books. In the next subsection I would focus on Guangyun, giving background to relevant Chinese-specific phonological terms and a reconstruction of its phonology.

2.2.2. Guangyun 廣韻 and its phonology

Guangyun 廣韻, chiefly edited by 陳彭年 Chen Pengnian, and 邱雍 Qiu Yong, was the most accurate representation of 切韻 Qieyun phonology until the discovery of an almost complete 8th century edition of Qieyun itself in 1947 (Norman 1988). It was heavily used in the reconstruction of Middle Chinese and it continues to be a major source. It has a clear structure based on and expanded from Qieyun: it is split into four tones in five volumes (平聲/level tone represents two of them), with each
tone splitting into rimes, a total of 206 increased from the 193 rimes of Qieyun. Each rime is then divided into individual entries of the characters’ definitions, with an overarching pronunciation guide provided in Fanqie formula.

Guangyun phonology has multiple reconstructions with different specific phonetic values assigned to each initial and rhyme (and there is hardly a reconstruction of specific tone values), but each reconstruction is loyal to Guangyun with their own strengths and drawbacks. This thesis uses the reconstruction by Pan Wuyun 潘悟云 (2000), which is comparatively newer and more updated from older reconstructions by Bernhard Karlgren 高本漢 and Wang Li 王力 and more consistent with the rendition of medials. The Guangyun system of Middle Chinese contains 36-38 initials (the Pan reconstruction suggest 37), 3-5 medials (/i~j/, /u~w/, /iu~y/, possibly /e/ and /j/), 5-7 vowel nuclei (/a/ /o/ /u/ /ə/ /ɨ/ /e/ /i/), where /a/ and /i/
can be analyzed as allophones of other vowel phonemes), 8 codas (vowel/glides /i~j/ and /u~w/, as well as nasals /m/ /n/ /ŋ/ and plosives /p/ /t/ /k/), and 4 tones (平 level, 上 rising, 去 departing, 入 entering, with only 3 phonemic tones because the entering tone 入聲 only has syllables ending in plosive codas while the other tones have everything apart from plosive codas). Below is a table of the 37 consonants, divided into groups based on place of articulation (named by the first initial, e.g. 幫组 Group /p/ = labials), with traditional names, traditional four-way voicing contrasts and reconstructed values:

<table>
<thead>
<tr>
<th>Group</th>
<th>Tenuis</th>
<th>Aspirated</th>
<th>Voiced</th>
<th>Nasals</th>
<th>Fricatives</th>
<th>Approximants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labials</td>
<td>幫 p</td>
<td>澎 pʰ</td>
<td>並 b</td>
<td>明 m</td>
<td>Tenuis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>端 t</td>
<td>透 tʰ</td>
<td>定 d</td>
<td>泥 n</td>
<td>Aspirated</td>
<td></td>
</tr>
<tr>
<td>Dentals</td>
<td>端 t</td>
<td>澎 pʰ</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retroflex stops</td>
<td>知 t</td>
<td>徹 tʰ</td>
<td>澄 d</td>
<td>娘 n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>來 l</td>
</tr>
<tr>
<td>Dental sibilants</td>
<td>精 ts</td>
<td>清 tsʰ</td>
<td>從 dz</td>
<td>心 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retroflex sibilants</td>
<td></td>
<td>精 ts</td>
<td>清 tsʰ</td>
<td>從 dz</td>
<td>心 s</td>
<td></td>
</tr>
<tr>
<td>Palatals</td>
<td></td>
<td>章 tc</td>
<td>昌 tcʰ</td>
<td>常 dz</td>
<td>日 j/ŋ/</td>
<td></td>
</tr>
<tr>
<td>Palatals</td>
<td></td>
<td>章 tc</td>
<td>昌 tcʰ</td>
<td>常 dz</td>
<td>日 j/ŋ/</td>
<td></td>
</tr>
<tr>
<td>Palatals</td>
<td></td>
<td>章 tc</td>
<td>昌 tcʰ</td>
<td>常 dz</td>
<td>日 j/ŋ/</td>
<td></td>
</tr>
<tr>
<td>Palatals</td>
<td></td>
<td>章 tc</td>
<td>昌 tcʰ</td>
<td>常 dz</td>
<td>日 j/ŋ/</td>
<td></td>
</tr>
<tr>
<td>Velars</td>
<td>見 k</td>
<td>溪 kʰ</td>
<td>群 g</td>
<td>疑 y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laryngeals</td>
<td>影 ?</td>
<td></td>
<td></td>
<td>晓 h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Guangyun initials 廣韻聲母

Due to the sheer number of individual rimes/finals, the thesis will not include a comprehensive list of each one. However, there is a general classification of rhymes called 等 (“grade/degree”), which have the following characteristics (Li 1956): 一等韻 1st grade rimes with no medials, 二等韻 2nd grade rimes with -ŋ/- → -ŋʊ/-

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4 Non-standard IPA of alveo-palatal nasal, widely used by Sinologists.
medial inherited from OC, 三等韻 3rd grade rimes with -/i/- medial and 四等韻 4th grade rimes with -/e/- medial. (The -/u/- medial was considered another criteria called 呼, roughly along the lines of lip rounding.) The very nature of 2nd and 4th grade rimes are still debated in the field depending on individual reconstructions of OC, but it is agreed that in EMC they have a medial different from -/i/-. Phonetic transcriptions of MC medials and vowels in the thesis follow Pan (2000) as well.

2.3 Diachronic phonologies of Chinese languages

2.3.1. Language versus dialects

Before going into the development of Chinese phonology, I would like to address the ultimate classification of modern Chinese languages. As hinted in Section 1, there is an ongoing dispute of whether the Chinese language(s) should be classified as a single language or a group of interrelated languages, and the nature of this debate is highly sociopolitical. According to Norman (1988) along with personal experience, linguists from Mainland China often refers to varieties of Chinese as dialects of a single language, thanks to the nation’s centralist language ideology, the unified writing system, the shared linguistic origin and cultural heritage, as well as the promoted legitimacy of Standard Mandarin as the only official tongue (though the informal and home usage of other “dialects” is more and more tolerated in the 21st century). The umbrella term 方言 (often translated or mistranslated as “dialect”) is used to refer to any variety of Chinese from village dialects to major language groups.
like Wu or Hakka, which is highly misleading and generalizing without properly attending to the linguistic facts, creating a social hierarchy between standard Language and non-standard 方言 “dialects”.

Meanwhile, most western linguists hold the opinion that first-level divisions within Chinese, such as Mandarin, Wu and Yue, should be classified as different languages due to the mutual unintelligibility between them; however, this also poses some serious questions. If the criterion of language versus dialect is solely based on mutual intelligibility, the situation would become much more complicated when dealing with a dialect continuum: for example the Tong-tai branch of Jianghuai Mandarin (江淮官话通泰片) on the north side of Yangtze River has limited intelligibility with both the rest of Jianghuai Mandarin and Taihu branch of Wu 吳語太湖片 on the south side – which side should it be classified into? Or should it be an independent language? In comparison, Norwegian, Swedish and Danish also have limited intelligibility but are traditionally treated as three distinct languages. Furthermore, some varieties within Min are completely mutually unintelligible but it is an overall dialect continuum – does that yield to another group of languages rather than a single one?

Modern linguists tend to agree on the term “variety” (which has already been used a lot), attempting to neutralize and legitimize language from every single speaker regardless of location and social background. A few linguists also stand behind the usage of words like “topolect” or “regiolect” as better translations of 方言, which unfavorably still leaves a huge ambiguity between concepts. This thesis will adhere to
the near-consensus of contemporary Sinologists that the first divisions of Chinese and
the divisions under Min (see 2.3.2) are referred to languages while a language variety
from a specific location will be referred to as a dialect where necessary.

2.3.2. Classification and development of Chinese languages

As 2.3.1 pointed out, the identification of Chinese languages has always been an
arduous effort, and it is even more so with internal classifications. The first scientific
classification, produced by 王力 Wang Li and 李方桂 Li Fang-kuei in 1936-37, was
mainly based on the evolution of MC voiced obstruent (全濁) initials, which includes
seven major groups: Mandarin 官話, Wu 吳語, Gan 贛語, Xiang 湘語, Min 闽语,
Hakka 客語/客家語 and Yue 粤語 (Kurpaska 2010: 53-55). Later scholars largely
followed this classification, with Li Rong (1987) proposing three new categories: Jin
晉語, Huizhou 徽語 and Pinghua 平話. Because Huizhou and Pinghua each have a
relatively small population and share phonological similarities with their respective
neighboring major languages, they are not considered its own branch directly under
Chinese for this thesis. Due to the internal unintelligibility, Min is further divided into
several languages: Eastern Min 闽东语, Pu-Xian Min 莆仙闽语, Southern Min 闽
南语, Leizhou Min 雷州闽语, Hainan Min 海南闽语 form the Coastal Min group,
while Northern Min 闽北语, Central Min 闽中语, Shao-Jiang Min 邵将闽语 are
the Inland Min languages.

Most modern varieties of Chinese can be analyzed to be descendants of LMC (c.
1000 AD), i.e. the time of Guangyun⁵, due to analysis of both synchronic and
diachronic sound change correspondences. For example, the labiodental fricative /f/
appeared after the time of Qieyun because all the modern /f/ characters correspond to
a bilabial stop initial (Group */p/) in those rhyme books – the phoneme /f/ is present
in all major varieties except Min, indicating that Min was the first to branch out
before the emergence of LMC (see 3.3). Further evidence of Min’s non-distinction
between Group */t/ and Group */t/ initials indicates that Min even branched out
before the emergence of EMC (Qieyun phonology); whereas other major languages
merges Group */t/ with either Group */ʈʂ/ or further with Group */ts/ (see 3.4). On the
other hand, Mandarin is arguably the newest and most innovative variety of all
because of widespread loss of the entering tone (see 3.2). Because of the complexity
of social interactions between different ethnolinguistic groups, linguistic layering (see
5.4) is a common phenomenon among all varieties of Chinese, which challenges the
idea that certain languages only directly descended from one ancestor (be it OC, EMC
and LMC). Again taking Min as an example, the colloquial vocabulary contains a
small amount of words which are obviously cognates to modern Tai-Kadai languages,
indicating the earliest substrata of linguistic exchange coming from non-Sinitic
languages. Overall, using the Guangyun phonology (as a representation of EMC) and
modern varieties for comparison is appropriate apart from apparent non-cognate
words or exceptions due to previous phonological rules, so Guangyun will mostly be
the reference point to compare with modern varieties in the analysis of Sections 3-4.

⁵ Due to the fact that Guangyun phonology is based on Qieyun, not the concurrent phonology, Guangyun counts as
a reflux of earlier EMC phonology instead of the time it was written (LMC).
2.3.3. Diachronic changes in Chinese phonologies (edited from Hou 2012)

Figures 2 and 3: Primary branches of Chinese / Primary branches of Mandarin (Li 1987)

This section serves as an introduction of the various diachronic changes across different Chinese varieties – more detailed discussions of specific sound changes can be found in Sections 3-4. Edited from Hou (2012), this non-extensive list provides a variety-specific reference point to sound changes, making it easier to do cross-variety comparisons of sound changes. Subsections are listed in parentheses also for reference.

A. Mandarin

- Palatalization of velars and alveolar sibilants before /j/ (3.4)
- Disappearance of coda /m/ and checked syllables (codas /p/ /t/ /k/) (3.2)
- Devoicing of stops and fricatives (3.1)
- Mostly having four tones (1/2/3/5), devoid of tones 4, 6, 7 and 8 (4.7)
A1 Beijing Mandarin

- 4 tones: T1 (55), T2 (35), T3 (214), T5 (51). T7/8 changes to T1/2/3/5 irregularly
- Development of rhotic vowel /-ɚ/ as a diminutive (4.6)
- [v] for onset [w] except in front of [u] or [o]
- [ŋ] → /ɻ/ (3.6)
- /tsʰ s/ lenition to /ɻ/ in casual speech (4.2)

A2 Northeastern Mandarin

- [ŋ] → /j/, triggering the glide to be fronted (3.6)
- Checked syllables distributed into T1/2/3/5, with a larger proportion into T3 (4.7)
- Lower T1 value (33)
- /ian/ → [iæn], /yan/ → [yæn]

A3 Ji-Lu Mandarin

- Initial [n] or [ŋ] developed before low vowels from the merged initial from /ʔ/ and /ŋ/ (4.2)
- T7+T8 changes to all of T1/2/3/5 but mostly T1

A4 Jiao-liao Mandarin (my native variety)

- T7 changes to only T3, T8a changes to T2, T8b changes to T5
- [ŋ] → /j/ (and marginally /l/ by lexical diffusion) (3.6, 4.1)
- T1 is a low-falling tone (31 / 311.5)
- Some dialects distinguish尖音 (/ts/ /tsʰ/ /s/ + /j/) from 团音 (/ʨ/ /ʨʰ/ /ɕ/)
  (originated from /k/ /kʰ/ /x/ + /j/) (3.4)
- Loss of initial /ŋ/ (2.2.2)

A5 Central Plains / Zhongyuan Mandarin

- T7 and T8b changes to T1, T8a changes to T2.
- Initial [ŋ] developed before low vowels from the merged initial from /ʔ/ and /ŋ/
A6 Lan-yin Mandarin
- T7+T8b changes to T5, T8a changes to T2.
- T2 merges into T1 or T3, so only 3 tones remain (T1/3/5)

A7 Southwestern Mandarin
- T7+T8 completely changes to T2 (3.2)
- Most dialects lack retroflex initials (Group /ts/ merged into Group /ts/) (3.4)
- Lost distinction between phonemes /n/ and /l/ (4.2)
- Distinction of /n/ and /ŋ/ as well as /f/ and /h/ being lost (4.2)
- Typical tone values: T1 (55), T2 (21), T3 (42), T5 (213). Some dialects have a T5/T6 distinction, others have marginally independent T7 without coda (4.7)

A8 Lower Yangtze /Jianghuai Mandarin
- T7 usually remains separate from other tones, /p/ /t/ /k/ codas merge into /ʔ/.
  Most varieties have five tones (T1/2/3/5/7) (3.2)
- /n/ and /l/ merge into one phoneme, often pronounced [l] (4.2)
- No retroflex initials in most varieties (Group /ts/ merged into Group /ts/) (3.4)
- 日母 *ŋ → /z/ or merged with /l/ (3.6)

B. Jin
- The distinction between 尖音 (/ts/ /tsʰ/ /s/ + /j/) and 团音 (/tɕ/ /tɕʰ/ /ɕ/) (originated from /k/ /kʰ/ /x/ + /j/) decreases northward (3.4)
- Voiced obstruents mostly turn into voiceless aspirated ones in T1 (T2) and voiceless tenuis ones in other tones (3.1)
- Some dialects have an independent 娘母 */ŋ/ initial, realized as [nz~ŋ]
- Plosive consonants (especially voiceless aspirated ones) have [x] affiliated
- In some dialects, 常母 MC */dz/, 崇母 */dz/ fricativize and merge into [s~ʂ]

C. Wu
- Maintenance of voiced or murmured initials, three-way phonemic contrast of stop
+ affricates (e.g. /pʰ/ /bʰ/) (3.1)

- Tones can be allophonic – T1/2, T3/4, T5/6, T7/8 only distinguished by voicing (4.7)
- MC */n/, */ŋ/, */ŋ/ merged into /ŋ/ before /j/-glide (3.6)
- Initial /ŋ/ kept distinct from initial /ʔ/ (2.2.2)
- Large inventory of phonemic vowels resulting from the loss of medials /monophthongization, including rounded front vowels like /ø/, uncommon in other Chinese varieties (3.7)
- Syllabic sonorants /ŋ/ /ŋ/ ([ŋ – ŋ]) and /ŋ/, marginally /l/ in literary pronunciations (4.5-4.6)
- Tone merge and tone split – range of 5 tones (Shanghai) to 12 tones (Wujiang) (4.7)
- Complex tone sandhi (left-prominent word-based, as well as right-prominent phrase-based ones), developing towards pitch accent (4.7)
- Historic layering (literal and colloquial pronunciations) (5.4)

D. Gan

- Historically voiced obstruents turns into voiceless aspirated ones. (e.g. MC */b/ merges into /pʰ/) (3.1)
- LMC */hw/ changes to /l/ (4.2)
- /l/ and /ŋ/ merges to [ŋ] before mid and low vowels (2.2.2)
- 果攝 Vowel nucleus */ɑ/ raises to [o] (3.7)
- 6-7 tones (T3 and T4 merges in all dialects, T5/T6 merges in some) (4.7)

E. Xiang

- Old Xiang retains the voiced obstruents, while New Xiang merges them into voiceless tenuis counterparts (3.1)
- T8a voiced initials change to aspirated forms (3.1)
- (Yiyang dialect) lenition of voiced obstruents to /l/ (3.5)
- Disappearance of coda /m/ /p/ /t/ /k/ with development of nasalized vowels (3.2)
- Some Group */ʨ/ and Group */ʈ/ characters indistinct with Group /t/ (3.4)
- Mostly 5 tones (T1/2/3/5/7) (4.7)

F. Min
- Voiced obstruents mostly devoiced into tenuis counterparts (3.1)
- No labiodental consonants (f, v) – retained from OC (3.3)
- Group */ʈ/ = Group /t/, retained from OC (3.4)
- */ɣ/ have colloquial pronunciation /k/, /kʰ/ or /ʔ/ (3.5)
- Some fricative initials turn into affricates (3.7)
- In some words, *ɦ → /h/, *j → /s/, Group */ʨ/ → Group /k/ (3.4)
- Coda /m//n//ŋ//p//t//k/ retained, developed /ʔ/ (3.2)
- Mostly 7 tones (T3/T4 merges) (4.7)

G. Hakka
- Historically voiced obstruents turn into voiceless aspirated ones. (e.g. */b/ merges into /pʰ/) (3.1)
- No retroflex initials (Group /tʂ/ turns into Group /ts/) (3.4)
- Distinction between /n/ and /l/
- */hw/ changes to /l/ (4.2)
- Some LMC Group */ʧ/ words retain its Group /p/ pronunciations (3.3)
- LMC */ɱ/ and */ɣ/hj + w merges into /v/ (4.1)
- 假攝主元音 */a/ and 果攝主元音 */a/ raise to [ɔ] and [o] (3.7)
- No [y] vowel
- Coda /m//n//ŋ//p//t//k/ retained (3.2)
- 6 tones (T1/2/3/5/7/8), Some T4 turns to T1 (4.7)

H. Yue
- Debuccalization: most /kʰ/ words (in some dialects /tʰ/ as well) turn to /h/ (and further fricativized to /l/ before /u/) (3.5)
- Presence of [l] from historical /s/ in some dialects
No retroflex initials (Group /ʈʂ/ turns into Group /ts/) (3.4)
No palatalization of Group /k/ + high front vowel (3.4)
Starting to merge /n/ and /l/, as well as /ŋ/ and /ʔ/ initials (4.2)
Codas /m//n//ŋ//p//t//k/ retained (3.2)
In most varieties medial /w/ merged with following vowel except after velars
Large number of vowels, differentiated by length and quality (3.7)
9-10 allophonic tones: T7 (also T8 in some dialects) develops into two allophonic tones with long/short vowels respectively (4.7)
3. Regular sound changes

As stated in 2.1.2, regular sound changes are the ones adhering to the Neo-grammarian hypothesis: they should be governed by sound laws and only conditioned by phonetic environments. This is often assumed when applying the comparative method, but most linguists acknowledge the fact that there are exceptions to regular sound changes. This section provides examples of regular sound changes, including obstruent devoicing (3.1), apocope and merge of plosive and nasal codas (3.2), dentilabialization (3.3), trajectories regarding postalveolar consonants (3.4), spirantization, debuccalization (3.5), denasalization, /j/-frication (3.6), and chain shifts (3.7). Through examining these examples and juxtaposing them with “irregular” examples in Section 4, the thesis tries to question the dichotomy between regular and irregular sound changes by synthesizing and analyzing data from modern varieties and reconstructions, arguing that regularity cannot be the basis of various kinds of sound changes.

3.1. Obstruent devoicing

Obstruent devoicing (全濁清化) is the most prevalent and large-scale sound change in historical Chinese phonology: It has been studied from early 20th century and is still continuously researched by historical linguists. According to the reconstruction of Guangyun, the stop and affricate consonants were divided into three groups: tenuis / voiceless unaspirated (幫*/p/, 端*/t/, 知*/ʈ/, 精*/ts/，莊*/ʈʂ/，章*/ʈɕ/，見*/k/), voiceless aspirated (滂*/pʰ/，透*/tʰ/，徹*/ʈʰ/，清*/tsʰ/，初*/ʈʂʰ/，昌
and voiced (並/*bl/, 定/ql/, 澄/*dzl/, 漆/*dzl/, 常/*dzl/, 群/*gl/); while fricatives were grouped into voiceless (心/*sl/, 生/*sl/, 書/*sl/, 曉/*sl/) and voiced (邪/*zl/, 俟/*zl/, 船/*zl/, 匣/*zl/) counterparts. As a result of the sound change, most varieties of Chinese no longer have voiced obstruents, which means that eleven consonants had been lost from Guangyun phonology: they had devoiced into their voiceless counterparts, creating the division of stops and affricates into two categories only differing by aspiration, and a single category of voiceless fricatives.

However, this process is not complete in all Chinese varieties, with the notable exception of Wu – almost all Wu dialects retain voiced obstruent phonemes, with varying degrees of realizations. Certain dialects of Old Xiang 湘語婁邵片 also retains voiced obstruent phonemes, while in others they devoice on a word-to-word basis. Figure 4 shows the rough boundary of voiced obstruents in Chinese varieties, and Table 3 shows some example of the devoicing from all major modern varieties:

Figure 4: the distribution of phonologies of the original voiced obstruent phonemes
Table 3: Realization of MC voiced obstruent initials across major varieties

<table>
<thead>
<tr>
<th>Characters</th>
<th>旁</th>
<th>地</th>
<th>跪</th>
<th>責</th>
<th>夕</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>b</td>
<td>d</td>
<td>t</td>
<td>定</td>
<td>g</td>
</tr>
<tr>
<td>GB-BJ</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ɕ</td>
<td>ɕ</td>
</tr>
<tr>
<td>GZ-WN</td>
<td>pʰ</td>
<td>tʰ</td>
<td>kʰ</td>
<td>tsʰ</td>
<td>s</td>
</tr>
<tr>
<td>GL-JN</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>GJ-DL</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>GH-YZ</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>GY-LZ</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>GX-CD</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>J-TY</td>
<td>pʰ</td>
<td>t</td>
<td>kʰ</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>W-SZ</td>
<td>b</td>
<td>d</td>
<td>ɕ/z</td>
<td>z</td>
<td>z</td>
</tr>
<tr>
<td>W-WZ</td>
<td>b</td>
<td>d</td>
<td>ɕdz</td>
<td>ɕ/z</td>
<td>z</td>
</tr>
<tr>
<td>X-CS</td>
<td>p</td>
<td>t</td>
<td>k</td>
<td>ts</td>
<td>ts/ʨ</td>
</tr>
<tr>
<td>X-SF</td>
<td>b</td>
<td>d</td>
<td>g</td>
<td>dz</td>
<td>dz</td>
</tr>
<tr>
<td>MD-FZ</td>
<td>p</td>
<td>t</td>
<td>k</td>
<td>ts</td>
<td>s</td>
</tr>
<tr>
<td>MN-XM</td>
<td>p</td>
<td>t</td>
<td>k</td>
<td>ʨ</td>
<td>e</td>
</tr>
<tr>
<td>H-MX</td>
<td>pʰ</td>
<td>tʰ</td>
<td>kʰ</td>
<td>tsʰ</td>
<td>s</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>pʰ</td>
<td>t</td>
<td>k</td>
<td>ts</td>
<td>ts</td>
</tr>
</tbody>
</table>

Most dialects of Wu synchronically exhibit a phenomenon called 清音濁流 “voiceless realizations with voiced streams”, in which the realizations of the voiced obstruent phonemes are allophonic and in complementary distribution, conditioned by the following (exemplified by the realization of the phoneme /z/) (Cao 2016: 78): when the initial segment /z/ is at the beginning of utterances or standing alone as the only syllable, it would be realized as [sz] or [sʰ]; while it is in the middle of utterance (especially between vowels) it retains its voiced pronunciation [z]. An illustrative example could be 謝謝 [szia²¹³-21 zia²¹³-13] in W-WX, where the first /z/ is realized [sz] and the second one realized as [z]. However, if examined diachronically, this
phenomenon provides insight into the first stages of the large-scale obstruent devoicing in other varieties – the sound change in the beginning of utterances would possibly be extended to elsewhere, and there are innovative dialects which advanced the realization to [s], so the combination of these two steps lead into a complete devoicing of [z]. In the realization of /z/ and [sz] and [sʰ], there seems to be a separation between articulation and phonation, i.e. the actual voicing phonation becomes an affiliative part of the whole articulatory process – therefore, the [z] or [sʰ] as a subsidiary phonation in [sz] or [sʰ] would soon become unstable and drop out.

We can also attempt to deduce the reason of this change by looking into other major varieties’ paths of change – there are six types of distribution within the scope of complete devoicing of voiced obstruents, suggested by Yang (1989):

- **Type I**: level tone syllables have aspirated initials, others have unaspirated ones. (平送仄不送) [Mandarin]
- **Type II**: all turned into aspirated counterparts. (平仄皆送) [Hakka]
- **Type III**: all turned into unaspirated counterparts. (平仄皆不送) [New Xiang]
- **Type IV**: unaspirated mostly, with few exceptions. [Min, Huizhou]
- **Type V**: level and rising tone syllables have aspirated initials, others have unaspirated
ones. (平上送去入不送) [Yue]

- Type VI: MC aspirated initials and voiced initials merged into a voiced aspirated one. (次清全濁合流) [Gan]

Another commonly argued impetus of the change is the LMC tone split, where the syllables with originally voiced initials split from ones with originally voiceless ones, forming its own “light” tones. Most modern varieties developed the 阳平 (light level) tone [T2] which usually is below the corresponding 陰平 (dark level) tone [T1] in pitch (there are few exceptions such as GJ-DL and GH-YZ), a parallel to the fact that voiced consonants are usually articulated lower in pitch than voiceless consonants. With tone as a newly developed phonemic suprasegmental feature, the voice-voiceless distinction became more and more redundant, resulting in its final disappearance. This may be not unreasonable at the first glance, but the general lack of distinction between T3/4 and T5/6 in Mandarin (the most geographically, demographically and socio-politically influential variety of Chinese after LMC) cannot explain why voiced obstruents did not remain in non-level-tone syllables.

Furthermore, given the geographical disparity and discontinuity between each type of devoicing, we can conclude that although devoicing might be shared as an areal trait or was originally diffused out by a single proto-dialect, the sound change was completed independently, pertaining to different factors. For example, the diachronic Type II change from Hakka may be derived from a similar process to synchronic 清音濁流 in Wu – the separation of a single voiced consonant into articulation (as a voiceless one) and phonation (its voiced counterpart → [ɦ]), then
eventually to \([h]\) resulting in all the voiced-derived obstruents becoming aspirated with \([h]\) phonation. A possible explanation of Type III change can be the pursuit of articulatory ease, where arguably the voiced consonants need extra effort to produce – clearly this argument is questionable, especially considering the more frequency of voicing contrast compared to an aspiration contrast. On the other hand, Type II change is fortifying because more syllables now require aspiration, a fortis variant of the contrasting pair of phonations.

Finally, this change is a clear reminder for historical linguists that synchronic modern variants can be reorganized to reflect an overarching diachronic change: from Wu dialects’ partial utterance-initial devoicing, to some Old Xiang dialects’ tone-based devoicing (Yang 2008), then to complete devoicing (types I-VI), comparing languages would often lead to a thorough step-by-step reconstruction of what happened in the past in internally opaque and phonologically innovative dialects.

3.2. Apocope and merge of plosive and nasal codas

The second major change happened after Guangyun phonology is the apocope of codas, in which apocope is the loss or elision of a sound at the end of a word. This is not as widespread as obstruent devoicing but it plays a huge role within Chinese phonology, especially the loss of 入声 – the entering tone. Guangyun phonological system has eight codas (-\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\), -\(\text{-}/\)), in which the latter six has been more or less transformed in very different ways. Figure 6 shows the modern
distribution of original stop and nasal codas:

Figure 6: a rough modern distribution of nasal and plosive codas (Vn stands for nasalized vowels)

From this generalized map, one can clearly see the diversity of the realization of original six codas: from the most conservative ones (Y-GZ and H-MX), to the seven-coda innovative MN-XM with /ʔ/ added, to the disappearance of a pair of codas with the same place of articulation (MN-CZ, MH-HK and GA-NC), then to the glottalization of stops and nasalization of vowels (W-SH), to a complete lack of stop
codas (most Mandarin dialects except Jianghuai, W-WZ). Geographically, some interesting observations can be made as well: in general the number of codas retained increase towards the south; also apart from the later developed -ʔ/, southern varieties are more likely to retain pairs of coda from the same place, while northern varieties tend to ignore the place correspondence altogether; overall, the process of apocope or merge has a diffusive dimension.

One of the first upon the issue, Matthew Chen (1973: 40-41) provides the following diagram for the trajectory of sound merge and elision mainly based on place parallelism, and it more or less fits the data from Figure 6:

![Diagram of stop and nasal coda merge and apocope](image)

Figure 7: Chen (1973)'s model of stop and nasal coda merge and apocope

However, Zhu and Yan (2009) gives examples from the synchronic variation of Y-HK -t/ and -k/ as well as -n/ and -ŋ/, indicating that -t/ and -k/ can convert to each other and become allophonic given certain vowel environments (-t/ corresponds to front vowels, -k/ to back vowels) while -ŋ/ gets realized as [n] in younger generations, similar to Taiwanese Mandarin. Moreover, Chen’s parallelism does not fit well to most Mandarin dialects which still retain -n/ and -ŋ/, whose plosive coda
went through apocope at least 800 years ago (中原音韵 Zhongyuan Yinyun was divided into dark level, light level, rising and departing, without a single entry for entering tone). Therefore, the unilateral backing of codas (-/p/ → -/t/ → -/k/, -/m/ → -/n/ → -/ŋ/) that Chen suggested is largely falsified. However, Steps I, IV-V and VI in his diagram is still widely supported by the dialectal data, with -/ʔ/ and Ź being the significant intermediate steps. This can be largely evidenced by the facts of: 1) if only one stop coda remains it is -/ʔ/, not -/k/ (W-SZ, J-TY, etc.); 2) the synchronic coexistence of all six codas with -/ʔ/ and Ź in MN-XM, indicating an ongoing change; 3) the coexistence of denasalized V, Ź and marginal -/n/ -/ŋ/ from MC nasal codas (W-SH).

As a distinctive tone, the entering tone is distinguished from other tones by two criteria: a shorter vowel length and a plosive coda. A possible explanation to the reason of this series of sound change is, again, astonishingly similar to the initial /z/ → [sz] example in Wu (see 3.1): in MC reconstructions, the codas are full plosive consonants with release, but the modern reflexes are non-exceptionally unreleased [ʔp], [ʔt] and [ʔk], possibly owing to the shortened vowel length leaving insufficient time to release the coda. Then, [ʔp], [ʔt] and [ʔk] can be easily converted to preglottalized [ʔʔp], [ʔʔt] and [ʔʔk], realizing a separation between articulation and phonation. The three then merges to simply [ʔ] for ease of articulation. The next step is the apocope of the glottal stop [ʔ], shifting the distinction to a pure tonal one instead of a segmental one (W-WZ, X-CS), and finally the entering tone enters into one tone (GX-CD), multiple tones with regularity (GJ-DL) or multiple tones on a lexical diffusion basis (GB-BJ).
As for nasal codas, they are easily turned into nasalized vowels since they tend to phonetically nasalize the previous vowel, so /VN/ is actually realized [ṼN] most of the time. As soon as the nasal part has the tendency to merge, the [Ṽ] realization takes its place. A few exception of morphophonologically-based nasal coda addition do exist, which would be discussed in 4.6.

3.3. Dentilabialization

The next big sound change is the dentilabialization of bilabials, which produces four new initials: 非/*f/, 敷/*fʰ/, 奉/*v/ and 微 */ɱ/ — these four initials are not in Guangyun phonology, but according to the Song dynasty 韻鏡 Yunjing (lit. Rhyme Mirror) they were already separated from corresponding bilabials 幫*/p/, 河*/pʰ/, 並*/b/ and 明*/m/. Notice that /fʰ/ and /ɱ/ are extraordinarily rare segments cross-linguistically because of their extreme instability as a contrasting phoneme: according to Ian Maddieson’s research, /ɱ/ appears only once out of the 1057 nasal phonemes in 317 languages (Zhu 2010), while /fʰ/ only appears in closely related historical Tibetan. Therefore, none of the modern varieties have these two phonemes. Table 4 shows the modern realizations of the four initials in representative varieties, with 便 (MC */p/) as an additional contrast:
<table>
<thead>
<tr>
<th>Characters</th>
<th>風</th>
<th>反</th>
<th>敷</th>
<th>拂</th>
<th>凡</th>
<th>服</th>
<th>尾</th>
<th>網</th>
<th>(便)</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC *</td>
<td>piŋ</td>
<td>pʰiŋ</td>
<td>pʰio</td>
<td>pʰiut</td>
<td>biem</td>
<td>biuk</td>
<td>mʰii</td>
<td>mʰiŋ</td>
<td>bien</td>
</tr>
<tr>
<td>*YJ initial</td>
<td>f</td>
<td>f</td>
<td>fʰ</td>
<td>fʰ</td>
<td>v</td>
<td>v</td>
<td>ŋ</td>
<td>ŋ</td>
<td>b</td>
</tr>
<tr>
<td>GB-BJ</td>
<td>fəŋ</td>
<td>fan</td>
<td>fu</td>
<td>fu</td>
<td>fan</td>
<td>fu</td>
<td>uei/i</td>
<td>uanŋ</td>
<td>piɛn</td>
</tr>
<tr>
<td>GJ-DL</td>
<td>fəŋ</td>
<td>fan</td>
<td>fu</td>
<td>fu</td>
<td>fan</td>
<td>fu</td>
<td>vei</td>
<td>vəŋ</td>
<td>piɛn</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>fəŋ</td>
<td>fə:ŋ</td>
<td>fu:</td>
<td>futʰ</td>
<td>fan</td>
<td>fokʰ</td>
<td>mei</td>
<td>məŋ</td>
<td>pi:n</td>
</tr>
<tr>
<td>H-HY</td>
<td>fəŋ</td>
<td>fan</td>
<td>fu</td>
<td>futʰ</td>
<td>fam</td>
<td>fukʰ</td>
<td>mi</td>
<td>miŋ</td>
<td>pʰien</td>
</tr>
<tr>
<td>MN-XM</td>
<td>həŋ</td>
<td>huan</td>
<td>hu</td>
<td>hutʰ</td>
<td>huan</td>
<td>hokʰ</td>
<td>bi</td>
<td>bəŋ</td>
<td>piɛn</td>
</tr>
<tr>
<td>W-SH</td>
<td>foŋ</td>
<td>fe</td>
<td>fu</td>
<td>faʔ</td>
<td>ve</td>
<td>voʔ</td>
<td>mi/vi</td>
<td>mā</td>
<td>bi</td>
</tr>
</tbody>
</table>

Table 4: Modern realizations of the labiodental initials in Yunjing (except 便)

Apart from Southern Min lacking the labiodental initials, all Yunjing */f/ and */fʰ/ changes to /f/, while */v/ remains the same in Wu and devoices to /f/ in other varieties. */ŋ/ has a different path: in GJ-DL and approximately half of all Mandarin dialects it denasalized to [v], while in other half, such as in GB-BJ it is realized as a zero initial with a glide [u] from the original medial, indicating a further merge between /v/ and /w/; however, the non-Mandarin dialects return to the bilabial [m], contrasting their realization of */f/ as [f]. Southern Min is a special case where all the /f/ from language contact with neighboring varieties and Mandarin turns the literary readings of the characters into [h], whereas a few colloquial native readings remain conservative bilabial stops [p] and [pʰ]; /ŋ/ was reanalyzed as /m/ and denasalized to [b] (see 3.6).
Through comparison of the *MC values of the labiodentalized characters, the first observation is that all syllables contain an -/i/- glide (三等韻 3rd degree rhyme) – nevertheless 便 also contain /i/ but it did not participate in this sound change. Taking a second look at the vowel environment surrounding /i/, we get [u], [v], [o] and [i] while 便 has [ɛ] as its main vowel, so the generalized conclusion for bilabials to turn into labiodentals would be /i/ and a [-front] vowel, which fits into the data of other rimes. The backing can be attributed to the relative ease of articulation: since /i/ is the vowel with maximum closure, it has the highest tendency to become fricativized – combined with the non-front vowel surrounding it, the position of the bilabial initial became less stable and started to co-articulate with the weakened and consonantized /i/ to form a labiodental. This process can be treated as a special kind of assimilative lenition while two segments combine to only one, with a place of articulation closer to its surrounding environment.

3.4. The production, splits and merges of postalveolar consonants

Guangyun phonology has a series of intricate distinctions around the alveolar ridge: a group of alveolar stops (端組 Group */t/), a group of retroflex stops (知組 Group */ʈ/), a group of alveolar sibilants (精組 Group */tsaida/), a group of retroflex sibilants (莊組 Group */ʈʂ̚/), and a group of alveopalatal sibilants (章組 Group */ʈɕ̚/). These five groups of initials have interconnected relationships to each other. However, the phonemic difference between either two can be subtle and susceptible to
change. According to the summary of Zhengzhang (2003), in *OC only two contrastive series occur in the alveolar ridge – Group */t/ and Group */ts/. However, these two series, together with a few characters in Group */k/, went through phase(s) of retroflexion and palatalization. Figures 8.1-8.3 illustrate all the changes that occurred from OC to selected modern varieties:

Figure 8.1: Evolution of alveolar and postalveolar consonants (Type A: GB-BJ and GX-CD)

Figure 8.2: Evolution of alveolar and postalveolar consonants (Type B: Y-GZ and H-MX)
Figure 8.3: Evolution of alveolar and postalveolar consonants (Type C: MN-XM)

The first stage of palatalization starts with the merge of OC */ti-/ and */ki-/* into a new 章組 Group */tɕ/ in MC – this was largely debated in the last century because some Min dialects read characters from MC Group */tɕ/ as the same as having a Group */k/ initial plus an */i/- medial, then seen as an irregular sound change. Here the orthographic evidence is very significant because the phonetic component is the basis of the emergence of Chinese characters from OC. Bernhard Karlgen 高本漢 (1957) proposes the concept of a phonological series (諧聲序列), assuming that characters with the same phonological component should relate to each other greatly, or even be near homophones in OC. Looking back to Min’s modern reflex of 章組 Group */tɕ/ as velar + */i/-, here is a comparison between the realization of some characters in the same phonological series 支 and 止 (both characters belong to Group /tɕ/ in Guangyun), in MN-XM (白讀 colloquial pronunciation) and *MC:

<table>
<thead>
<tr>
<th>Character</th>
<th>支</th>
<th>枝</th>
<th>肢</th>
<th>妓</th>
<th>履</th>
<th>止</th>
<th>齒</th>
<th>芷</th>
<th>址</th>
</tr>
</thead>
<tbody>
<tr>
<td>MN-XM</td>
<td>ki</td>
<td>ki</td>
<td>ki</td>
<td>ki</td>
<td>kiaʔ</td>
<td>tɕi</td>
<td>kʰ i</td>
<td>tɕi</td>
<td>tɕi</td>
</tr>
<tr>
<td>*MC</td>
<td>tɕi e</td>
<td>tɕi e</td>
<td>tɕi e</td>
<td>kie</td>
<td>giak</td>
<td>tɕi</td>
<td>tɕʰ i</td>
<td>tɕi</td>
<td>tɕi</td>
</tr>
</tbody>
</table>

Table 5: Realization of Group /tɕ/ and Group /k/ in MN-XM and *MC

From the data, the 支 series behave more conservatively both in MN-XM and in *MC: all the character in this series have [ki] as the initial part in MN-XM while in
*MC only the characters 妓 and 履 have [ki]; the 止 series is more innovative in a way that only 齒 in MN-XM have the [kʰ] initial. Hypothesizing these two series inherit directly from *MC, a part of Group /tɕ/ characters must dissimilate to become velar, which increases the difficulty of articulation – therefore, the opposite holds true that MC 章組 Group */tɕ/ was partially developed via the palatalization of a */ki/ sequence. (An initial */ti/ sequence behaved similarly and merged with */ki/ into */tɕ/.

marked as “3b” in Figure 8.1) Despite the fact that palatalization is an assimilatory gesture where the velars are assimilated to the position of /i/ to become palatal, the change would be considered irregular because of its inconsistency and lexically based behavior (see 4.1 for more discussion on lexical diffusion).

知組 Group */t/ and 莊組 Group */tɕ/ separated from their predecessors later (before Qieyun), with Proto-Min already separated from EMC and unaffected by the change. The mechanism of retroflexion is again assimilatory, given the fact that a -/ɻ/-medial is reconstructed in 二等韻 2nd grade rimes, possibly the result of consonant + /t/ clusters from OC (Zhengzhang 2003, see 4.4). When dealing with 三等韻 3rd grade rimes from Group */t/ and Group */tɕ/, dissimilation happened because the alveopalatal Group */tɕ/ had already existed independently. Therefore, the 3rd grade rhymes (marked as 3a in Figure 8.1), under the influence of -/i/- medial, backed to retroflex as well along with the original syllables with a -/ɻ/- medial, hence the formation of the five groups of the Guangyun alveolar and postalveolar initials.

Nevertheless, as aforementioned the five-way place distinction is too subtle to hold up as contrasting phonemic segments (see the discussion of */tʰ/ and */m/ in 3.3),
therefore it is later reconfigured. GB-BJ is a prominent type, where the three postalveolar consonants generally merged into one retroflex series (/ʈʂ/), with the exception of the second wave of palatalization discussed below. With language contact with the non-Mandarin varieties, dialects like GX-CD further merged all four into a single dental series (Group /tʃ/). Major southern non-Mandarin varieties like Y-GZ and H-MX took a similar path, except the newly formed consonant is largely reconstructed as a postalveolar Group */tʃ/ since this group is still existing in some Yue and Hakka dialects (Chen 2005), and later the second wave of palatalization did not affect them because of the loss of -/i/- medials.

The second wave of palatalization starts with the appearance of 團音 (“rounded consonants”), a group of newly derived alveopalatal consonants from velar and /i/ sequences, sharing the exact same mechanism with the first palatalization more than a thousand years ago. This new group of alveopalatal initials (with /i/ being a secondary articulation) contrast with the sequences like /tsi/ called 尖音 (“sharp consonants”), a yet unpalatalized form. Starting in the second half of Qing dynasty, Group /ts/ + /i/ started to lose their individual articulations and merge with the alveopalatalas (尖團合), giving the new group an additional source apart from the palatalization of velars. Due to the promotion of Modern Standard Mandarin in Mainland China after 1949 – in which Group /tɕ/ is the prescribed pronunciation, more and more surrounding Mandarin dialects (and even Wu dialects which participated the first wave of palatalization from /ki/ to /tɕ/ like W-SH) have joined this change. Here is a comparison between GB-BJ and H-HY and *MC on the “sharp and rounded
characters”, where homophones in GB-BJ have different initials in H-HY:

<table>
<thead>
<tr>
<th>Characters</th>
<th>箭</th>
<th>剣</th>
<th>千</th>
<th>牽</th>
<th>先</th>
<th>掀</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB-BJ</td>
<td>ʈɕiɛn</td>
<td>ʈɕiɛn</td>
<td>tʰɕiɛn</td>
<td>ʈʰɨɛn</td>
<td>ɕiɛn</td>
<td>ɕiɛn</td>
</tr>
<tr>
<td>H-HY</td>
<td>ʈsiɛn</td>
<td>kiam</td>
<td>tʰɨɛn</td>
<td>kʰɛn</td>
<td>sen</td>
<td>hien</td>
</tr>
<tr>
<td>*MC</td>
<td>ʈsiɛn</td>
<td>kiɛm</td>
<td>tʰɨɛn</td>
<td>kʰɛn</td>
<td>sen</td>
<td>hien</td>
</tr>
</tbody>
</table>

Table 6: the realizations of 尖團音字 “sharp and rounded characters” in different varieties

Through the chronological discussion, we can clearly see a pattern of chain shift: the initiation of a single change (e.g. OC */ki/ → *MC /ʈɕi/), causes a series of sound changes, in a manner that each phoneme occupies the place of a previous phoneme which had just disappeared – thus, when one phoneme completes the change to another phoneme, there would be a phoneme behind it which shifts to occupy its original sound value in a counterfeeding order – one vacancy triggers another sound change to maintain the phonemic equilibrium. The chain shift discussed above can be generalized to formulae like /ki/ or /ʈɕi/ or /ti/ → (palatalization) → /ʈɕi/ → (coarticulation of two segments) → /ʈʃi/ or /ʈʂi/ → (fronting) → /ʈs/ and /ʈɭ/ or /ʈʂɭ/ → (retroflexion) → /ʈ/ or /ʈʂ/ → (affrication) → /ʈʂ/ → (fronting) → /ʈɭ/. The shifts are seemingly irreversible, but segments like /ʈʂ/ and /ʈɭ/ are generated repeatedly in the processes and subsequent -/i/- glides can feed into the first process. More examples of chain shifts will be discussed in 3.7.
3.5. Examples of lenition: spirantization, debuccalization and lateralization

Lenition is often defined loosely as a “weakening” process (Latin lenis “weak”), but generally it contains a category of sound changes that make consonants more sonorous, or in other words, change from fortis to lenis. Lenitions thus typically include changes of stops or affricates to fricatives, and of obstruents to sonorants (liquids and glides) (Campbell 2013: 37). There are two main types of lenition: opening and sonorization, in which the opening type of lenition derives more and more opening articulations and the sonorization type involves voicing, approximatization and vocalization. As discussed in 3.1, the general trait of Sinitic languages’ obstruents is inclining towards devoicing in favor of voicing, so the voicing lenition is not as common as languages with more voiced phonemes like Spanish. Within the opening type, there are three major changes happening in variants of Chinese languages: spirantization (stops to fricatives), debuccalization (fricative to glottal) and lateralization (stops and fricatives to the approximant [l]).

Spirantization and debuccalization are common among a few southern varieties: they appear in an obvious feeding order, so the change of stops \( \rightarrow \) fricatives \( \rightarrow \) glottals (e.g. [h]) is the most phonologically accountable path of lenition. This is different from a chain shift that it does not require the non-simultaneous shift as categories: as soon as stops shift into fricatives, those newly formed fricatives can immediately take on another change to debuccalize to a glottal consonant. A representative would be MH-HK where the 次清 aspirated stops and affricates */pʰ/, */tʰ/ and */kʰ/ spirantized (and in the case of */tʰ/, debuccalized) to /f/, /h/ and /x/,
while the */b/ and */g/ derived from Proto-Min */m/ and */ŋ/ (see 3.6) also spirantized and merged to /v/, resulting in one of the Chinese variants with most fricative phonemes. In Siyi Yue 四邑粤语 dialects like Y-TS, *MC */tʰ/ and */kʰ/ all debuccalized to /h/. Table 7 below shows a comparison between MH-HK, Y-TS and *MC, with MN-XM as an additional contrast:

<table>
<thead>
<tr>
<th>Characters</th>
<th>開</th>
<th>丘</th>
<th>梯</th>
<th>套</th>
<th>鋪</th>
<th>破</th>
<th>文</th>
<th>月</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>kʰəi</td>
<td>kʰiu</td>
<td>tʰei</td>
<td>tʰau</td>
<td>pʰuo</td>
<td>pʰua</td>
<td>miun</td>
<td>ñʰiet</td>
</tr>
<tr>
<td>Y-TS</td>
<td>hɔi</td>
<td>hiu</td>
<td>hai</td>
<td>hau</td>
<td>pʰu</td>
<td>pʰua</td>
<td>man</td>
<td>nut</td>
</tr>
<tr>
<td>MN-XM</td>
<td>kʰai</td>
<td>kʰiu</td>
<td>tʰui</td>
<td>tʰɣ</td>
<td>pʰɔ</td>
<td>pʰua</td>
<td>bun</td>
<td>gue?</td>
</tr>
<tr>
<td>MH-HK</td>
<td>xai</td>
<td>xiu</td>
<td>hui</td>
<td>ho</td>
<td>fu</td>
<td>fua</td>
<td>vun</td>
<td>vue</td>
</tr>
</tbody>
</table>

Table 7: Spirantization and debuccalization in Y-TS and MH-HK

These changes are highly explicable both quantitatively and qualitatively, as they closely follow the Ease of Articulation principle: “the original */kʰ/ initial debuccalized to a glottal fricative [h] in Guangzhou Yue (where the pronunciations of 開 and 丘 are the same with Y-TS in table 7) for the reason that the aspirational component of [kʰ] is phonetically equivalent to [h], so the strengthening of aspiration causes the merge of articulation and phonation towards the latter, resulting the substitution of [kʰ] with [h]. [kʰ] is closer to the glottis that [tʰ] and [pʰ], so the proportionality of the debuccalization of [kʰ] is significantly higher.” (Wang 1985: 602) (Zeng 2014: 97) The statistical data from Y-GZ, Y-TS and MH-HK proves this conclusion by showing a majority of [kʰ] (⇒ [x]) ⇒ [h] changes than anything else. However, there is not an instance where /tʰ/ develops into [θ] before debuccalizing to
[h] – probably because [0] is farther away from [h], causing a difficulty for it to lose its articulation point. The /b/ and /g/ to [v] change in MH-HK is triggered by the feature of [+labial] because only /gu/ sequences participate in this change while other /g/ initials keep the /ŋ/ initial of Proto-Min; while the loss of all aspirated consonants is a genetically unique feature which is very distinguishable from other varieties.

Lateralization is a marginal phenomenon compared to previous examined opening lenitive processes, with a focus in a single dialect – X-YY, exhibiting an unusually large-scale lateralization of MC voiced initials:

<table>
<thead>
<tr>
<th>Characters</th>
<th>長</th>
<th>常</th>
<th>柴</th>
<th>賤</th>
<th>乘</th>
<th>尋</th>
<th>茶</th>
<th>蛇</th>
<th>爬</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>ㄑ iŋ</td>
<td>ㄑ iŋ</td>
<td>ㄑ uæ</td>
<td>ㄑ ien</td>
<td>ㄑ iŋ</td>
<td>ㄑ iŋ</td>
<td>ㄑ ua</td>
<td>ㄑ ia</td>
<td>ㄑ ua</td>
</tr>
<tr>
<td>X-YY</td>
<td>ㄌ l</td>
<td>ㄌ l</td>
<td>ㄌ iẽ</td>
<td>ㄌ iẽ</td>
<td>ㄌ iŋ</td>
<td>ㄌ iŋ</td>
<td>ㄌ la</td>
<td>ㄌ la</td>
<td>ㄌ la</td>
</tr>
</tbody>
</table>

Table 8: Lateralization tain X-YY

Xia Liping (2008) gives an explanation of this phenomenon that there is an intermediate stage /ɮ/ between the alveolar/postalveolar consonants and [l]. She proposes that the stops spirantized and merged into their corresponding fricatives first, and they all merged into /ɮ/, yielding to a final step of approximation to [l]. Nonetheless, there are two questionable points to this explanation: Firstly, the approximation of 爬 is exceptional given its */b/ initial – it cannot be well explain even with the introduction of /ɮ/ because of the distance between their respective articulatory spaces; Secondly, the phoneme /l/ itself had already steadily existed throughout the years in both MC and Xiang but it still didn’t resist the move of all these other phonemes merging into /l/ (comparatively /ɻ/ or /ɻ/ would be an innovation
that retains the phonemic boundary, see 4.2). This unique process still needs further research by more Xiang especially and remains unresolved.

3.6. Examples of fortition: denasalization and /j/-fricatation

As the opposite of lenition, fortition (from Latin *fortis* “strong”) refers to a “strengthening” of consonants: usually it encompasses processes like fricatives or sonorants becoming stops, approximates becoming fricatives, etc.

Among the MC nasal initials, 明 */m/ and 泥 */n/ are the most stable ones, with others going through a common thread of lenition: In most Mandarin dialects and Y-HK, 疑 */ŋ/ went through syncope, merging with the zero initial 影 */ʔ/; 娘 */ŋ/ has a rare and unstable value and no modern preservation at all, inciting doubts among linguists about its identity as actually independent or a constructed initial with an actually value of [n], just to fit into the symmetry of rhyme books; while 日 */ŋ~ŋ/ has a complicated modern phonology, which would be discussed in the latter part of this section.

While most */m/ and */n/ initials are kept intact, Southern Min varieties like MN-XM develops a denasalizing change which can be a really good example of fortition, where the phonemes /m/, /n/ and /ŋ/ split into two groups of allophonic realizations: [m] [n] [ŋ] before nasalized vowels, and [b] [l] [g] before oral vowels. The correspondence of [b] [l] [g] is peculiar in a way that */ŋ/ is approximated to [l] (lenition) where */m/ */ŋ/ plosivized to [b] and [g] (fortition). An immediate
assumption is that [l] is the product of lateralization (see 3.5) from once existed [d] to compensate for this synchronic imbalance. Moreover, the originally inherited /l/ initials underwent an opposite change: nasalizing to /n/ before nasalized vowels. Therefore, both processes can be attributed to a nasal agreement constraint that initials must agree with their vowels in nasality (Liu 2007). Table 9 shows the nasal harmony of MN-XM – all the characters with both a nasal initial and a nasal coda in *MC behave differently in MN-XM:

<table>
<thead>
<tr>
<th>Characters</th>
<th>明</th>
<th>棉</th>
<th>南</th>
<th>年</th>
<th>林</th>
<th>原</th>
<th>硬</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>muian</td>
<td>mien</td>
<td>nəm</td>
<td>nen</td>
<td>lim</td>
<td>n^iɛn</td>
<td>n^ian</td>
</tr>
<tr>
<td>MN-XM (colloquial)</td>
<td>biəŋ</td>
<td>mî</td>
<td>lam</td>
<td>nî</td>
<td>nã</td>
<td>guan</td>
<td>nè/ŋĩ</td>
</tr>
</tbody>
</table>

Table 9: Nasal agreement in MN-XM

From the perspective of Optimality Theory (OT), the nasal agreement suggests that vowel nasality constraint is prior to consonant nasality constraint in Southern Min, causing this fortifying change from nasals to its corresponding plosives. Moreover, the data from Table 9 shows that nasal codas do not affect the nasality of initials at all since unlike vowel nasality it is not a characteristic inherent to vowels, at least synchronically (see 3.2 for the process of their convergence). In most other varieties (as well as *MC), vowel’s [±nasal] quality has no effects on the initial, hence the phenomenon only occurrence in Southern Min. This kind of denasalization can find a parallel in Japanese 漢音 Kan’on borrowings of Chinese characters around 8th-9th century (e.g. 馬 /be/, 泥 /de.i/, 疑 /gi/), with respective MC */m/, */n/, */ŋ/ initials), so there is still an ongoing debate about the extent of this wave of denasalization in
The diachronic trajectory of MC */ɲ~ȵ/ initial is very complicated, possessing arguably the most diverse modern reflexes of any initial: it is mostly denasalized, yet the realization in GB-BJ and other Mandarin dialects shows some outstanding synchronic variations: the phoneme is best described by /ʐ~ɻ/, with a few even more advanced syllables pronounced as [ɕ~ɑ] (兒, 二). An excellent map from *Language Atlas of China* shows the incredible variability of modern day */ɲ~ȵ/ initial:

Figure 9: the modern realizations of the initial of 熱 (*MC /ɲiet/*)
Chow-Yiu Sin (2016: 159) proposes that the pronunciation of this initial should be closer to [ȵz] rather than [ȵ] itself, but the distinction is not as significant diachronically because [ȵz] is an intermediate result of the fortition of [ȵ]. He constructs multiple sound change pathways for different dialects: In Mandarin, the most common realizations are /∅/: [j] (GJ-DL) [type A], and /ʑ-/ɿ/ (GB-BJ) (deriving /ʑ/ as in GX-CD due to de-retroflexion) [type B] – these two types of articulations differ considerably in both the place and the manner of articulation, and the -ɿ/-medials from all the characters of this initial (it only contains 3rd degree rimes) get lost in type B because /ʑ-/ɿ/ itself is a product of palatalization (see 3.4): the process of a palatal nasal becoming various fricatives and affricates in type B (including very innovative minority values like /v/, /ts/ and /tɕ/) is definitely a process of fortition because it goes down the sonority hierarchy and opposes relative articulatory ease. (See 4.2 for a more detailed analysis of the free variation between /ʑ/ and /ɿ/ in GB-BJ)

Chain shifts can also create fortifying sound changes, which will be discussed in the next section.

3.7. Examples of chain shifts: consonants and vowels

Building on the previous example in 3.4, this section will explore more examples of chain shifts. As mentioned before, chain shift is a non-simultaneous process which can be represented by the formula A⇒B⇒(…)⇒C⇒D, where one end of change triggers the change, in a counter-feeding order (Murray 2001: 264-265). Chain shifts
are further classified into two categories: a drag chain (or pull chain) starts with $C \rightarrow D$, with the vacancy of phoneme $C$ triggering a second change, to the last change of $A \rightarrow B$; whereas a push chain is a less common type with $A \rightarrow B$ triggering a crowding effect of $B$ and leading to the dissimilation of original $B$ phoneme to a new one, until $C \rightarrow D$ is complete. In early years of historical linguistics, the reason of chain shifts was largely attributed to a form of uniformitarianism, or a systematic conservation of phonemes: if one phoneme disappears, another one would have to shift to fill this vacancy in order to distinguish all the phonemes in the system – though the previous discussions of splitting and merging phonemes can easily falsify this claim. Up to now, the phonetic basis of chain shifts still remains nonconsensual. Chain shift can happen in both consonants and vowels, exemplified by the cases below in this section.

A prominent example of consonant chain shift is again MH-HK, directly causing its mutual unintelligibility with other Min dialects. The chain can be described with the following formula: $/t͡sʰ/ \rightarrow /s/ \text{ (with partial addition of } /t͡s/, \text{ not before the } /l/-\text{medial)} \rightarrow /t/ \rightarrow /ɗ/$. It is triggered by the $/*t/ \rightarrow /ɗ/ \text{ end because there is a parallel implosivization of } /^{/p/} \rightarrow /ɓ/ \text{ (while } /^{/k/} \text{ remains } /k/ \text{ possibly due to the rarity and difficulty of } /ɠ/ \text{ as a phoneme) – the change is highly agreed upon to be affected by the presence of } /ɓ/ \text{ and } /ɗ/ \text{ in the neighboring 黎語 Li/Hlai languages (Vietnamese went through the same process in borrowed Sino-Vietnamese pronunciations as well).}$

The lack of $/t/$, an outlandishly cross-linguistically common phoneme, causes a relatively rare sound change of $/^{/s/}$ plosivizing to $/t/ \text{ to fill in the blank, which is a strong fortition; however, } /s/ \text{ is also common, so the fortis affricate } /^{/t͡sʰ/} \text{ shifts to its
place, and the chain synchronically stops here. */t̚si/* without a -/i/- medial also participated in the stopping to /t/ (possibly merged into /s/ then plosivized) while /t̚si/ got palatalized into [t̚si] ~ [tʃi]. Table 10 below is the result of the change, with MN-XM (with /t̚si/ and /si/ sequences backed to [t̚si] and [ʃi]) as a relatively conservative comparison from Proto-Min:

<table>
<thead>
<tr>
<th>Characters</th>
<th>茶</th>
<th>大</th>
<th>生</th>
<th>是</th>
<th>做</th>
<th>上</th>
<th>車</th>
<th>業</th>
</tr>
</thead>
<tbody>
<tr>
<td>MH-HK</td>
<td>dɛ</td>
<td>ðua</td>
<td>tɛ</td>
<td>tɨ</td>
<td>tɔ</td>
<td>tʂio</td>
<td>ʂia</td>
<td>sai</td>
</tr>
<tr>
<td>MN-XM</td>
<td>te</td>
<td>tua</td>
<td>sɛ</td>
<td>ɕi</td>
<td>tʂy</td>
<td>tɕiʊ</td>
<td>t胞ja</td>
<td>t胞ai</td>
</tr>
<tr>
<td>*MC</td>
<td>ðua</td>
<td>da</td>
<td>ʂuaŋ</td>
<td>dzie</td>
<td>tsuo</td>
<td>dzɪɛ</td>
<td>t胞ia</td>
<td>t胞ai</td>
</tr>
</tbody>
</table>

Table 10: Consonant chain shift in MH-HK

Compared to consonants, vowels are far less stable segments because of the continuity of the vowel space in the mouth. Previously in Section 3, a minimal amount of sound change is dedicated to vowels so far because of the flexibility and lack of consensus, even on *MC vowel reconstructions. Realizing those limitations, this thesis will continue to use Pan (2000)’s reconstruction values as a reference because most vowel values apply phonemically, if not phonetically. The chain shift of vowels in Chinese varieties are studied because a special series of sound changes, traditionally named “extra-raising 高頂出位” is relatively common – it involves the continuous “raising” of vowels after reaching the high vowels /i/ and /u/. Zhu (2004, 2005) argues that the major vowel shifts in Chinese languages (or universally) can be represented by Figure 10, inheriting Labov’s three conditions of vowel chain shifts (long vowels raising, short vowels lowering [only in languages with vowel length
Zhu argues that “extra-raising” can be one of the six processes shown in Figure 10 starting with /i/, with different varieties of Chinese taking on different paths: in Y-GZ */i/ vowel diphthongized to [ei] or even [ui] with a short [u], resembling the blue path on the far left side and the principle of short vowel lowering; in W-SZ */i/ and */y/ are shifting to [iə] and [yəw], */i/ and */y/ shifted to [ɪ]=zs and [u]=z̩, as well as /u/ is shifting into [β] and [y]; in most Mandarin like GB-BJ and GJ-DL, */i/ shifted to [i]=zs after alveolar affricates, while */i/ and */i/ merged after retroflex initials into [i]=zs — all these changes are triggered by the respective push chains as rimes like */ei/ and */ei/ raising to /i/. Table 11 and Figure 11 illustrate the vowel chain shift of GB-BJ from *MC, corresponding to Labov’s first (raising) and third (fronting) principles:

6 [ɪ], [u] and [i] are non-standard IPA symbols shared by Sinologists to describe the phenomenon of a vowel’s “extra-raising” and turning into syllabic consonants because phonemically they are still considered vowels and using the latter symbols after the equal sign (their actual phonetic values) may cause extra confusions.
Table 11: Correspondence between *MC and GB-BJ vowel systems

<table>
<thead>
<tr>
<th>Characters</th>
<th>仏</th>
<th>多</th>
<th>五</th>
<th>艾</th>
<th>也</th>
<th>齊</th>
<th>四</th>
<th>時</th>
<th>世</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB-BJ</td>
<td>(ʔ)</td>
<td>tuo</td>
<td>(w)</td>
<td>(ʔ)</td>
<td>i</td>
<td>iɛ</td>
<td>iɛ</td>
<td>sɿ/sɿ</td>
<td>ɿ/ɿ</td>
</tr>
<tr>
<td>*MC</td>
<td>ɲ</td>
<td>ta</td>
<td>ɲuo</td>
<td>ɲai</td>
<td>jia</td>
<td>dzɛi</td>
<td>s</td>
<td>dzii</td>
<td>ɛi</td>
</tr>
</tbody>
</table>

Figure 11: proposed directions of GB-BJ vowel chain shift

Notice that 世 *MC /ɕɛi/ to GB-BJ [ʂɿ]⟩[ʂɿ] seems like a farfetched exception, but it is merely a two-step mechanism: 1) raising [*/ɛi/⟩(*/ɛi/)⟩(ʃii/)⟩ʃi], and then the consonantally conditioned change /ɛi/⟩[ʂɿ]⟩[ʂɿ] with the retroflexion of */ɛ/ to [ʂ] discussed in 3.4.

There are many other synchronic and diachronic changes that follow the Neogrammarian regularity hypothesis – a non-exhaustive list can be found back in 2.3.3. Moreover, some sound changes covered in Section 3 are “irregular” according to the Neogrammarian hypothesis, which evokes the lingering question regarding the legitimacy of the overarching regularity dichotomy – Section 4 will provide more examples and elaborate on the different types of irregular changes.
4. Irregular sound changes

Now that the major regular Neogrammian changes have been discussed in Section 3, the focus will be shifted to the sound changes that are deemed “irregular”, which means that a sound change not entirely based on phonetic environment has taken place, or the sound change does not affect every word in the lexicon with the particular phone. This is a very expansive category with lots of different types of sound change: lexical diffusion (4.1), free variations (4.2), phono-semantic dissimilation (4.3), OC consonant clusters hypothesis (4.4), syllabic nasal (4.5), forms of diminutives (4.6) and tonal changes (4.7) – these changes cover the realms of phonetics, phonology, morphophonology, semantics and sociolinguistics, therefore they are far from a homogenous group, further proving that this artificial dichotomy is very problematic.

4.1. Lexical diffusion and analogy

Among the irregular changes, lexical diffusion is the most prevalent phenomenon, which can be defined as a modification of a phoneme only in a subset of lexicon and a later gradual spread to other lexical items. Intriguingly, the studies of lexical diffusion started with a Chinese variety – MN-CZ (Teochew), as William Wang 王士元 (1969: 9-25) examined its tonal formation and developed the theory of lexical diffusion: All sound changes originate in a single word or a small group of words and then spread to other words with a similar phonological make-up, but may not spread to all words where they potentially could apply. Using his theory, Ogura
(1986: 1-20) discusses the significance of lexical diffusion, using the modern reflexes of the long \( /i/ \) (“me”) vowel as evidence. However, the theory itself received a fierce backlash after its publication, especially by the Sinologist Edwin G. Pulleybank 蒲立本 (1982: 406): he criticized the theory by claiming that “[it is] so manifestly at odds with any realistic picture of how dialects are inter-related and how innovations spread spatially through a language as to make them totally untenable”.

Up to this day, most historical linguists still largely adhere to the Neogrammarians' hypothesis, though often times a distinction between “sound change proper” and “lexical diffusion” is made: Labov (1994: 421-439) states that there are two types of sound changes including regular sound change (respecting the Neogrammarians' hypothesis) and lexical diffusion, and provides a typology, according to which certain kinds of sound changes are exclusively regular (e.g. vowel quality changes) while others are more susceptible to lexical diffusion (e.g. metathesis). This thesis do not necessarily agree with all of Labov’s typologies, but his dichotomy between regular sound change and lexical diffusion is a crucial one because it legitimizes the fact that there are sound changes happening outside the Neogrammarians' model and it proposes some possible conditions for lexical diffusion, which is one of the central problems of historical linguistics and sound change. Furthermore, lexical diffusion is largely analogical, meaning that the spreading of one change in an individual lexical item to another is based on the similarity between the two, either in phonetic environment or otherwise. For Chinese languages, this kind of similarity is mostly orthographic, in a way that characters with similar phonetic components are often pronounced the same
or rhyme with each other (see the discussions on phonological series in 3.4 and 4.4).
The latter part of this section will provide an empirically based discussion on lexical
diffusion of two groups of characters, both with MC 以 */j/ initials – the 唯 series
and the 容 series.

The historical changes of the 唯 series is generally regular among varieties,
with a few exceptions in GZ-WN, W-SZ and MD-FZ (微 MC */m~ɱ/ and 穩 MC
*/ʔ/ are included for comparison):

<table>
<thead>
<tr>
<th>Characters</th>
<th>唯</th>
<th>維</th>
<th>惟</th>
<th>帷</th>
<th>微</th>
<th>穩</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>jʷi</td>
<td>jʷi</td>
<td>jʷi</td>
<td>jʷi</td>
<td>mʷi</td>
<td>?uon</td>
</tr>
<tr>
<td>GB-BJ</td>
<td>(?uei)</td>
<td>(?uei)</td>
<td>(?uei)</td>
<td>(?uei)</td>
<td>(?uei)</td>
<td>(?uən)</td>
</tr>
<tr>
<td>GJ-DL</td>
<td>vei</td>
<td>vei</td>
<td>vei</td>
<td>vei</td>
<td>vei</td>
<td>vən</td>
</tr>
<tr>
<td>GZ-WN</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>(?uŋ)</td>
</tr>
<tr>
<td>W-SZ</td>
<td>vi (ji)</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>(?uən)</td>
</tr>
<tr>
<td>H-MX</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>vi</td>
<td>mi</td>
<td>vun</td>
</tr>
<tr>
<td>MD-FZ</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
<td>mi</td>
<td>(?uŋ)</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>wei</td>
<td>wei</td>
<td>wei</td>
<td>wei</td>
<td>mei</td>
<td>ən</td>
</tr>
</tbody>
</table>

Table 12: Realizations of the 唯 series

In *MC, 唯, 微 and 穩 belonged to three different initials, whereas most modern realizations merge at least two of them, if not all three, but the directions of merging is not quite the same. The first type (GB-BJ and GJ-DL) merge them towards [ʔ] and later developed initial [w], with GJ-DL further fricativizing the /w/ initial to [v]. Notice that although GJ-DL, GZ-WN and H-MX share the [v] initials for the four
characters in the 唯 series, their groupings with other initials are not quite the same: GJ-DL merges all three and it’s clearly an innovation from /w/ because a small amount of free variation with [w] exists in careful speech (see 4.2 for discussions of free variation); H-MX merges the 唯 series and 穩 to [v], with 微 retaining its [m] due to an earlier loss of -/w/- glide, similar to Y-GZ, forming the second type. The third type includes GZ-WN, W-SZ and MD-FZ, where the 唯 series merged with 微, different from 穩 – this requires /(ʔ)u/ and /v/ to be separate regarding change so the situation like GJ-DL would not happen with 穩 turning into [v]. However, the 唯 series turned into [v], merging with 微 in GZ-WN and MD-FZ without any backing because the [(ʔ)u] from -/w/- medial is still there. Thus, this is a clear example of lexical diffusion happened to the 唯 series. All four exemplary characters (唯, 維, 惟 and 帷) share the same phonetic component on the right side, and their pronunciations are the same regardless of location. However, the */jʃw/* cluster turning into [v] without any change of */u/* is firm evidence that the 唯 series deviated from regular sound changes and merged into the same initial with 微, in those cases [v]. MD-FZ takes this a step further: all the 唯 series got changed to [m], still alongside with 微. This change is unprecedented in many regards because it adds the feature of nasality out of nowhere, which can only be considered an analogy from the fact that 唯 and 微 are considered homophones before and 微 retains its [m] initial while losing the -/w/- glide. Given the geographical distance and blockage between these varieties (GZ-WN is in the northwestern part while MD-FZ is in the far southeast), there is no way that this trait can be explained regularly by a shared areal trait,
therefore, the only logical exit would be lexical diffusion. Bybee (2009) states that lexical diffusion always start with the most frequently used tokens, which holds true given her statistical data – therefore the assumption could be that 唯 shifts its pronunciation to be homophonic with 微 in certain dialect groups independently, with the irregular [m] in MD-FZ being a later layered analogy of the homophonous nature, disinherit the actual pronunciations with a */j/ initial.

The 容 series, also with MC */j/, took a similar turn in different directions and in GB-BJ (冗 and 戎, both */ŋ/, as well as 用 */j/, are included for comparison):

<table>
<thead>
<tr>
<th>Characters</th>
<th>容</th>
<th>蓉</th>
<th>榕</th>
<th>镜</th>
<th>用</th>
<th>冗</th>
<th>融</th>
<th>戎</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
</tr>
<tr>
<td>GB-BJ</td>
<td>ziong</td>
<td>ziong</td>
<td>ziong</td>
<td>ziong</td>
<td>jiong</td>
<td>ziong</td>
<td>ziong</td>
<td>ziong</td>
</tr>
<tr>
<td>GJ-DL</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
</tr>
<tr>
<td>GX-CD</td>
<td>yiong</td>
<td>yiong</td>
<td>yiong</td>
<td>yiong</td>
<td>yiong</td>
<td>ziong</td>
<td>yiong</td>
<td>ziong</td>
</tr>
<tr>
<td>W-SZ</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
</tr>
<tr>
<td>H-MX</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
<td>iiong</td>
</tr>
<tr>
<td>MD-FZ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
<td>yŋ</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
<td>jiong</td>
</tr>
</tbody>
</table>

Table 13: realizations of the 容 series

Although the characters belong to two *MC rimes */iŋ/ and */iŋ/, all varieties surveyed here non-exceptionally merged them – the problem lies in the consonants. Dialects like GJ-DL, H-MX and Y-GZ merges all four combinations of consonants and rhymes, with */ŋ/ turning into [i~j]; W-SZ is the most conservative here, keeping
all the consonants as the original; MD-FZ also merges */ŋ/ with /j/ with a surface level [y] due to monophthongization, but the character 円 shifted to [n] (probably because of the lexically based unusual loss of */i/- medial, conserving the nasality). GB-BJ is the focus because all the characters in the 容 series fortified to [ʐ] (in free variation with [ɻ], see 3.6 and 4.2), while 用 with the exact same pronunciation in *MC remain unchanged – obviously the shift of 容 to be homophonic with 戎 (which, according to the sound change explained in 3.6, should have a [ʐ] reflex) is lexically based. 容, as the basis of this phonological series and the most commonly used morpheme, undertook this change of fricativization and spread out this change to its orthographic neighbors 榕, 蓉 and 鎔. This lexically diffused fortition to [ʐ] in GB-BJ, which is largely by chance, is prescribed to be “correct” in the creation of Standard Mandarin, therefore spreading even more to major Mandarin dialects, causing speakers to hypercorrect their former conservative pronunciations with /j/ (e.g. my grandma, a native speaker of GJ-DL, pronounces them with a [ʐ] although she is not a speaker of Standard Mandarin in daily life). Thus, sometimes a small, irregular change can really spread out, thanks to other sociolinguistic factors (see 4.3 and 5.3).

Although 融 does not share similarities with the 容 series orthographically, it still follows the same pattern with the series analogically, proving that orthography (or phonological series) is not the only impetus of lexical diffusion in Chinese, albeit a common and widespread one. A few more examples of lexical diffusions can be found throughout Section 4.
4.2. Surface and underlying “free variations”

Free variation is the phenomenon that two or more sounds appearing in the same environment do not change the meaning of an utterance – in other words, the sounds are considered synchronically allophonic within the same phonetic environment (Clark et al: 110). This phenomenon is very widespread in speech and can be found in almost every language – for example, the English word “meet” in the General American variety can be pronounced [mit], [mitʰ], [miʔ], [miʔt] and [miʔ] depending on speakers, but listeners can identify each of the pronunciations as realizations of “meet” without any problems. Free variations occur in almost all varieties and are usually non-phonemic: for example, aforementioned free variation between [z] and [ʐ] in GB-BJ can be attributed to the subtle difference between two sounds – the amount of frication directly determines the phonetic outcome of the consonant since the place of articulation is the same, and most people pronounce it (perceptually and phonetically) somewhere in between, with a weak frication. (This is similar to the development of <rz> in Polish, involving a retroflexion of /ɻ/ into [ʐ].) A new but also common change in GB-BJ is the r-coloring of all retroflex consonants, which is assimilative in nature: /tʂʰz/, /tʂʰz/ and /tʂz/ (pinyin zi, ci, si) all elide into [ʐ] in casual speech, or even [ʐ] without its own syllable, affiliating onto the previous one (e.g. 老師好 /lau21ʂ55xau214/ → [lauʂʰ24xau214] → [lau-24xau214]). Although this has long been marked as a defining characteristic of the local dialect deviating from Standard Mandarin, it is largely frowned upon in educated Beijing speech since lenition is perceived as a bad, improper speech habit. Nevertheless, the r-lenition of syllabic
retroflexes is still prominent and continues to vary cross speakers between the full pronunciation, [z], [ɻ] and r-colored vowels, with or without its own syllable.

The examples above are more or less “free” regarding to variability – however, the most “free variations” are not ever free at all – that is, they have the tendency to favor one sound over another. The GB-BJ examples of [z] show that [ɻ] and even r-colored vowels are potential substitutes for ease of articulation – only in conservative and “proper” speech do people carefully enunciate the frication of [z], so the general process is inclined towards approximants and more closely integrated articulations between segments. There are two main groups of intra- and inter-dialectal “free variations” in varieties of Chinese: /hw/ or /xw/ versus /l/, and /l/ versus /n/.

The distribution of /hw/ or /xw/ (most varieties only have one of them) and /l/ is geographically very sporadic all southern varieties, due to the fact that the respective two segments are in underlying “free variation” in most places. Synchronously speaking, some varieties have already completed the sound change, like all Min languages: the original layer of LMC Group */f/ was Group */p/ bilabials, but due to more input from Mandarin since it has had such a great influence, Min languages later absorbed a more modern layer of Mandarin phonetic approximations containing the /l/ sound. However, labiodentals have never existed in Min – therefore the closely related /hw/ is chosen to borrow this pronunciation (see Table 4, MN-XM) (also see 5.4). Fascinatingly X-SF also follows this principle with the pronunciation of LMC Group */l/ all starting with [x], some even lost the -/u/- medial (Yuan 2001). On the
other hand, the change also happens in the other direction, with /h/ and /x/ spirantizing to /f/, which is even more widespread: this change is complete in New Xiang dialects like X-CS, as well as all Gan and Hakka dialects. In these varieties, /x-h/ and /u/ sequences have long disappeared and shifted to [f] (e.g. 花 *MC /hɯa/, H-MX [fa]). Y-GZ and similar Yue dialects are something in between: only the syllables /huŋ/ and /huʔ/ exists, but their pronunciations shifted to [hoŋ] and [hoʔ] respectively, which helped them keep their relatively conservative initials (some [h] are derived from MC */kʰ/ in Y-GZ). A radical example from multiple sound changes would be 苦 *MC /kʰuo/, Y-GZ [fu]): the debuccalization of */kʰ/ (3.5) and the spirantization of /hu/ form a feeding order, therefore a huge shift from /kʰ/ to its reflex [f]. Overall, this series of bidirectional changes are defined as underlying “free variations” since the two sets of segments are really similar in articulation. An intermediate third option can be found in Songjiang dialect from a suburb of Shanghai: [ɸ]. [ɸ] is the bilabial equivalent of [f], but it is also the co-articulation of /x-h/ and /u/ ([xu] without tongue movement from the velum would easily turn to [ɸ], while [hu] would also turn to [ɸ] if frication is increased). Therefore, [xʰ-hʰ], [ɸ] and [f] are diachronically free variants of the same underlying phoneme, though surface level and intra-dialectal free variations are rare.

來 *l/ and 泥 *n/ tells a similar story: Both alveolar sonorants, their only difference is only about nasality or laterality. This trait is also quasi-areal: it is popularized along the Yangtze River in Jianghuai Mandarin and Southwestern Mandarin dialects, and later started to develop independently in different varieties like
MN-XM and Y-GZ. Table 14 and Figure 12 illustrate the shifts between phonemes /n/ and /l/:

<table>
<thead>
<tr>
<th>Characters</th>
<th>蓮</th>
<th>年</th>
<th>老</th>
<th>腦</th>
<th>路</th>
<th>怒</th>
<th>呂</th>
<th>女</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>len</td>
<td>nen</td>
<td>lau</td>
<td>nau</td>
<td>luo</td>
<td>nuo</td>
<td>liɔ</td>
<td>ɲɔ</td>
</tr>
<tr>
<td>GH-YZ</td>
<td>niɛ</td>
<td>niɛ</td>
<td>lɔ</td>
<td>lɔ</td>
<td>lu</td>
<td>lu</td>
<td>ny</td>
<td>ny</td>
</tr>
<tr>
<td></td>
<td>(liɛ)</td>
<td>(liɛ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(ly)</td>
<td>(ly)</td>
</tr>
<tr>
<td>GH-HF</td>
<td>niɪ</td>
<td>niɪ</td>
<td>lɔ</td>
<td>lɔ</td>
<td>l̩ɛβ</td>
<td>l̩ɛβ</td>
<td>z̩y/z̩w</td>
<td>z̩y/z̩w</td>
</tr>
<tr>
<td></td>
<td>(liɪ)</td>
<td>(liɪ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GX-CD</td>
<td>liɛ</td>
<td>ɲiɛ</td>
<td>ɿau</td>
<td>ɿau</td>
<td>ɿu</td>
<td>ɿu</td>
<td>ly</td>
<td>ɲy</td>
</tr>
<tr>
<td>GX-CQ</td>
<td>lian</td>
<td>lian</td>
<td>lau</td>
<td>lau</td>
<td>lu</td>
<td>lu</td>
<td>ly</td>
<td>ly</td>
</tr>
<tr>
<td>MN-XM</td>
<td>nĩ</td>
<td>liɛn</td>
<td>lau</td>
<td>nǖ</td>
<td>lɔ</td>
<td>nŋ</td>
<td>li/lu</td>
<td>li/lu</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>lin</td>
<td>nin</td>
<td>lou</td>
<td>nou</td>
<td>lou</td>
<td>nou</td>
<td>lɔy</td>
<td>nɔy</td>
</tr>
<tr>
<td></td>
<td>(lin)</td>
<td>(nou)</td>
<td>(lou)</td>
<td>(lou)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 14: Realizations of */l/ and */n/ (the values in brackets are free variants or a new reading)

Figure 12: the general directions of /l/ and /n/ redistribution

In general, the merge of /l/ and /n/ as one single phoneme tend to incline towards [l] as its surface value than [n] – this is probably due to the relative ease of
articulation of a lateral approximant compared to a nasal; however, there are dialects like GH-YZ and GX-CD favoring \([l]\) or \([\tilde{l}]\) except for the presence of \(-/i/-\) or \(-/y/-\) medials, where \([n]\) and \([\eta]\) are favored. The appearance of \([\eta]\) as a possible realization is simply a product of palatalization, and the change of tongue position for \([n]\) and \([\eta]\) before a high front vowel is relatively small, compared to producing \([l]\). In other varieties like GX-CQ, \([l]\) is clearly favored, and that is also a trend among the dialects with synchronic surface level free variation, like Y-GZ and GH-YZ where the new native speakers manifest a clear tendency towards the \([l]\) realization regardless of vowels. Therefore, sometimes surface level “free” variations can also be confined and directional as well, with underlying “free variations” always a part of a greater-scaled sound change. This will be further discussed in 5.1-5.2.

4.3. Phono-semantic dissimilation

For historical linguists, dissimilation largely refers to the mechanism where two of the same segments are relatively close to each other that one must take on certain modifications to its original pronunciation in order to pronounce it more easily. This can be seen in Spanish “árbol” (tree) where the second <l> is originally <r>, as in Latin “arbor”. However, phono-semantic dissimilation in this section is not the same concept: it refers to the dissimilative gesture of one morpheme (or in the case of Chinese, one character) with regards to a homophonic other, in order to separate the meaning of the two. This change is highly artificial and prescriptive in nature, but it
still changes the way people pronounce and use a given morpheme to a great extent.

The most famous examples of phono-semantic dissimilation are the characters 鉛 (the metal “lead”) and 癌 (“cancer”), whose pronunciations in several major varieties are shown in Table 15:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>鉛</td>
<td>jʷiɛn</td>
<td>ʨʰiɛn</td>
<td>yɛɛ</td>
<td>ʨʰiɛɛ</td>
<td>ian</td>
<td>jyn</td>
<td>ian</td>
<td>kʰɛ</td>
<td>kʰan</td>
</tr>
<tr>
<td>癌</td>
<td>ŋuæm</td>
<td>ai</td>
<td>ŋai</td>
<td>ɛ</td>
<td>gam</td>
<td>ŋa:m</td>
<td>ŋam</td>
<td>ŋɛ</td>
<td>ŋan</td>
</tr>
</tbody>
</table>

Table 15: pronunciations of 鉛 and 癌

These two characters are excellent examples of phono-semantic dissimilation because each has an potentially ambiguous homophonic counterpart: 鹽 (“salt”) and 炎 (“inflammation”). Coincidentally the four were once all pronounced [iɛn^T2] in most Mandarin dialects: 鉛 (lead), as a part of the 沿 phonological series, lost its -/w/-glide due to lexical diffusion among the series, so it turned out to be pronounced the same with 鹽 (salt). This caused a severe problem of two important minerals being homophonic and indistinguishable in conversations, so the pronunciation of 鉛 was changed to [ʨʰiɛn], which is a palpably abrupt development since the fortis consonant [ʨʰ] cannot be derived from any phonemes in */jʰiɛn/. With the expansion to more southern varieties having the same change (W-SZ and GA-NC), now the initial is [kʰ], which only corresponds to MC 溪 */kʰ/ in W-SZ. Thus, the conclusion should be a character with the rough pronunciation of [kʰ] + (-/j/- glide) + front vowel + nasal substituted the original 鉛, a process called 訓讀 (morpheme substitution of the same character, comparative to Japanese kun’yomi) – the new morpheme inherits all
the old semantic sets entailed by the character 鉛, while the pronunciation took a sudden and drastic shift to a completely irrelevant one. Hirayama (1998: 198) states that [kʰam] is a morpheme meaning “白鐵皮 (lit. white iron skin, roughly slices of white metal)” in Lichuan dialect of Gan, proposing that to be the substitute that has gone through sound changes when it was spread into other varieties. Valid or not, the fact that this morpheme with [kʰ] initial does not share a common etymological root with the original 鉛, therefore it was a dissimilative gesture to eliminate potential confusion.

癌 shares a similar but different story: Firstly, its meaning shifted from a small pain in traditional Chinese medicine to the disease “cancer”, introduced by the Japanese. According to regular sound changes, 癌 should also be pronounced [ien^n2] since it directly came from 岩/讝, a similar character meaning “rock”. However, this coincidentally caused ambiguity with a homophone 炎 (inflammation), which is a tiny disease compared to cancer. Thus, 癌 shifted its pronunciation to a new one, reanalyzing an input of a certain Wu variety 岩 /ŋe/ (which already lost its final -/m/), resulting in a surface value of [ai] due to the loss of */ŋ/ initial and diphthongization. Notice that only Mandarin took this change because there is no need for deviating from the original pronunciation if one has a [ŋ] initial and the other do not. In general, semantic dissimilation is rare, but it can be the source of further lexical diffusion to the members within the same phonological series since its frequency of usage is relatively high.
4.4. The OC consonant cluster hypothesis

Previously in 3.4 the OC reconstruction of certain characters’ sound values is briefly touched upon, and it is mentioned that the concept of phonological series is significant for understanding the particular phonetic composition in OC. However, one can find some obvious disparities of the method of phonological series – for example, the 監 series contains 監/礦 with MC */k/, 藍/籃/濫 with MC */l/; the 各 series contains 各/格 with MC */k/, 恪 with MC */kʰ/, and 洛/絡/路 with MC */l/; the 質 series with 筆 MC */p/ and 律 MC */l/; the 䜌 series with 變 MC */p/, 樂/鸞/戀 MC */l/…… The list can go on. If the assumption of “all characters sharing the same phonetic components must share the same initial 同諧聲者必同韻” by Qing dynasty philologist 段玉裁 Duan Yucai (which was adapted by a lot of mainstream linguists, including the Zhengzhang-Pan reconstruction) holds true, they must have multiple consonants to account for the disparity because there is no evidence that a change like the approximation from voiceless stops to /l/ has ever taken place. More importantly, all the MC reflexes are partially filled with /l/, which is common among these series. Zhengzhang (2003) states that this can be linked to the -/r/- medial in MC 二等韻 2nd grade rimes and reconstructs the original values to be */kr/- for the 監 and 各 series, and */pr/- for the 質 and 䜌 series. This reconstruction presumes irregular changes, in that a split must occur somewhat to account for the conservation of plosives and loss of -/r/- medial in one subgroup and the right opposite in the other subgroup. The loss of -/r/- medial was a historical trend and there is evidence that it has gone through the process of vocalization that none of
the modern varieties has /r/ as a phoneme; but the apocope of plosive onsets is yet to be explained. Zhou Changji 周長楫 criticizes this method of reconstructing consonant clusters: “The special phenomena among the phonological series are the result of sound change itself, not from splitting or lexical diffusion; furthermore, [l] as an intrusive to split one syllable into two with the same rime is a common tactic for wordplay found across ancient and modern Chinese varieties, which does not fit into the characteristics of a consonant cluster.” (1998: 25) Since the reconstruction of Old Chinese has the tradition to refer to orthography and there are no rime books available, this hypothesis is still disputed, and there is not enough evidence that clusters like */pr/- shifted to */p/- and */r/-, so this thesis holds a reserved opinion towards this hypothesis despite the general recognition of modern linguists working on OC.

4.5. Development of syllabic nasals

In Southern China there is a special phenomenon that is geographically shared across different varieties: the development of syllabic nasals. While *MC does not have any of them, dialects from the six major southern varieties have this trait without exception. There are four possible realizations of the syllabic nasal across varieties: [m̩], [n̩], [ŋ̩] and a flexible nasal prefix (denoted by N). These three nasal sounds are always present as an inherent part of the dialects’ respective consonant inventories, manifesting a direct inheritance from MC phonemes /m/, /n/ and /ŋ/. Since they can be at either the initial or final position of the syllables, the syllabic nasals in various
dialects can be analyzed accordingly into two different types of changes: one type from the initials, the other type from the endings (Shen 2006).

The most common morpheme for the sound /m̩/ is “no/not” with various orthographic representations like 唔 (Y-GZ [m̩21]) and 毋 (H-MX [m̩11], MN-XM [m̩33]) – however, its original form should be “無”: throughout the varieties there are two forms of negative markers both with an original bilabial consonant, one stemming from 無 (MC */mio/) and the other stemming from 不 (MC */piu/, */piut/) (both subject to labiodentalization, see 3.3). In regular sound change processes, most dialects from the six Southern varieties treat 無 with an /m/ initial since the -/i/-medial is largely lost, for example Y-GZ [mou21], H-MX [mo11], MN-XM [bɤ24] (from denasalization). [m̩] contrasts with 無 in all of the varieties above, with 無 largely used in literary and formal contexts, and [m] confined in colloquial, everyday usage. This can be illustrated by the distinction in Y-GZ: 唔會 (will not), 唔得(cannot) with [m̩21], while 無盡 (endless) and 無情 (merciless) use 無 [mou21] since these lexical items are inherited from MC. In other words, [m̩] functions more like a bound morpheme, similar to English “not” (compared to “no”): it can attach to other morphemes (mostly colloquial ones) but it cannot effectively stand alone. Another example would be MN-XM 是毋 [ei33 ŭi33] (lit. “yes no”) functioning as a tag question or a rhetorical question: here the [m̩33] also cannot stand alone to express the meaning of “isn’t it” like in the English sentence “I thought you knew, no?”, similar to the idea that “not” also cannot substitute “no” in such positions.

Since 無 had a nucleus /o/ in MC, it has largely been raised to [u] in vowel
chain shifts, and later the [u] started co-articulating with [m], giving a syllabic [m̩]. Shen (2006) and Sheng (2017) argue that the appearance of syllabic nasal must attain to phonetics in a way that the vowel that got elided or assimilated to the nasal must only require a minimal movement, hence it must be high (maximum closure, close to being consonantal), and it must agree with both the roundedness and the articulatory point of the respective nasals. Therefore, a syllable of [mu], [ni] and [ŋu] (or the reversed counterparts) are required for the change. This, in turn, determines that the change should be more or less lexically sparse, since the subset of [mu], [ni] and [ŋu] is relatively rare in the lexicons of all relevant languages.

Furthermore, the change is also frequency-sensitive and lexically selective – it does not apply to all of the [mu], [ni] and [ŋu] syllables. For example, the development of [ŋ] from MC */ŋ/ and */ŋ/ is a case where the eligible syllables [ni]~[ŋi] do not all change to [ŋ]: in W-JH, 兒 (child, son), 二 (two) and “you” (all MC */ŋi/) shifted to [ŋ] while 而 (an uncommon conjunction) and 爾 (antique “you”) stayed to be [ŋi].

Regarding [ŋ] there are two origins: from MC */ŋ/- initial and all nasal finals. Table 16.1-2 shows the distribution of these syllabic nasals in various varities:
Table 16.1: [ŋ̩] from *ŋ/- initial

<table>
<thead>
<tr>
<th>Characters</th>
<th>吳</th>
<th>梧</th>
<th>午</th>
<th>五</th>
<th>誤</th>
<th>悟</th>
<th>魚</th>
<th>娛</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
</tr>
<tr>
<td>W-SZ</td>
<td>ŋ̩</td>
<td>ŋ̩o</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
</tr>
<tr>
<td>H-MX</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩o</td>
<td>ŋ̩o</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>ŋ̩</td>
<td>jy</td>
<td>jy</td>
</tr>
</tbody>
</table>

Table 16.2: [ŋ̩] from -ŋ/ final in MN-XM

<table>
<thead>
<tr>
<th>Characters</th>
<th>湯</th>
<th>堂</th>
<th>桑</th>
<th>喪</th>
<th>糧</th>
<th>稔</th>
<th>莊</th>
<th>雍</th>
</tr>
</thead>
<tbody>
<tr>
<td>*MC</td>
<td>tʰɑŋ</td>
<td>ɗɑŋ</td>
<td>sɑŋ</td>
<td>sɑŋ</td>
<td>kʰɑŋ</td>
<td>ɳIan</td>
<td>ʈIan</td>
<td>ɿIan</td>
</tr>
<tr>
<td>MN-XM</td>
<td>tʰŋ</td>
<td>ʈŋ</td>
<td>sŋ</td>
<td>sŋ</td>
<td>kʰŋ</td>
<td>ɳŋ</td>
<td>ʈʂŋ</td>
<td>sŋ</td>
</tr>
<tr>
<td>MN-CZ</td>
<td>tʰŋ̩</td>
<td>ʈŋ̩</td>
<td>sŋ̩</td>
<td>sŋ̩</td>
<td>kʰŋ̩</td>
<td>ɳŋ̩</td>
<td>ʈʂŋ̩</td>
<td>sŋ̩</td>
</tr>
</tbody>
</table>

From Table 16.1 a firm conclusion can be made that this change follows the path of lexical diffusion, so it is not at all a regular sound change: originally MC homophones, W-SZ 吳 and 梧 became not homophonous due to the more common usage of 吳 since 吳 is the name of both the place and the language of Suzhou. Similarly, 五 (number “5”) all turned into [ŋ̩] in all three varieties – with the pathway [ŋ̩o] → [ŋu] → [ŋɯ] → [ŋ]. (Notice that Y-GZ 魚 and 娛 did not participate because regular sound change monophthongized /i/ and /ɔ~o/ to [y], which is very far away from [ŋ].) On the other hand, the syllabic final -[ŋ̩] in MN-XM can be totally attributed to the fact that this particular rime has a relatively high, back and unrounded nucleus in related Southern Min dialects (testified by presence of MN-CZ [ŋ̩]), which creates the condition of the two co-articulating and merge into a single [ŋ̩].
The final type of syllabic nasal is also a bound morpheme, largely functioning as a prefix resulting from simultaneous assimilation and disyllabification. Take W-SH [m\textsuperscript{55} ma\textsuperscript{31}] and [n\textsuperscript{55} na\textsuperscript{31}] for example: it is clear that the nasal is spread across the two syllables – with their origins [ma\textsuperscript{51}] (mother) and [na\textsuperscript{51}] (grandma), one can easily find out that the second mora spreads its initial consonant into the first, and the tones are based on a gradation of the original contour. This kind of “added syllabic nasals” is also created by lexical diffusion since only addresses to family members are affected.

4.6. Forms of diminutives: nasals, r-coloring and tone changes

Apart from being a free morpheme derived from specific characters, the syllabic nasal can also be used grammatically as a realization of the diminutive. Since Chinese languages generally have a near one-to-one syllable-morpheme ratio, the presumption would be that the diminutive suffixes would be their own syllable, hence a syllabic nasal could be a possibility; nevertheless, co-articulation has taken place in many language varieties between the diminutive morpheme and the morpheme it attached to, so that the newly formed syllable contains two morphemes at once, which is an extremely rare phenomenon among all Chinese syllables. Whether syllabic or non-syllabic, there are three kinds of diminutive morphemes across all varieties: a nasal, an r-colored vowel and a change of tones.

Nasal diminutives are sparsely distributed among the southern non-Mandarin varieties, including dialects like Hu-YX, W-JH and Y-XY – although the nasal suffix
is shared among them, their realizations are completely independent of each other, and the interaction between the suffix and the root is very different. Liu Hsiu-Hsueh 刘秀雪 summarizes some of the phenomena in Hu-YX and W-JH, represented in Tables 17.1-17.2 (2009: 95, 99):

<table>
<thead>
<tr>
<th>Rimes</th>
<th>Monoph-thong</th>
<th>mid/low vowel + u</th>
<th>high vowel + u</th>
<th>high vowel coda</th>
<th>nasal final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interaction</td>
<td>+ [n]</td>
<td>delete first vowel + [n]</td>
<td>second vowel to [e] + [n]</td>
<td>monothongization + [n]</td>
<td>[yn]</td>
</tr>
<tr>
<td>Examples</td>
<td>兔 tʰu → tʰun</td>
<td>盒 xu.ː → xun</td>
<td>花 xu.ː → xuen</td>
<td>簎 tei → 簳 laŋ</td>
<td></td>
</tr>
</tbody>
</table>

Table 17.1: Diminutive -[n] in Hu-YX

| z → zn 絲 | i → in 梨 | u → un 虎 | y → yn 櫥 |
| leu → un 雀 | in → in 餅 | uo → uen 或 | ye → yen 桌 |
| r → un 鴿 | ie, ieʔ → in 麻/雀 | uoʔ → uen 館 | ioʔ → yen 桔 |
| æ → æn 梅 | iæ → iɛn 鐵 | uæ → uɛn 鬼 |
| a → æn 個 | iau → iɛn 鳥 | ua → uan 鴨 | ya → yæn |
| anŋ → æn 狼 | iaŋ → iɛn 娘 |
| aʔ → æn 柏 | iaʔ → iɛn 夾 | uaʔ → uɛn 骨 |
| ioʔ → ionŋ 竹 |

Table 17.2: Nasal diminutives in W-JH

From these two examples, we can see that the interaction between the nasal diminutive suffix and the root morpheme exhibits complicated characteristics: in H-YX, the sound change depends on both the existence of one or two vowels and the vowel quality of each one, with the overall result still not confined to any type of vowels (similar to the GB-BJ r-coloring diminutive discussed later in this subsection).
For example, 盒 [xɔː] and 花 [xuː] only differ in their long first vowel, but the result [xɔn] and [xuen] are completely different in both vowel quality and structure. Liu proposes that Hu-YX favors high vowel nuclei, which is only partially true since the long mid vowel nucleus is already an innovation from its ancestors (especially MC). Therefore, the inner dynamics of the vowel deletions or changes brought by the diminutive is still unclear and far from systematic. W-JH is a similar scenario: overall the front vowels are favored with [n] but there are exceptions like [ŋ] → [un] keeping [n] with an unrounded back vowel, and even more extraordinary exceptions like the [ieu] → [un] in 狗 (dog) – an educated guess would be that this morpheme is so overused that it is maximally reduced, but the appearance of [u] instead of assumed monophthongized result [y] is still inexplicable. Furthermore, the [ioʔ] rime, unlike others, split into two, resulting two drastically different diminutive forms [ion] and [yen]. The appearance of [ŋ] as coda is exceptional because it is the only instance of [ŋ], but [ioʔ] to [yen] is also out of the common pattern of syllables with -/i/- glides to turn into [iɛn] or [in]. Through analysis, both the innovation of the [ŋ] coda and the behavior similar to syllables with a -/y/- medial is due to the mid-high back position of [o] – [n] lag assimilated to [ŋ] because it is closer and easier to pronounce, and [i] anticipatorily assimilated to [y] to agree in roundedness. Still, there are other exceptions (e.g. [ua] and [uaʔ] behaving differently) left to explain.

The second category of diminutives is r-coloring, which has a clear derivation from the character 兒, so it is called 兒化 (erhua, lit. 兒-ization) – this character meaning “son / children” has gradually been grammaticalized to the semantic
equivalent of a diminutive, while the sound change from */ȵi/ → */ȵʑ/ → */ʑ/ → modern [ʐ-i] (see 3.6) has also taken place, which effectively shifted its pronunciation from */ȵi/ to */ʑ/. However, a further change regarding the */ʑ/ syllables occurred because of the inherent articulatory difficulty of the retroflex + /i/ sequence: in the past 400 years, such syllables went through a change from */ʑ/ → */ʐ/ → */ɻ/ → */ɚ/, as evidenced by Zhongyuan Yinyun 中原音韻. The intermediate step */ɻ/ is a perfect source of further reduction to a non-syllabic */ɻ/, or an r-colored vowel together with the segments from the root morpheme. For example, GB-BJ has a schema for the r-coloring of finals:

<table>
<thead>
<tr>
<th>Nucleus</th>
<th>/i/</th>
<th>/u/</th>
<th>/ŋ/</th>
<th>/ŋ/</th>
<th>/ŋ/</th>
<th>/ŋ/</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>/ɛ/</td>
<td>/ɛ/</td>
<td>/ɛ/</td>
<td>/ɛ/</td>
<td>/ɛ/</td>
<td>/ɛ/</td>
</tr>
<tr>
<td>Medial</td>
<td>/a/</td>
<td>/u/</td>
<td>/u/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
</tr>
<tr>
<td>Coda</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
</tr>
<tr>
<td></td>
<td>/u/</td>
<td>/u/</td>
<td>/u/</td>
<td>/u/</td>
<td>/u/</td>
<td>/u/</td>
</tr>
<tr>
<td></td>
<td>/ŋ/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
<td>/ŋ/</td>
</tr>
</tbody>
</table>

Figure 13: The r-colored finals of GB-BJ (Li 2005)

Similar to the changes triggered by nasal diminutives in the previous two dialects, the r-coloring of finals in GB-BJ is conditioned by the interaction of multiple rules: for codas, -/i/ and -/ŋ/ are deleted, -/ŋ/ is also deleted but nasalizes the whole syllable, while -/u/ becomes rhoticized itself; for nuclei, [ɛ] and [ɛ] become centralized ([v] and [o]), [a] and [u] becomes rhoticized and high vowels turn into glides. These changes involve the merging of certain finals while creating completely new syllabic
structures that is not allowed previously by its phonotactics, for example nasalized vowels. However, the r-coloring in other Mandarin dialects do not share the same rules: in GJ-DL the rhoticization is more detailed, along with more vowel changes like the backing of [a] to [ɑ] in syllables originally with an -/n/ final, causing a distinction between 把儿 <bar> [pa-] (with the r-coloring of [a] itself) and 伴儿 <banr> [paɐ̯] (with a centralizing diphthong); in dialects of Southwest Mandarin like GX-CD and GX-CQ, the r-coloring ignores the vowel nuclei, resulting in only one group of [ɤ] nucleus with different glides. Therefore, <bar> <banr> <bangr> <bor> <bongr> would all be [pɤ]. Generally, the r-colored diminutives decrease southwards because of the proximity to non-Mandarin varieties where it is non-existent.

A final type of diminutive is done by a change in tone: in Maoming and its surrounding area, both a nasal and a tone change can be regarded as the form of diminutive: Huazhou dialect mainly uses a syllabic nasal [ŋ], Maoming dialect uses either nasal suffix or a tone change, while Xinya dialect (Y-XY) has allophonic system of both an [n] suffix and a tone change (Shao 2005, Liu 2009: 96):

<table>
<thead>
<tr>
<th>Monophthong</th>
<th>-/i/ -/u/ coda</th>
<th>nasal coda</th>
<th>plosive coda</th>
</tr>
</thead>
<tbody>
<tr>
<td>-[ŋ] + tone change</td>
<td>tone change</td>
<td>tone change</td>
<td>tone change and coda nasalization</td>
</tr>
<tr>
<td>試[ʃi³³ → ʃin⁴⁶]</td>
<td>头[tʰu₁³ → tʰu⁴⁶]</td>
<td>深[fem⁵³ → fem⁴⁶]</td>
<td>鴨[ap³ → am³⁵]</td>
</tr>
<tr>
<td>車[ʃʰe⁵³ → ʃʰen⁴⁶]</td>
<td></td>
<td></td>
<td>腳[kia³ → kianj³⁵]</td>
</tr>
</tbody>
</table>

Table 18: Diminutive in Y-XY
From the data, the tone change is the primary sound change and nasality comes second: every syllable has undergone a certain tone change, with non-checked syllables elevating to a new tone value of 46, higher than the starting point of the dark level tone 53, and checked syllables turning into its corresponding non-checked syllables with a dark rising tone (35), sharing a similar contour with the newly developed 46 tone. The extra high pitch of this tone may be a product of sound symbolism: when talking to kids or an affectionate person, the pitch would unconsciously rise to a higher level than one’s ordinary voice – therefore the ending point 6, higher than the normal voice range, functions as a linguistic cue of “smallness” and “cuteness”. The checked syllables change to 35 instead of 46 to distinguish the sets between plosive codas and nasal codas. It is amazing that all these allomorphs combined convey the meaning of a single morpheme, which is quite unique within Chinese languages.

Because this change often involves a redistribution of finals (glides, vowels and codas) and it is morphophonological (the change is not driven by the surrounding phonetic environments), it is considered irregular in the Neogrammarian viewpoint – however, the creation of new segments (like nasalization in GB-BJ and the extra high rising tone 46 in Y-XY) can be the starting point of another sound change, or a complete restructuring of the respective phonological systems.
4.7. Tone categories, tone values and tone sandhi

So far this thesis has largely (and somewhat deliberately) omitted the discussion of tones (apart from the last subsection) because tones are by far the least thoroughly studied type of segment in historical Chinese phonology, albeit the fact that the Sino-Tibetan family is the largest family whose members are mostly tonal languages. The number of tones is usually stable in a given language given the trajectory of tone merges and tone splits: the MC four tones – 平 level, 上 rising, 去 departing and 入 entering – are very distinct categories. However, a major tone split concurrent with obstruent devoicing (see 3.1) resulted in eight new tones with each original tone splitting into two based on the voicing of initials – characters with voiceless initials have 陰調 “dark tones” and characters with voiced initials have 陽調 “light tones”. Further tone merges occurred in languages like Mandarin, including (in most dialects) the complete disappearance of the entering tone and the non-distinction between T3/T4 (dark/light rising) and T5/T6 (dark/light departing), yielding four new tones (e.g. Standard Mandarin), totally reconfigured compared to the four tones of MC. Moreover, the disappearance of entering tone is more or less random in some dialects like GB-BJ where it got irregularly distributed into modern T1/2/3/5, while in others it is highly regular, for example all T7/8 shifts to T2 in GX-CD. In the six non-Mandarin major varieties, there are generally more tone preservations and less tone merges.

On the other hand, tone values are probably the most flexible segments in all of Chinese phonological history – the starting point from MC is unknown. Given the
current diversity in tone values across dialects and assuming uniformitarianism, it is agreed there should be a similar array of various tone contours in different varieties even in the era of MC. A suggestion purely based on acoustics may be that “light” tones are pronounced lower in pitch than “dark” tones since the original voiced consonants were lower (see 3.1) – however, this does not hold true for many varieties (e.g. GJ-DL where T1 [dark level] is lower than T2 [light level], and neither of their contours are truly “level”/flat), especially after the completion of devoicing in those varieties. Another assumption usually made about tone values is that the appearance of (phonetically) level tones would be prior to contour tones, and unidirectional tones are prior to bidirectional tones. This is largely based on the seemingly decreasing order bidirectional tones > unidirectional tones > level tones of relative linguistic complexity. There are still plenty of exceptions that can falsify this claim – taking GJ-DL as an example again, the four tones (T1/2/3/5) are all contour tones with three unidirectional tones (T1/2/5) and one bidirectional tone (T3), in which T1/5 are falling and T3 (the dipping tone) also focuses on the falling aspect. However, they are still four distinct tonal categories, both phonetically and perceptually. Therefore the overarching conclusion would be that tone values are very unstable and susceptible to change. Figure 14 shows the tonal categories and contours of major Chinese varieties:
Furthermore, tone sandhi is also a prominent feature affecting the real pronunciation of words, and each variety has their own rules of tone sandhi. The word “sandhi”, coming from the Sanskrit word संधि (joining), is a fusional change carried at morpheme or word boundaries; more specifically, tone sandhi is a tone change of a morpheme when it happens to be in certain surrounding tonal environments – it is morphophonological in nature, since some varieties do not exhibit sandhi at word boundaries while others distinguish the sandhi patterns at morpheme boundaries and word boundaries. Post-sandhi tone values can inherit original tones (GB-BJ with little overall sandhi, where T3 changes to T2; MN-XM with an elaborate system but still sticks to its seven tones), or create new tones and tonal patterns (GJ-DL with two new...
tones in sandhi, and W-SH’s left-prominent sandhi with a tendency to spread out the
tone of the first syllable and an inclination towards pitch accent). Table 19 shows the
tone sandhi in GJ-DL as an example:

<table>
<thead>
<tr>
<th>C2</th>
<th>C1</th>
<th>阴平 T1: 31</th>
<th>阳平 T2: 24</th>
<th>上声 T3: 213</th>
<th>去声 T5: 52</th>
</tr>
</thead>
<tbody>
<tr>
<td>阴平 T1: 31</td>
<td>33+31 / 13+31</td>
<td>24+31</td>
<td>24+31</td>
<td>33+31</td>
<td></td>
</tr>
<tr>
<td>陽平 T2: 24</td>
<td>31+24</td>
<td>24+24</td>
<td>21+24</td>
<td>52+24</td>
<td></td>
</tr>
<tr>
<td>上声 T3: 213</td>
<td>31+213</td>
<td>24+213</td>
<td>24+213</td>
<td>52+213</td>
<td></td>
</tr>
<tr>
<td>去声 T5: 52</td>
<td>31+22 / 31+21</td>
<td>24+52</td>
<td>21+52</td>
<td>31+22 / 31+21</td>
<td></td>
</tr>
</tbody>
</table>

Table 19: Two-character tone sandhi in GJ-DL (C1/C2: First/second character)

There are three types of sandhi happening in two-character words in GJ-DL,
shaded in yellow, green and blue respectively. Group Yellow focuses on C1 with T3
and C2 with T1/T3 that the T3 got changed to share the same value with T2, without
creating a new tone value. Note that T3+T2 and T3+T5 also shorten the original
dipping value of T3 to 21 – a similar simplification can be seen in Standard Mandarin
as well, due to a relative ease of articulation. However, Group Green and Group Blue,
the interaction between T1 and T5, creates two new substitutive tones 33/13 (T1’) and
22/21 (T5’), while the contour tone values 13 and 21 function as free variants of level
tones 33 and 22. Moreover, Group Green merges T1/T5 to T1’ on C1, while Group
Blue also merges T1/T5 on C1 towards T1 and shifts the original T5 on C2 to T5’.
Group Green can be described as right prominent as the original T1 is kept intact,
while Group Blue is left prominent for the T1+T5 combination but bidirectional for
T5+T5 the T5 on the left side merging into T1 – this is an indication that T1 is a
“stronger” and more conservative tone than T5, with T5 at the starting phase of the synchronic process of merging into T1. The city just across the strait, Yantai, has a closely related dialect with only three tones, so comparatively we can deduce that GJ-DL would merge T1 and T5 in the future.

There are a lot of other more complicated instances of tone sandhi that still needs a more thorough explanation, like all dialects of Wu has a unique distinction between left-prominent and right-prominent tone sandhis, affecting words, phrases or even sentences. In general, this is an area still in need of a lot of work and more miscellaneous analyses.

In general, “irregular” change is not a very effective category: it encompasses a whole range of sound changes with different causes and mechanisms. Since both regular and irregular sound change are somewhat flexible with no absolute boundaries, in Section 5 the thesis will synthesize the data and try to question the Neogrammariam hypothesis (5.1) and unidirectional hypothesis (5.2), as well as attending to the topics of socio-geographical reasons of language change (5.3) and linguistic layering / literal and colloquial readings of characters (5.4) – all of them contribute to sound change in different ways, and the thesis will argue that 1) the regular-irregular dichotomy is largely an accustomed construct without necessarily reflecting the reality and 2) there are much more factors other than phonetic reasons impacting the course of sound changes.
5. Discussions

5.1. Regular or irregular? – Potential reasons behind sound change

Now that the major regular and irregular changes have been examined in the previous sections, it is time for a second look at the Neogrammian regularity hypothesis: does it still hold true? Are all sound changes only based on phonetic environments? If statistically regular changes outnumber irregular changes by a great amount, what is the reason behind the irregular changes?

Clearly this thesis does not strictly adhere to the Neogrammian hypothesis by any means, as evidenced by the equal weight of discussions on regular and irregular changes, hinting that irregular changes are not in fact just “irregular”: in the discussion of lexical diffusion in 4.1, it was clear that orthography and phonological series play a great role in the analogical and collective change; in 4.2 on free variation, the synchronic irregularity is a direct reflex on a greater-scaled sound change, hence the proposition of diachronic and underlying “free variations” as a bidirectional exchange; in 4.5 and 4.6, the frequency of usage is a prevalent determiner of change, corresponding to Bybee (2011)’s usage-based theory of grammaticalization that a lexical item with more usages would go through the grammaticalization process more quickly, along with phonetic reduction – the forming of syllabic nasals with only one phoneme representing the whole morpheme, and the forms of diminutives with either one segment added or merely a suprasegmental tone change. All those examples show the obvious facts that 1) “irregular” changes are in fact also driven by certain motivations and far from random, and 2) the distinction between “regularity” and
“irregularity” fells flat because there are multiple reasons and sources leading into various types of sound changes, that the dichotomy between “phonetic” and “non-phonetic” is a false one: the best examples would be the morphophonological changes discussed in 4.5-4.6 which well depends on phonetics and phonology (only co-articulation of [mu], [ni] and [ŋui] sequences can easily lead to a syllabic nasal, and the allomorphs of the diminutives are phonetically conditioned) but also on morphology (the suffixation of a lexeme 兄 into a derivational r-colored vowel). The examples of 4.3 even touch on semantics and pragmatics – language users actively dissimilating homophones because of their semantic difference is a completely pragmatic move initiated by the people, not the properties of language itself. Therefore, the study of sound change should often think out of the Neogrammarian box and realize that there are many other causes of sound changes that are equally valid and legitimate as they can also happen in any circumstances [which are why the term “sound change proper” (e.g. from Labov 1994) should now be discouraged because it implies the non-existent superiority of Neogrammarian hypothesis]. On the other hand, the sources of Neogrammarian “regular” sound changes are also various as well, with an array of different examples discussed in Section 3, and a synchronic “irregular change” can well be a reflection of a larger, “regular” change (e.g. the free variation of /l/ and /n/ with a general tendency towards [l] in 4.2). Thus, it is best to classify sound changes to its direct causes or sources rather than “regular” or “irregular”, to acknowledge their equal footings and better understand all of them in the big picture of sound change.
Below is an attempted list of all the reasons behind the changes surveyed in Sections 3-4:

1. **Co-articulation of segments:** dentilabialization (3.3), /hʷ-xʷ/ - /l/ free variation (4.2), formation of syllabic nasals (4.5), formation of diminutives (4.6);

2. **Separation of articulation and phonation** (of an original single segment): 清音濁流 (“voiceless sound, voiced airstream”) in Wu dialects (3.1), obstruent devoicing (3.1), glottalization of -/p/, -/t/, -/k/ codas (3.2), tone split (4.7);

3. **Assimilation** (place or manner): dentilabialization (3.3), palatalization (3.4), syllabification of [ʐ] in GB-BJ (4.2), formation of syllabic nasals (4.5), diminutive formation in W-JH (4.6);

4. **Dissimilation** (within the whole phonological system): retroflexion of Group */tɕ/ (3.4), phono-semantic dissimilation of homophones (4.3);

5. **Lenition:** merge and apocope of nasal and plosive codas (3.2), spirantization, debuccalization and lateralization (3.5), loss of medials (3.4, 4.4), part of MH-HK consonantal chain (3.7);

6. **Fortition:** obstruent devoicing (3.1), denasalization (3.6), /ʃ/-frication (3.6), part of MH-HK consonant chain (3.7), 高頂出位 “extra-raising” (3.7), the 容 series and the 唯 series (4.1);

7. **Chain shift:** postalveolar consonants (3.4), MH-HK consonant chain (3.7), GB-BJ vowel chain (3.7), “extra-raising” (3.7);

8. **Lexical diffusion:** palatalization from Group */k/ to Group */tɕ/ (3.4), lexical diffusion based on phonological series (4.1);
9. **Morphophonological**: syllabic nasal (4.5), diminutives (4.6), tone sandhi (4.7);

10. **Phono-semantic and pragmatic**: homophone dissimilation (4.3);

11. **Synchronic reflex of a larger change**: initial devoicing in Wu dialects (3.1), free variations (4.2);

12. **Other / flexible**: modern tone values and tone sandhi (4.7), possible OC consonant cluster split (4.4).

Although this list is far from authoritative, this is a more thorough and accurate typology of sound changes rather than a blatant distinction between “regular / phonetic” or “analogy” – the changes in Sections 3-4 often cross that invisible line (e.g. first wave vs. second wave of palatalization in 3.4), and some are still fuzzy or inexplicable with only educated guesses (e.g. tone sandhi). Thus, though the Neogrammari an hypothesis still undoubtedly has a widespread influence and high applicability, this thesis itself, especially the inclusion of all shapes and sizes of “irregular” changes which were largely lumped together in previous studies, serves as a call for more attention and inclusion of research, as well as a wider, more synthetic method to approach sound change in general. Recognizing their variability and the overlap between possible explanations (illustrated by the list above) should be valued more in historical phonology, and the inclusion of paralinguistic information or the incorporation of sociolinguistics in the field should be necessary because sound change is absolutely not a stand-alone product of phonetics itself, and after all language is created and used by humans. (See 5.3 for a more detailed discussion on historical sociolinguistics.)
5.2. Unidirectional or not? – Role of fortition and innovation in sound changes

Now that the regularity hypothesis has been discussed, the following question would be the directionality of sound change, which is also a prominent issue that came up many times in Sections 3-4. With previous introduction and discussion on the Unidirectionality hypothesis in 2.1.3, it is clear that lenitive phonology is their focus and lenition is the only direction in which sound change should take place because grammaticalization, argued to be a unidirectional process, is always accompanied by phonetic reduction. Fortition is acknowledged, but it is always treated as an outlier or only a product of analogical leveling. The same questions, as with the Neogrammarians, apply here: does the empirical data support Heine and Bybee’s claim (see 2.1.3)? If not, is sound change bidirectional or multidirectional? What is conditioning the directionality of sound change? With a similar methodology used in 5.1, below is a list of the changes in Sections 3-4, based on the criteria of lenitive, fortifying, bidirectional or without an obvious direction / multidirectional:

- **Lenitive**: apocope and merge of codas (3.2), dentilabialization (3.3), spirantization, debuccalization and lateralization (3.5), loss of medials (3.4, 4.4), retroflex free variation (4.2), syllabic nasals (4.5), diminutives (4.6)
- **Fortifying**: obstruent devoicing (3.1), 高頂出位 extra-raising (3.7), lexical diffusions of the 唯 and 容 series (4.1), phono-semantic dissimilation (4.3)
- **Bidirectional**: /hʷ-xʷ/ - /l/ free variation (4.2), /l/ and /n/ free variation (4.2)
- **Without an obvious direction / multidirectional**: merge and split of postalveolar consonants (3.4), MH-HK consonantal chain (3.7), GB-BJ vowel chain (3.7), OC
consonant split (4.4), tone merges and tone splits (4.7), tone value reflexes (4.7), tone sandhi in GJ-DL (4.7)

Because all these changes are significant and representative examples of Chinese historical phonology, the result is very astounding that lenitive changes does not have a majority at all, while there are a lot of changes whose directions (on the fortis-lenis axis) are unclear or fluctuating. Take one of the chain shifts – the chain shift of MH-HK consonants – as an example: with the formula /tsʰ/ → /s/ (with partial addition of /ts/, not before the -/i/- medial) → /t/ → /ɗ/, its direction shifts midway and becomes unclear: its first step /tsʰ/ → /s/ is lenitive for sure (compare the spirantization examples in 3.5), but the immediate next step /s/ or /tsʰ/ → /t/ is a strong fortition since stops are the “strongest” consonants due to a maximum closure; and what about the next step /t/ → /ɗ/? Through the lens of voicing, /t/ is a comparative fortis and /ɗ/ is a lenis, but its implosive articulation leaves room for a second discussion since implosives are inherently difficult to articulate because they require a mixture of glottal ingressive and pulmonic egressive airstream mechanisms, leading to its existence of a mere 13% in all the world’s languages (Maddieson 2008). Therefore, this chain would be definitely marked “complicated” regarding the weakening or strengthening of sounds because sound change is not mathematics and cannot be precisely quantifiable. The non-majority of lenition and the strong examples of fortition lead to an inevitable doubt with regards to the unidirectionality hypothesis (of lenition) and the 3.4% data of fortition in the Allophon database.

Furthermore, the dynamic equilibrium of a whole phonological system is also
salient, and unidirectionality cannot lead to a balanced system: if most sound changes incline towards lenition, segments like /p/, /t/, /k/ and most vowels (except the schwa, possibly) should have lost productivity into the future generations long before today since a single lenitive change like frictivization usually take only a few centuries or even less; but so far /p/, /t/ and /k/ are still the most common segments throughout all the languages, which is a direct rebuttal of the lenitive claim. The continuous existence of fortifying changes is especially significant to keep the balance of phonology as a contrastive system (parallel to lexical diffusion) – if all lenitive gestures cause merges and final elision of segments, there would be little to no contrast, insufficient for the connection between sounds and meanings.

However, a possible suggestion of a “circle of lenition” can be like Figure 15 (an exaggeration according to related ideas in Shevelov 1969):

![Figure 15: “Circle of lenition”](image)

The circle seems true at the first glance that both the reconstructions of OC (Stage C) and Old Slavic (Stage B) fits right into the picture, with modern Chinese in
the process of Stage A to Stage B as well. However, it does not comply to the conservation of the system: if the majority of vowels were to be elided in the process of B to C, there should be little to no vowels in Stage C, only consonants, which is far from true in modern Slavic languages – there must be some new vowel phonemes generated in the process. That explains the necessity of innovations in languages: if expanded, the extra high rising tone 46 in Y-XY (4.6) can well be the start of the next tone split, with its own set of syllables rather than obtaining them through an allophonic morphophonological change. Also in certain changes there would be recurrence of a particular segment, like the regeneration of Group /ᵝ/ in Mandarin (3.4) and the loop from /a/ to /i/ back to /a/ through diphthongization (3.7, Figure 10), which fulfills the requirement of a systematic equilibrium since the net level of contrast should be relatively stable. Although not all sound changes behave in completely closed loops, it is safe to conclude that sound change is far from a unidirectional process, given the amount of reasons contributing to different kinds of sound change (5.1); although fortition, loops, free variations and other non-lenitive changes may seem few in quantity, their functions establish their inevitable position throughout phonological history, and they would persist to exist in the foreseeable future.

5.3. Conservative or innovative? – Society, geography and language change

Throughout the previous sections, the terms “conservative” or “innovative” are
used to describe certain sound changes in certain varieties, where “conservative” means the retention of original characteristics and “innovative” means that (multiple) big changes cause the system to drift away from the previous sound structures. A common misconception about the Chinese languages is that the farther south it gets, the more conservative a dialect would be – which has true elements in it (e.g. regarding the retention of plosive codas), but the statement is easily overturned by the fact that varieties like the developing of the unique consonantal chain shift in MH-HK and the large-scale loss of medials in Y-GZ, both of which are rather innovative. Therefore, the follow-up questions would be: how do some dialects remain conservative while others dialects are changing radically? Apart from pure phonetic factors, what are the other forces and how do they drive sound changes, or language change in general?

The society plays a great role in shaping every form and shape of Chinese languages. There have long been regulations for which kind of language could/should be used throughout history: for example, 韻書 rime books themselves served as a tool for the standardization of language in that the upper-class elites and the intellectuals must adopt those specific forms of pronunciations in order to maintain their social status and better navigate among groups of people. Modern examples of societal language regulation include organizations like L’Académie française and Asociación de Academias de la Lengua Española – two authoritative entities that regulate the French and Spanish languages in every way, including pronunciation, spelling and grammar, all specified in the dictionaries they have published. Chinese
language (Standard Mandarin) has split standards by nationalities, with the most prominent 国家语言文字工作委员会 “State Language and Orthography Commission” in Mainland China, which pinpoints details of every aspect of Standard Mandarin including pronunciation – and its standard changes nuancedly with every update. These forms of standardized languages coined by the institutions cannot be separated from a high socioeconomic status, since only if a person has access to training resources to master these prescriptive rules do their language appear standardized, hence the stigmatization of “dialects”, or unstandardized language varieties (see 2.3.1). More specifically, most users of Chinese varieties live in diglossia since the only official language in Mainland China is Standard Mandarin (apart from Standard Cantonese in Hong Kong and Macau) – therefore, all public media use Standard Mandarin as the only language medium to operate, and it is an essential skill for almost all careers. The schools use Standard Mandarin in its entirety, and there were even punishments if students speak their local languages in 1980s-1990s in various cities like Shanghai and Guangzhou which accelerates the active disuse of non-standard varieties. Of the people using the local varieties, codeswitching causes the phonology of Standard Mandarin to permeate into the local variety unconsciously, creating unstable pidgins with either variety on the top or bottom layer. This process is largely unidirectional due to the government’s centralist language policies, causing the gradual disintegration of the local phonological systems. This sound change, or language change, is very unprecedented in history because we are now in the technological era with more and more people gaining
access to such language standardization projects, and the difference between standard and nonstandard varieties are very clear due to the spread of mass media, so language change happens in a faster rate, usually between generations. For instance, an example of a synchronic sound change is the lexically selected reclamation of retroflex initials in varieties like GJ-DL and GH-YZ: these varieties originally had a different way of distinction with regards to alveolar and postalveolar sibilants (Groups ɦʂ/, ɦs/ and ɦɕ/) from Standard Mandarin, with more characters falling into Group ɦs/ and Group ɦɕ/ respectively (e.g. 站 GB-BJ/Standard Mandarin [tɕan⁵¹], GJ-DL [tɕɛ̄⁵²], GH-YZ [tɕiɛ̄⁵⁵]), but in the new generation, these characters exhibit a clear influence from Standard Mandarin, with the pronunciation of 站 all turning into a [tʂ] initial, which did not even exist as a phoneme in GH-YZ fifty years ago. These changes are arguably the most penetrative ones in modern phonological history after early 20th century because of the establishment of standards and the strong positive associations with them – this language hierarchy is the principal factor for the ongoing internal homogenization of Chinese languages.

Furthermore, the Chinese languages are very sensitive to orthographical changes and pronunciation although the orthography is considered largely logographic: the uniqueness of Chinese languages with drastically different pronunciations sharing a common writing system date from a single edict from Qin Shi Huang 秦始皇 (lit. the first Emperor of Qin) in 221BC – he unified the various writing systems in previous six kingdoms with a single standard script, the small seal 小篆 script. This change had an indirect yet profound effect on the phonological history of Chinese
because it reorganized some of the original characters using a standard akin to Warring State Qin Kingdom, causing redistributions and potential mismatches of the characters’ pronunciations within OC phonological series\(^7\): therefore, the study of OC and the reconstruction of the phonological series should not depend on modern day traditional characters, but a combination of all variants of philological orthography in order to be more precise. A similar move is the modern simplification of characters in Mainland China, which also indirectly causes some confusion of the phonological series: for example, the orthography of the 畽 series are 欢-权-罐-灌-獾 [simplified] and 歡-權-罐-灌-獾 [traditional] respectively, with traditional showing an advantage during reconstruction because all characters have the same corresponding phonetic component 畫, with simplified characters 欢 and 权 with transplanted 又 (MC */fiuə/) which is totally irrelevant to the -/uan/ rhyme shared by this series. In the future, the pronunciation of 欢 and 权 may go through reanalysis into the 又 phonological series, and their pronunciation may change analogically, which might be considered a highly innovative change synchronically, but it would be totally explicable based on the new orthography.  

Throughout the ages, language contact between varieties is the main determinant of the formation of dialect groups – a golden rule would be that less contact of a language community with the outside world means more innovations and uniqueness of its dialect. This thesis argues that there are no solely “conservative” or “innovative” dialects because the difference is often featural and limited to a particular sound

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\(^7\) Qin dynasty is considered a later stage of OC, or the transferring into EMC.
change. MN-XM can be conservative in that it does not have labiodentalization (3.3), but it can also be innovative because it has a unique process of denasalization (3.6) – thus, the distinction between the two should be apply to a single feature at the micro-level, rather than the varieties as a whole.

Back in pre-industrial times, geography had a great role of the formation of major Chinese languages and language contact since the relative closeness of language communities depend highly on the development of transportation, which depends on the land topography – a wide river or a high mountain chain can easily block the connection of communities on both sides, and the small remote valleys or seaside villages can be fertile grounds of linguistic diversity. Take the dividing line of Mandarin and non-Mandarin varieties in southern China (Figure 16) as an example:
Firstly, this line is intrinsically fuzzy because some varieties at the border exhibits traits from both sides, forming a dialect continuum, so any form of classification would violate some rules and do some injustice; secondly, there are dialect islands in both sides belonging to each other, so this line is far from a perfect description of the real situation. However, some correspondence can still be established, especially the closeness of the eastern side of this line to 長江 Yangtze River. Without permanent bridges on the river until late Qing dynasty (19th century), the two sides are naturally blocked from each other by ways of land transportations, with only a limited amount of water transportations available. Therefore, the separation caused people on both sides to develop their own divergent regional traits, with the spread of Mandarin dialects up to the northern bank due to the plain topography, and Wu, Gan, Xiang taking up the land south of the river from their respective centers down south. Furthermore, the dissimilation of Min languages from each other can also be well explained through history and geography: the first wave of Sinitic people immigrated to Fujian and its neighboring areas from 308AD along with the Chinese language – a large amount of time throughout the 1810 years, the mountainous terrain in the area effectively blocks the communication between villages and towns, so each valley was essentially their own geographical unit with a bare minimum of contact with the outside world, speaking their own variety of Min language with independent sound changes. Oppositely, the south of Hunan province has a gap between Xiang and Yue filled with Mandarin due to the previous Mandarinization of northern Guangxi Province, including the administrative center Guilin – later many Guilin natives were
relocated into the Chenzhou area in southern Hunan, substituting the urban population to Mandarin speakers, with local 韶州土話 Shaozhou Tuhua (a variety yet to be classified) limited to rural areas and home usage. However, as previously mentioned, the influence of natural geography is going through a significant decrease, thanks to the increased accessibility of transportation and informations about other language varieties (e.g. online), and the fluidity of population brings us to the next section – a discussion on immigration and linguistic layering.

5.4. One sound or many? – Literal and colloquial readings

Language contact brings upon a noteworthy phenomenon in the Sinitic family, which is 文白異讀, the literal and colloquial readings of characters. It is true that most Chinese characters only have one pronunciation in a given variety, but sometimes they can have multiple pronunciations based on the semantic formality of the word they are in. This phenomenon is a fossilization of linguistic layering and substrata through the development of language because the pronunciations usually come from immigration and population exchanges from different origins and different time periods. All Chinese varieties exhibit this phenomenon to varying degrees – the extensiveness and diversity of pronunciations testify the length and complexity of the overall phonological history of a particular variety. Table 20 provides some examples from various varieties (Wang 1956, Qian 2003, Wang 2006):
<table>
<thead>
<tr>
<th>Variety</th>
<th>Character</th>
<th>*MC</th>
<th>Literary reading and example</th>
<th>Colloquial reading and example</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB-BJ</td>
<td>薄</td>
<td>bʷak</td>
<td>[pwɔ³⁵] in 薄情 (merciless)</td>
<td>[pao³⁵] in 厚薄 (thickness)</td>
</tr>
<tr>
<td></td>
<td>給</td>
<td>kuip</td>
<td>[ʨei²¹¹] in 給予 (supply/provide)</td>
<td>[ker²¹¹] to give</td>
</tr>
<tr>
<td></td>
<td>色</td>
<td>ŝik</td>
<td>[sy⁵¹] in 色彩 (color, flavor)</td>
<td>[ʂai²¹¹] in 顏色 (color)</td>
</tr>
<tr>
<td></td>
<td>露</td>
<td>luo</td>
<td>[lu⁵¹] in 露天 (outdoors)</td>
<td>[lou⁵¹] in 露面 (appear, show up)</td>
</tr>
<tr>
<td></td>
<td>熟</td>
<td>dʑiuk</td>
<td>[ʂu³⁵] in 成熟 (mature)</td>
<td>[ʂou³⁵] in 成熟 (ripe)</td>
</tr>
<tr>
<td>Y-GZ</td>
<td>精</td>
<td>ʨiɛŋ</td>
<td>[ʨiŋ⁵⁵] in 精神 (spirit)</td>
<td>[ʨiŋ⁵⁵] (clever)</td>
</tr>
<tr>
<td></td>
<td>生</td>
<td>ʂuaŋ</td>
<td>[ceŋ⁵⁵] in 生命 (life)</td>
<td>[ceŋ⁵⁵] (raw)</td>
</tr>
<tr>
<td>H-HY</td>
<td>肥</td>
<td>bʷiːi</td>
<td>[fui²⁴] in 肥沃 (fertile)</td>
<td>[pʰui²⁴] (fat)</td>
</tr>
<tr>
<td></td>
<td>惜</td>
<td>siɛk</td>
<td>[sit³] in 珍惜 (cherish)</td>
<td>[siak³] (love dearly)</td>
</tr>
<tr>
<td>W-SH</td>
<td>人</td>
<td>ŋiŋ</td>
<td>[zaŋ] in 人民 (people)</td>
<td>[ŋiŋ] in 大人 (adult)</td>
</tr>
<tr>
<td></td>
<td>畢</td>
<td>miut</td>
<td>[vəʔ] in 事物 (thing)</td>
<td>[məʔ] in 物事 (thing)</td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>MN-XM</td>
<td>學</td>
<td>ɦɯɔk</td>
<td>[ha̰k̚] in 大學 (university)</td>
<td>[ʔɤ̚5] (learn/study)</td>
</tr>
<tr>
<td></td>
<td>成</td>
<td>ɕiŋ</td>
<td>[ɕiŋ^24] in 成功 (success)</td>
<td>[tɕi^24] (approximately)</td>
</tr>
<tr>
<td></td>
<td>ㄆ</td>
<td>liuŋ</td>
<td>[liuŋ^53] in 兩難 (dilemma)</td>
<td>[ȵ^33] (number 2)</td>
</tr>
</tbody>
</table>

Table 20: Literal and colloquial readings of characters in different varieties

Through the examination of the table, several observations can be made. Firstly, the “literal” readings are newer in the strata order compared to “colloquial readings”: compare the two pronunciations of H-HK 肥 and W-SH 人/物, it is clear that labiodentalization (3.3) and /j/-frication (3.6) affected the literal readings with [f], [v] and [z] initials but not the colloquial ones retaining the bilabial and nasal initials. Secondly, the colloquial readings reflect more local phonology compared to the literal readings: in MN-XM, nasalized vowels and [ʔ] codas never show up in literal pronunciations due to the fact that it was the approximation of a certain historical Mandarin which would not use those segments; the diphthongization of vowels in GB-BJ is another good example as a type of local 高頂出位 (extra-raising) development (see 3.7, Zhu 2004-2005) – it reflects the local phonology of favoring diphthongs and triphthongs (a corresponding change would be the synchronic
diphthongization of /ɤ/ into [ɯɤ] or [ɯə]). Thirdly, the semantic distinction between “literal” and “colloquial” is more or less lexicalized and deemphasized in some words, while others evolve into a mere indicator of formality for the exact same morpheme(s): compare GB-BJ 色彩 and 颜色 (both “color”) which is usually on the same level of formality with different pronunciations, and W-SH 人民 (people) and 大人 (adult) which are among the most common words in a language; however, the same morphemes with only position difference (物事 vs. 事物) or no difference at all (成熟) sometimes have two different pronunciations just to indicate formality – therefore this development is bidirectional in nature. Lastly, the abundance of this phenomenon and the three (or more, not exemplified here) readings of a single character in MN-XM suggesting a complicated phonological history with more substrata underneath: deducing the origins of different readings from different time periods can help a lot, not only with the history of immigration, but also with the reconstruction of earlier languages (like OC and Proto-Min). For example, the colloquial readings in Y-GZ has the same vowels with *MC, indicating that it branched off right around the time of Guangyun phonology, while for MN-XM it is the right opposite that literal readings line up more closely with *MC, suggesting an even earlier strata of Proto-Min with nasalized vowels. Through comparative linguistics and semantic analysis, more and more instances of literal and colloquial readings are studied to provide more insights for the specific phonetic values of dialects in the past, and also the reconstruction of OC.
6. Conclusion

With a combination of methodologies from Western and Chinese traditional historical linguistics, this thesis is an attempt to survey and synthetically analyze the major sound changes in Chinese phonological history. It also addresses two related hypotheses – the Neogrammarian regularity hypothesis and the unidirectionality hypothesis – and tries to question their validity and applicability using real examples. By the act of dividing the changes into seemingly two firm categories of “regular” and “irregular” changes, the thesis argues that the reasons or impetuses of sound change should be more valued in the future research of historical linguistics rather than the “regular” and “irregular” dichotomy. Throughout Sections 3 and 4, there are many times that a “regular” change evolves into an “irregular” one and vice versa (e.g. chain shifts [3.7]), as well as a synchronically irregular change happens to be a component of a large-scale diachronic “regular” change (e.g. free variations [4.2]) – all these linguistic phenomena show that the categories of “regularity” and “irregularity” is not that significant, and the Neogrammarian hypothesis should not be the ultimate and only guideline in the field of historical phonology. Similarly, the unidirectionality hypothesis has various counterexamples – the most prominent one being fortition (3.6), chain shifts (3.7) and tone sandhi (4.7) – to prove that a linguistic system would lose its function if lenition keeps reducing contrasts, that they must restore the system with multidirectional changes and changes in the opposite direction. Statistically fortifying changes are less in number, but that does not indicate that they are not as important or should not be treated equally during the research – these
surface “anomalies” are extremely valuable resources on the way of solving the questions regarding the origins of sound change. Moreover, sound changes are not just phonetics and phonology: it involves many other factors like politics, geography, language contact and linguistic layering – it serves as a reminder that the whole picture is extraordinarily broad, and sound changes cannot be thoroughly studied and explained with the comparative method or phonetic and phonological principles only – they require a large amount of interdisciplinary knowledge and effort in order to fully understand the nuances of a seemingly simple change, and the detailed study of such small changes can sometimes lead to new conclusions and new theories applicable to many other areas of phonetics, phonology and historical linguistics.

This thesis is far from an exhaustive or comprehensive piece of work – due to its mostly theoretical framework and the relatively small data sample, the analyses and the conclusions may still be negotiable given a larger database or a more empirical approach; however, due to inaccessibility and unavailability of resources, this thesis does not integrate phonetic analyses and fieldwork data, so it is less an actual guide to the specifics of the sound changes (because of the width of topics it is unable to fully focus on a specific one and getting deeper into the every aspect of each change) but more like an exploration of the topic and a critique of the western-dominant field of historical linguistics in general: historical linguistics is historical because it is created by man, and the human-language and human-human interactions are also an integral part of linguistics, just like theories, models and hypotheses. Therefore, historical sociolinguistics, as a relatively new field, would be a bright prospect and a new start.
of historical linguistics, as we are living in this rapidly changing society with countless interactions between people. For example, the North American Research Network in Historical Sociolinguistics (NARNiHS) launched its first meeting at the LSA Summer Institute in July 2017 and it will hold a meeting in 2019 again – similar organizations dedicating to this field are also emerging in Europe. Therefore, I sincerely hope that Sinologists and linguistics working on Chinese languages can grasp this chance and do more interdisciplinary research.

Going back to the field of historical Chinese phonology, future research should focus more on tones and its associative sound changes, whether synchronic or diachronic – especially the study of tone sandhi, including its formation and the driving forces behind, is still very underdeveloped. More phonetic methods and advanced technology should be applied to better explain the synchronic situations and diachronic trajectories of tone sandhis as a relatively unique phenomenon. Similarly, the reconstruction of OC is also a very miscellaneous and interdisciplinary field: the study of phonological series involves philology, literature study and possibly archaeology, while the study on other areas like tonogenesis, consonant cluster hypothesis and the study of 詩經 Shijing (lit. Classic of Poetry, the most ancient poetry collection in Chinese) rimes are either barely even started or not reaching a consensus among scholars – e.g. Zhengzhang-Pan’s reconstruction of OC is controversial in many aspects, without sufficient integration and knowledge from other disciplines because it is largely based on the proposed phonological series whose real properties are still largely uncovered and understudied – a joined research
of experts in paleography and historical linguists would be much more helpful rather than a pure theoretical approach, and making the best use of unique available historical/archeological records is also crucial in the reconstruction of ancient Chinese language that date thousands of years ago.

In conclusion, sound change is a perpetual subject of study in historical linguistics, while linguists have only discovered the tip of an iceberg regarding the exceptional diversity within Sinitic family – given the significance of Chinese historical phonology both in the study of synchronic and diachronic linguistics, there should be more work and new approaches dedicated to this topic in the future, and I hope that this thesis and my potential future research can contribute to the better understanding of Chinese language, historical phonology, and human languages as a whole.
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