Consonant clusters

Yunfan Lai

Consonant Clusters in Chinese

<<PLEASE PROVIDE ABSTRACT, KEY WORDS AND INDEX TERMS>>

1. Introduction

Consonant clusters like *pr-, *sn- and *-ks are postulated by various scholars for →Old Chinese (OC). The debate about their existence and inventory runs through the modern history of Chinese historical phonology and remains the most thorny and interesting aspect of the field. In recent reconstruction systems of OC, rhymes are mostly identical (given notational differences), while initials differ in a wide variety of ways, between clusters and singletons and especially between different cluster types (see Table 1). A reliable reconstruction of OC is immensely valuable in different fields of study, from ancient Chinese textual interpretation to the identification of Eurasian proper names in Chinese-language historical sources, let alone for an understanding of the history of the Chinese language and for the reconstruction of Proto-Sino-Tibetan and other language families. Yet largely because of uncertainty about the nature of consonant clusters, OC reconstructions are not yet reliable enough to serve these purposes.

Reconstructions of →Middle Chinese (MC) have no consonant clusters, nor do most contemporary →Chinese dialects. Exceptions are always shown to be secondary: Píngdìng 平定 (a Jìn 晋 dialect, Xú 1981; Wáng Hóngjūn 1994) /˨tsɭɤŋ/ 'today' comes from rhotacization (*érhuà* 兒化) (cognate to Běijīng Mandarin *jīnr* 今兒); for Qīngyī Miáo 青衣苗 Chinese (a Xiāng 湘 dialect, Lǐ Lán 2004), /ˢklu/ 'early' in the Fúróng 芙蓉 variety corresponds to affricate /ˢtlu/, /ˢtsu/ in other varieties (cognate to Standard Mandarin *zǎo* 早). In contrast, other Sino-Tibetan languages often show a richer syllable structure, like Khroskyabs (rGyalrongic) /ʁɴzbrɑ˥˥/ 'dare' or Classical Tibetan *bsgrigs* 'arrange, fix (past stem)'. Although Proto-Sino-Tibetan is yet to be reconstructed in detail, it clearly had consonant clusters like *sn-: Zbu Rgyalrong (rGyalrongic) /kə-snɑz˥˧/ 'seven' corresponds to Burmese *khu.n̥ac* and Kinnauri (Bodic) /stiʃ/; Zbu Rgyalrong /tə-sɲəv˥˧/ 'nasal mucus' to Burmese *n̥ap*, Kinnauri /stəmti/ and Tibetan *snabs*. As the Sino-Tibetan →origin of Chinese is hardly in doubt, some linguistic system ancestral to MC must have once had consonant clusters. However, some scholars reconstruct consonant clusters within OC, while others consider that the syllable structure of OC had already been reduced to something essentially identical to that of modern Chinese.

Influential recent systems of reconstructed OC include those of Li Fang-kuei (1971, 1976) later revised by Gong (1990, 1993, 1994, 2005), Wáng Lì (1958, 1987) later revised by Guō (2010), Starostin (1989), Zhèngzhāng (2003, 2013) and Pān (2000), Baxter (1992), Schuessler (2009), and Baxter and Sagart (2014). All contain consonant clusters, except Wáng Lì's system, which remains to this day the version taught to mainland Chinese undergraduates.

In this article, we will mostly use the →Baxter-Sagart system to illustrate recent OC reconstructions. Chinese words are transcribed in MC, with added asterisks, using Baxter's MC transcription, which we adapt into IPA and annotate with MC division (*děng* 等) numbers (see below) in roman-numeral subscript to facilitate discussion. The presence of these subscript numbers enables MC reconstructed forms to be readily distinguished from OC reconstructed forms.

2. Final Clusters in Old Chinese

We briefly discuss final clusters before confining the scope of the remainder of this article to initial clusters. Following a hypothesis first propounded by André-Georges Haudricourt (1954a,

1954b), it is generally accepted that MC →tonal distinctions come from lost codas: *shǎng* 上 (*-X) <*-ʔ, *qù* 去 (*-H) <*-s. This hypothesis entails OC *-Nʔ and *-Ns for syllables with a nasal coda in MC. Scholars also reconstruct *-ks, *-(N)ʔs > *-H; *-ps, *-ts > *-jH to explain, among other things, derived *qù*-toned forms, reconstructed with an OC suffix *-s with several functions: *wù* 惡 *uH$_{|}$ < *ʔˤas < OC *ʔˤak-s 'hate (v.)', cf. *è* 惡 *ak$_{|}$ < OC *ʔˤak 'bad'; *nèi* 內 *nwʌjH$_{|}$ < *nˤuts < OC *nˤ[u]p-s 'inside', cf. *nà* 內 (later 納) *nʌp$_{|}$ < OC *nˤ[u]p 'bring in'.

3. Reconstructing Initial Clusters Using xiéshēng

Consider the character *mái* 霾 *mɛj$_{||}$ 'dust storm'. In *Shuōwén Jiězì* 說文解字, a 2nd-century character dictionary, it is analyzed as a phono-semantic compound, with *lí* 貍 *li$_{|||}$ 'a kind of wild cat' functioning as a phonetic element. To a speaker of Middle or later Chinese, it is hard to understand how *li$_{|||}$ could indicate the pronunciation of *mɛj$_{||}$.

We can conjecture that the two words had more similar pronunciations during the formative centuries of the Chinese script. This does seem to be the case for the vowels: both words are attested in the *Book of Odes*, where they transitively rhyme with each other. This reflects a general principle formulated by Duàn Yùcái 段玉裁, in his *Liùshū Yīnjūnbiǎo* 六書音均表 (1776), as *tóngshēng bì tóngbù* 同聲必同部 'characters sharing a phonetic element must be in the same (OC) rhyming category'. Modern reconstructions of OC have *-ə for both words.

As for the initials, we could propose MC *m- in *mái* 霾 as originating in a consonant cluster *ml- that later simplified to *m-. A character like *lí* 貍 pronounced OC *lə would be judged good enough by literate speakers of OC as phonetic element to write *mlə. We have now a hypothesis where an OC initial cluster *ml- explains a graphic connection between MC *m- and *l-, a connection seen also in other sets of words written with the same phonetic element; such sets are called →*xiéshēng* 諧聲 series. (See Table 1 for different modern reconstructions for *mái* 霾).

This line of thinking underlies early hypotheses that postulate initial consonant clusters in OC, starting with Gabelentz (1881), who conjectured a *kl- to explain the particularly common MC *k-/*l- connection. Maspero (1920) and Karlgren (1923) in Europe, as well as Lín (1924) and Chén (1937) in China all argued for initial clusters in OC to account for a range of phenomena centered on *xiéshēng* connections.

The most influential among early proponents of OC initial clusters was Bernhard Karlgren, who, in his later works, notably *Grammata Serica Recensa* (1957), reconstructed 19 initial clusters like *kl-, *xm-, *sn-, and *k^{h}s-, corresponding to various *xiéshēng* connection patterns. Karlgren's approach, probably influenced by Maspero (1920, 1930), can be termed "consonant stacking": he reconstructed OC *AB- for a *xiéshēng* connection between MC onsets *A- and *B-. A *xiéshēng* connection is explained as either (1) OC *AB- > MC *A-, OC *B- > MC *B-, or (2) OC *AB- > MC *B-, OC *A- > MC *A-.

A theory explaining patterns of *xiéshēng* connections with clusters is actually a bundle of three theories: a proto-phonology of OC, a theory of cluster simplification between Old and MC, and a theory on the workings of the Chinese script. Karlgren reconstructed only *AB- clusters with rising sonority (*bl-, *sn- and *k^{h}s-, but not *lb- or *sk^h); most of his OC *AB- clusters simplified to *A- in MC, except for *bl-, *gl- > MC *l-. A *xiéshēng* series with *AB- can include words with both *A- and *B-.

Consonant stacking was the first systematic method in the reconstruction of OC initial clusters. Perceived as synonymous with the hypothesis of initial clusters in OC, Karlgren's methodology invited widespread criticism, especially among Chinese scholars, starting with epigrapher Táng

(1937, 1949:35–46). According to Wáng Lì's influential criticism (1958:68, 1987:32–34), Karlgren cherry-picked his *xiéshēng* patterns. If Karlgren had applied his reconstruction method consistently, the OC onset system would be full of bizarre stacked clusters like *ɕŋ- or *kʰʈʰ- and would lose all phonological systematicity.

In general, there was a widespread sentiment that *xiéshēng* was too shaky a ground on which to base the existence of clusters. This view was upended by the *-r- hypothesis, to be discussed in Section 4, which demonstrated the reliability of *xiéshēng* evidence through corroboration by a wealth of other evidence. Apart from *Cr- clusters, *sC- clusters are now also reconstructed by most scholars, and will be discussed in Section 5.

4. *CR- CLUSTERS

MC *l- has *xiéshēng* connections with a wide variety of onsets, for which Karlgren reconstructed *Cl- clusters. Every rhyme in the →MC phonological system belongs to a division (*děng*): I, II, III(a/b) or IV, a distinction whose nature remains controversial today but which most scholars believe was related to vowel quality and medial glides. The first definite breakthrough on OC clusters was made by Yakhontov (1960), who noticed that, in a *xiéshēng* series containing MC *l- and a non-lateral initial *C-, *C- frequently occur in Division-II syllables, while *l- often correlates with Division I. For example, the phonetic element *jiān* 監 *kæm$_{II}$ 'inspect' occurs in *jiàn* 鑑 *kæmH$_{II}$ 'mirror', *lán* 藍 *lam$_{I}$ 'indigo' and *làn* 濫 *lamH$_{I}$ 'excess'. Moreover, *læm$_{II}$* is not a possible MC syllable. Accordingly, Yakhontov reconstructed OC *Cl- clusters as the origin of Division II vocalism: MC *kæm$_{II}$ < OC *klam. OC *lam stayed MC *lam$_{I}$, whence the absence of *læm$_{II}$*.

Yakhontov's *Cl- is revised to *Cr- in later treatments. With important contributions by Pulleyblank (1962) and Li Fang-Kuei (1970), scholars gradually converged on a set of hypotheses, collectively dubbed the *-r- hypothesis:

1. Division II syllables, unlike Division I or IV, come from OC *Cr-: compare *bái* 白 *bæk$_{II}$ < *bˢrak 'white' and *bó* 泊 *bak$_{I}$ < *[b]ˢak 'calm';

2. For the controversial →*chóngniǔ* rhymes, Division IIIb syllables (*chóngniǔ sānděng* 重紐三等) had OC *-r-, while Division IIIa (*chóngniǔ sìděng* 重紐四等) did not: compare *mì* 密 *mit$_{IIIb}$ < *mri[t] 'dense' and *mì* 蜜 *mjit$_{IIIa}$ < *mit 'honey';

3. MC retroflex initials, non-existent in Divisions I and IV, come from *T(S)r- clusters: *zhī* 知 *ʈie$_{III}$ < *tre 'know', *zhāi* 齋 *ʈʂɛj$_{II}$ < *tsˢr[ə]j 'purify oneself'.

The reconstruction of OC *-r- proved a unifying element that gave a parsimonious explanation for a range of phenomena in Chinese historical phonology. The hypothesis is also supported by Sino-Tibetan cognates: *bā* 八 *pɛt$_{II}$ < *pˢret 'eight' and *bǎi* 百 *pæk$_{II}$ < *pˢrak 'hundred' to Tibetan *brgyad* and *brgya* respectively (both from earlier *brj- as per Li Fang-Kuei's law: Tibetan *rgy-* < *rj-), *pí* 羆 *pie$_{IIIb}$ < *praj 'brown bear' to Zbu Rgyalrong /prɑʔ^{55}/, *shī* 蝨 *ʂit$_{III}$ < *srik 'louse' to Japhug Rgyalrong /zrɯɣ/, and by Wanderwörter of Greater Southeast Asia, notably *jiāng* 江 *kæwŋ$_{II}$ < *kˢroŋ 'river, Yangtze' to Thai คลอง /kʰlɔɔŋ^{33}/ 'canal' and Thổ (Vietic) /kʰrɔŋ^{1}/ 'river'. Finally, it is supported by regular alternations that suggest a causative infix *<r>, cf. *zhì* 至 *tɕijH$_{III}$ < *ti[t]-s 'to arrive' and *zhì* 致 *ʈijH$_{III}$ < *t<r>i[t]-s 'to send', between *chū* 出 *tɕʰwit$_{III}$ < *t-kʰut 'to go out' and *chù* 黜 ʈʰwit$_{III}$ < *t-kʰ<r>ut 'to expel'.

An important hypothesis that started with Coblin (1986) suggests that coronal *T(S)r- clusters reconstructed in (3), rare in other Sino-Tibetan languages, should be revised to *rT(S)-. For

example, *zhuàng* 撞 ɖæwŋH$_{||}$, *N-tʿroŋ-s 'strike' in the Baxter-Sagart system, would be revised to *r-N-tʿoŋ-s and compared with Tibetan *rdung* < *rⁿd- 'strike, pound'.

Apart from *Cr-, many scholars have also reconstructed *Cl-, where *-l- disappeared in MC without trace. The word *gè* 各 *kak$_{|}$ 'each' in the same *xiéshēng* category as 落 lak$_{|}$ 'fall' is reconstructed by Zhèngzhāng (2003) as *klaːg in contrast to *gé* 格 *kæk$_{||}$ 'go to' < *kraːg.

5. *sC- Clusters

Two different hypotheses reconstruct *s-sonorant clusters in OC for different lexical sets.

The first hypothesis postulates *s-sonorant clusters for the voiceless element in the *xiéshēng* connections *m-/*x(w)- (*měi* 每 *mwəjX$_{|}$ 'every' and *huǐ* 悔 *xwəjX$_{|}$ 'regret'), *ŋ-/*x- (*yí* 儀 *ŋie$_{|||b}$ 'ceremony' and *xī* 犧 *xie$_{|||b}$ 'sacrificial animal'), *n-/*th- (*nán* 難 *nan$_{|}$ 'difficult' and *tān* 灘 *than$_{|}$ 'foreshore'). In earlier studies (Maspero 1920, 1930, Karlgren 1957), these are reconstructed by consonant stacking, as *mx- (later *xm-), *xŋ- and *thn-. Yakhontov (1960) proposed that the prenasal element in Karlgren's *xm-, *thn- and *xŋ- should be unified into an archiphoneme, which comes from a common earlier *s-.

On the other hand, Li Fang-kuei (1935) and Tung (1948) analyzed the *m-/*x(w)- connection in terms of a voiceless sonorant *m̥- > *x(w)-. Pulleyblank (1962) extended their proposals and reconstructed not only *m̥-, *n̥- and *ŋ̥-, but also *l̥- (*r̥- in later reconstructions), for the *xiéshēng* connections *th-/*l-: *tǐ* 體 *thejX$_{|V}$ < *r̥ʿij ʔ 'body' and *lǐ* 禮 *lejX$_{|V}$ < *rʿij ʔ 'rites', as well as *θ- (*l̥- in later reconstructions) for *th-/*j-: *tōu* 偷 *thuw$_{|}$ < *l̥ʿo 'steal' and *yú* 俞 *ju$_{|||}$ < *lo 'yes'. Recent reconstructions mostly prefer the voiceless sonorant treatment.

The reconstruction of voiceless sonorants as above permitted clusters of the *sN- type to instead be postulated, following Li Fang-kuei (1971, 1976), for the *xiéshēng* connections between MC s- and N-. This is what we find in most recent reconstruction systems. The word *sāng* 喪 *saŋ$_{|}$ 'mourning', written with *máng* 亡 *mianŋ$_{|||}$ 'flee, die' as the phonetic component, is reconstructed with the cluster *sm-, which simplified to MC s-. Likewise for *xī* 西 *sej$_{|V}$ < *s-nʿər 'west', cf. *nǎi* 迺 *nəjX$_{|}$ 'then'; *xiè* 褻 *siet$_{|||}$ < *s-ŋet 'garment next to the body', cf. *yì* 槷 *ŋet$_{|V}$ 'pole'; *sì* 賜 *sieH$_{|||}$ < *s-lek-s 'bestow', cf. *yì* 易 *jeH$_{|||}$ < *lek-s 'easy'. As predicted by the *-r- hypothesis, *sr- gave MC ʂ-: *shǐ* 使 *ʂiX$_{|||}$ < *s-rəʔ 'send', cf. *lì* 吏 *liH$_{|||}$ < *[r]əʔ-s 'officer'.

OC *s-stop clusters likely existed, by a typological argument that *s-sonorant clusters imply *s-stop clusters (Goad 2011). However, competing hypotheses typically reconstruct *s-stop clusters in a more limited scope:

1. In his 1958 talk, Bodman first mentioned the possibility of a metathesis, or rather affrication, MC *ts- < OC *st-. This proposition was later elaborated in Pulleyblank (1962) and Bodman (1969), where they are extended to other stops: OC *sk-, *sp- are also reconstructed for MC *ts-.

2. A competing hypothesis, first proposed in Li Fang-kuei (1971), had OC *sk-, *st- simplifying to *s-.

3. Baxter and Sagart (2014) reconstructed a fricativizing effect for *s-, with OC *sts- > MC *s-, OC *st- > *stɕ- > MC *ɕ-.

Recent reconstructions agree on some clusters and differ on others (see Table 1 for some examples). This difficulty of reconstructing *s-stop clusters can be understood by analogy to Tibetan, where Old Tibetan *s-sonorant clusters show distinctive modern reflexes in most

modern dialects, while *s-stop clusters are distinguished from other cluster or simplex initials only under specific phonological environments, and only in some dialects.

The prefix /s-/ is a common causativizer in other Sino-Tibetan languages, so a transitivizing function is reconstructed for OC *s- in many systems. The Baxter-Sagart system, for example, has *shì* 示 *ʑijH$_{|||}$ < *s-dʑijs < *s-gijʔ-s 'show' derived from *shì* 視 *dʑijH$_{|||}$ < *gijʔ-s 'look, see'.

6. Methodological Advances and Future Directions

Xiéshēng still forms the primary justification of many clusters in recent reconstructions of OC. As is shown by Zhèngzhāng's (2003:121) reassessment of Wáng Lì's criticism, the treatment of *xiéshēng* evidence in recent reconstructions has made good progress since Karlgren's time. More systematic proto-phonologies, inspired by Old Tibetan or Austroasiatic languages, achieved a better coverage of *xiéshēng* patterns. Karlgren's hypothesis that *AB- almost always simplifies into *A- is replaced by less simplistic models. However, an upper limit exists to the amount of phonetic information that can be mined from *xiéshēng*. One problem is a lack of agreed-upon constraints: scholars have a great degree of freedom both in the choice of *xiéshēng* connections to explain by clustering and in the cluster reconstructions themselves. As an extreme example, scholars who work in Wáng Lì's tradition regard all cases of *k-/*l- connections as exceptional (Sūn 2005). Hence, hypotheses that integrate *xiéshēng* with other sources of evidence achieve a better explanatory power than those relying on *xiéshēng* interpretation alone like Karlgren's.

Other sources of evidence that have been used include: Sino-Tibetan comparanda, Chinese loanwords in languages of Mainland Southeast Asia, daughter languages apart from MC, and reconstructed Chinese morphology. They are used to corroborate hypotheses suggested by *xiéshēng* evidence, but also permit the discovery of clusters invisible from *xiéshēng* evidence.

Scholars like Karlgren (1923:31) and Wáng Lì (1987:19) hoped that (Greater) Sino-Tibetan comparison could settle problems concerning Chinese clusters. But Sino-Tibetan **<<XREF>>** genetic position of Chinese actually plays a limited role in recent constructions (Gong 1990 being a notable exception). The usual approach privileges one language, Old Tibetan, as the object of comparison, but this approach does not yield enough cognates for systematic comparison. Usually only one or two genuine cognates can be found corresponding to any given proposed OC cluster. As a result, conflicting hypotheses can often all be justified by the careful selection of one or two Tibetan comparanda. Broadening comparison to lesser-known Sino-Tibetan languages that preserve consonant clusters is one avenue for future research that remains promising.

Compared to Sino-Tibetan cognates, Chinese loanwords in Bai, Hmong-Mien, Kra-Dai and Austroasiatic are often more reliably identified and contain features that predate MC. Also, it is agreed that →Mǐn 閩 dialects of Chinese do not descend from MC and preserve some OC features. One highly convincing hypothesis in Baxter and Sagart (2014:163–165) combines evidence from Mǐn and loans in Southeast Asian languages. Proto-Mǐn is reconstructed by Norman (1973, 1974) with voiceless sonorants such as *lh- and *nh-. Chinese loans in other languages often have a stop prefix in cognate words: for example, *liù* 六 *liuwk$_{|||}$ 'six' (Proto-Mǐn *lh-) is borrowed as Proto-Hmong-Mien *kruk (Ratliff 2010) **<<NO RATLIFF 2010 IS LISTED IN THE BIBLIOGRAPHY, PLEASE REVISE>>** and Proto-Tai *krok^{D} (Pittayaporn 2009); *ròu* 肉 *ŋuwk$_{|||}$ 'meat' (Proto-Mǐn *nh-) is borrowed as /kŋuk^{7}/ in Pong (Vietic). Words with Proto-Min voiceless sonorants are therefore reconstructed by Baxter and Sagart as sonorants with preinitials: *k.ruk (distinguished from *kruk), *k.nuk.

A renewal of interest in OC morphological processes (Sagart 1999, Jīn 2006, Schuessler 2007

are some recent examples) has profoundly changed the nature of OC reconstruction. Reconstructed affixes like *-s, *<r> and *s- mutually support hypotheses concerning clusters *-Cs, *Cr- and *sC-. To take a recent example, the debate between the two hypotheses involving *sC- clusters mentioned before (Mei 2012, Sagart and Baxter 2012) crucially involves the nature and regularity of the morphological processes that are integrated with these hypotheses.

CONCLUSION

Disagreements about the reconstruction of OC clusters are apparent from Table 1, which provides reconstructions in six different systems.

Table 1. Comparison of OC reconstructions

Character and MC reconstruction	Karlgren	Wáng Lì	Li Fang-kuei	Zhèngzhāng	Pān	Baxter-Sagart
lí 貍 *li$_{\|\|\|}$ 'kind of wild cat'	*l̥iəg	*lĭə	[*ljəg]	*p·rɯ	*[g]rɯ	*p.rə
mái 霾 *mɛj$_{\|\|}$ 'dust storm'	*mlɛg	*meə	[*mrəg]	*mrɯː	*mgrɯɯ	*mˤrə
héi 黑 *xək$_{\|}$ 'black'	*χmək	*xĕk	*hmək	*hmlɯːg	*m̥hɯɯg	*m̥ˤək
mò 墨 *mək$_{\|}$ 'ink'	*mək	*mĕk	*mək	*mlɯːg	*mɯɯg	*C.mˤək
xū 戌 *swit$_{\|\|\|}$ 'eleventh earthly branch'	[*s̥iwĕt]	*sĭwĕt	[*smit]	*smid	*smig	*s.mi[t]
miè 滅 *mjiet$_{\|\|\|a}$ 'destroy'	*m̥iat	*mĭăt	*mjiat	*med	*med	*[m]et
jiàng 匠 *dzianH$_{\|\|\|}$ 'craftsman'	*dzˤi̯aŋ	*dzĭɑŋ	[*dzjaŋh]	*sbaŋs	*sbaŋs	*s.baŋ-s
zào 造 *tshauH$_{\|}$ 'go to'	*tsˤôg	*tsˤəu	*skhəgwh	*skʰuːgs	*skhuugs	*(mə)-tsʰˤuʔ-s
jiǔ 酒 *tsiuwX$_{\|\|\|}$ 'liquor'	*tsi̯ôg	*tsĭəu	*tsjəgwx	*ʔsluʔ	*skluʔ	*tsuʔ
jīng 莖 *ɣɛŋ$_{\|\|}$ 'stalk'	*gˤĕng	*ɣeŋ	[*griŋ]	*greːŋ	*greeŋ	*m-k-lˤ<r>eŋ

Note: Brackets mark extrapolated forms. For Wáng Lì, Pān, and Baxter-Sagart, forms are not taken from their respective monographs, but books or online resources with a more exhaustive coverage. Karlgren = Karlgren (1957), Wáng Lì = Guō (2010), Li Fang-Kuei = Li (1970, 1971), Zhèngzhāng = Zhèngzhāng (2013), Pān = Dōngfāng Yǔyánxué (2015), http://www.eastling.org/oc/oldage.aspx, Baxter-Sagart = Baxter and Sagart (2014), Version 1.1, http://ocbaxtersagart.lsait.lsa.umich.edu/.

Despite the inherent difficulty of reconstructing OC initial consonants given methodological and evidential constraints, there is reason to hope that improved understanding of OC morphology and judicious use of comparative data from Southeast Asian and Sino-Tibetan languages will drive significant improvements in future research into the reconstruction of OC and its consonant clusters.

PRIMARY SOURCES

Duàn Yùcái 段玉裁, *Liùshū yīnjūnbiǎo* 六書音均表, Fùshùn Guānxiè 富順官廨, 1776, reprinted in *Shuōwén Jiězì zhù* 說文解字注, Jīngyùnlóu 經韻樓, 1815.

REFERENCES

Baxter, William H., *A Handbook of Old Chinese Phonology*, Berlin: Walter de Gruyter, 1992.

Baxter, William H. and Laurent Sagart, *Old Chinese: A New Reconstruction*, Oxford: Oxford University Press, 2014.

Bodman, Nicholas, "Tibetan Sdud "Folds of a Garment", the Character 卒, and the *St-Hypothesis", *Bulletin of the Institute of History and Philology*, Academia Sinica 39, 1969, 327–345.

Chén Dúxiù 陳獨秀, "Zhōngguó gǔdài yǒu fùshēngmǔ shuō 中國古代有複聲母說" [On the existence of complex initials in Ancient China], *Dōngfāng zázhì* 東方雜誌, 1937, 20–21.

Coblin, South, *A Sinologist's Handlist of Sino-Tibetan Lexical Comparisons*, Monumenta Serica Monograph Series XVIII, Nettetal: Steyler, 1986.

Gabelentz, Georg von der, *Chinesische Grammatik, mit Ausschluss des niederen Stils und der heutigen Umgangssprache* **<<PLEASE PROVIDE TRANSLATION>>**, Leipzig: Weigel, 1881.

Goad, Heather, "The Representation of sC Clusters", in: Marc van Oostendorp, Colin Ewen, Elizabeth Hume and Keren Rice, eds., *The Blackwell Companion to Phonology,* Oxford: Blackwell, 2011, 898–923.

Gong Hwang-cherng 龔煌城, "Cóng Hànzàngyǔ de bǐjiào kàn Shànggǔ Hànyǔ ruògān shēngmǔ de nǐcè 從漢藏語的比較看上古漢語若干聲母的擬測", [Reconstruction of some initials in Archaic Chinese from the viewpoint of comparative Sino-Tibetan], *Xīzàng yánjiū lùnwénjí* 西藏研究論文集 3, 1990, 1–18.

Gong Hwang-cherng 龔煌城, "Cóng Hàn, Zàng yǔ de bǐjiào kàn Hànyǔ shànggǔyīn liúyīn yùnwěi de nǐcè 從漢、藏語的比較看漢語上古音流音韻尾的擬測" [Reconstruction of liquid codas in Old Chinese from the viewpoint of comparative Sino-Tibetan], *Xīzàng yánjiū lùnwénjí* 西藏研究論文集 4, 1993, 1–18.

Gong, Hwang-cherng, "The First Palatalization of Velars in Late Old Chinese", in: Matthew Y. Chen and Ovid J. L. Tzeng, eds., *In Honor of William S-Y. Wang: Interdisciplinary Studies on Language and Language Change*, Taipei: Pyramid Press, 1994, 131–142.

Gong Hwang-cherng 龔煌城, "Lǐ Fānggùi xiānshēng de shànggǔyīn xìtǒng 李方桂先生的上古音系統" [The phonological system of Old Chinese as reconstructed by Fang-kuei Li], in: Pang-Hsin Ting 丁邦新 and Anne O. Yue 余靄芹, eds., *Hànyǔshǐ yánjiū: jìniàn Lǐ Fānggùi xiānshēng bǎinián míngdàn lùnwénjí* (Yǔyán jì yǔyánxué zhuānkān wàibiān zhì'èr) 漢語史研究：紀念李方桂先生百年冥誕論文集 (語言暨語言學專刊外編之二) [Essays in Chinese historical linguistics: Festschrift in memory of professor Fang-Kuei Li on his centennial birthday (Language and Linguistics Monograph Series Number W-2)], Taipei 台北: Institute of Linguistics, Academia Sinica 中央研究院語言學研究所, Seattle: University of Washington, 2005, 57–93.

Guō Xīliáng 郭锡良, *Hànzì gǔyīn shǒucè (zēngdìngběn)* 汉字古音手册（增订本）[A handbook of historical pronunciation of Chinese characters (revised and expanded version)], Běijīng 北京: Shāngwù 商务印书馆, 2010.

Haudricourt, André-Georges, "De l'origine des tons en vietnamien" [The origin of tones in Vietnamese], *Journal Asiatique* 242, 1954a, 69–82.

Haudricourt, André-Georges, "Comment reconstruire le chinois archaïque" [How to reconstruct Archaic Chinese], *Word* 10/2-3, 1954b, 351–364.

Jīn Lǐxīn 金理新, *Shànggǔ Hànyǔ xíngtài yánjiū* 上古汉语形态研究 [A study of Old Chinese morphology], Héféi 合肥: Huángshān 黄山书社, **<<PLEASE PROVIDE YEAR OF PUBLICATION, IS THIS 2006?>>**.

Karlgren, Bernhard, *Analytic Dictionary of Chinese and Sino-Japanese*, Paris: Geuthner, 1923.

Karlgren, Bernhard, "Compendium of Phonetics in Ancient and Archaic Chinese", *Bulletin of the Musuem of Far Eastern Antiquities* 26, 1954, 211–367.

Karlgren, Bernhard, *Grammatica Serica Recensa*, Stockholm: Museum of Far Eastern Antiquities, 1957.

Li Fang-kuei, "Archaic Chinese *-i̯wəng, *-i̯wək, and *-i̯wəg", *Bulletin of the Institute of History and Philology* 5, 1935, 65–74.

Li Fang-kuei 李方桂, "Zhōngguó shànggǔyīn shēngmǔ wèntí 中國上古音聲母問題" [Notes on Archaic Chinese initials], *Xiānggǎng Zhōngwén dàxué Zhōngguó wénhuà yánjiūsuǒ xuébào* 香港中文大學中國文化研究所學報 3/2, 1970, 511–519.

Li Fang-kuei 李方桂, "*Shànggǔyīn yánjiū* 上古音研究" [Studies in Old Chinese phonology], Journal of Chinese Studies: New Series 9, 1971.

Li Fang-kuei 李方桂, "Jǐgè shànggǔ shēngmǔ wèntí 幾個上古聲母問題" [Several problems on Old Chinese initials], in: *Zǒngtǒng Jiǎnggōng shìshì zhōunián jìniàn lùnwénjí* 總統蔣公逝世週年紀念論文集 [Memorial volume to President Chiang Kai-shek], Taipei 台北: Academia Sinica 中央研究院, 1976.

Lǐ Lán 李蓝, *Húnán Chéngbù Qīngyī Miáorén huà* 湖南城部的青衣苗人话 [Qīngyī Miáo Chinese of Chéngbù, Húnán Province], Běijīng 北京: Zhōngguó shèhùikēxué 中国社会科学出版社, 2004.

Lín Yǔtáng 林語堂, "Gǔ yǒu fùfǔyīn shuō 古有複輔音說" [On the existence of consonant clusters in older Chinese], *Chénbào liùzhōunián jìniàn zēngkān* 晨報六週年紀念增刊, 1924, 206–216.

Maspero, Henri, "Le dialecte de Tchang-ngan sous les T'ang" [The Chang'an dialect during the Tang Period], *Bulletin de l'Ecole française d'Extrême-Orient* 20, 1920, 1–124.

Maspero, Henri, "Préfixes et dérivation en chinois archaïque" [Prefixes and derivations in Archaic Chinese], *Mémoires de la Société de Linguistique de Paris* 23/5, 1930, 313–327.

Mei, Tsu-lin, "The Causative *s- and Nominalizing *-s in Old Chinese and Related Matters in Proto-Sino-Tibetan", *Language and Linguistics* 13/1, 2012, 1–28.

Norman, Jerry, "Tonal Development in Min", *Journal of Chinese Linguistics* 1/2, 1973, 222–238.

Norman, Jerry, "The Initials of Proto-Min", *Journal of Chinese Linguistics* 2/1, 1974, 27–36.

Pān Wùyún 潘悟云, *Hànyǔ lìshǐ yīnyùnxué* 汉语历史音韵学 [Historical phonology of Chinese], Shànghǎi 上海: Shànghǎi jiàoyù 上海教育出版社, 2000.

Pittayaporn, Pittayawat, "The Phonology of Proto-Tai", dissertation, Cornell University, 2009.

Pulleyblank, Edwin, "The Consonantal System of Old Chinese", *Asia Major* 9/58, 1962, 58–144, 206–265.

Pulleyblank, Edwin, "Review: The Roman Empire as Known to Han China", *Journal of the American Oriental Society* 119/1, 1999, 71–79.

Sagart, Laurent, *The Roots of Old Chinese,* Philadelphia: John Benjamins, 1999.

Sagart, Laurent and William H. Baxter, "Reconstructing the *s- Prefix in Old Chinese", *Language and Linguistics* 13/1, 2012, 29–59.

Schuessler, Axel, *ABC Etymological Dictionary of Old Chinese,* Honolulu: University of Hawai'i Press, 2007.

Schuessler, Axel, *Minimal Old Chinese and later Han Chinese: A Companion to Grammata Serica Recensa*, Honolulu: University of Hawai'i Press, 2009.

Starostin, Sergei, *Rekonstrukcija drevnekitaiskoj fonologičeskoj sistemy* [A reconstruction of the Old Chinese phonological system], Moscow: Nauka, 1989.

Sūn Yùwén 孙玉文, "Shànggǔyīn gòunǐ de jiǎnyàn biāozhǔn wèntí 上古音构拟的检验标准问题" [On the criteria of evaluating Old Chinese reconstructions], *Yǔyánxué lùncóng* 语言学论丛 31, 2005, **<<PLEASE PROVIDE PAGE NUMBERS>>**

Táng Lán 唐蘭, "Lùn gǔ wú fùfǔyīn fán láimǔzì gǔ dúrú nímǔ 論古無復輔音凡來母字**<<SHOULD THERE BE gǔ IN CHARACTERS, AS THERE IS IN THE PĪNYĪN TRANSCRIPTION?>>**讀如泥母" [On the absence of consonant clusters in Old Chinese. All cases of Middle Chinese *l- were pronounced *n-], *Qīnghuá dàxué xuébào (zìrán kēxué bǎn)* 清華大學學報(自然科學版) 2, 1937.

Táng Lán 唐蘭, *Zhōngguó yǔyīnshǐ* 中國語音史 [Chinese historical phonology], Shànghǎi 上海: Kāimíng 開明書店, 1949.

Tung T'ung Ho 董同龢, "Shànggǔ yīnyùn biǎogǎo 上古音韵表稿" [Tentative tables of Old Chinese phonology], *Zhōngyāng yánjiūyuàn lìshǐyǔyán yánjiūsuǒ jíkān* 中央研究院歷史語言研究所集刊 18, 1948, 1–249.

Wáng Fǔshì 王辅世 and Máo Zōngwǔ 毛宗武, *Miáoyáoyǔ gǔyīn gòunǐ* 苗瑶语古音构拟 [The reconstruction of Proto-Miáo-Yáo], Běijīng 北京: Zhōngguó shèhuìkēxué 中国社会科学出版社, 1995.

Wáng Hóngjūn 王洪君, "Hànyǔ chángyòng de liǎngzhǒng yǔyīngòucífǎ, cóng Píngdìng érhuà hé Tàiyuán qiàn-l-cí tán qǐ 汉语常用的两种语音构词法, 从平定儿化和太原嵌l词谈起" [Two common phonetic word formations in Chinese, the case of rhotacization in the Píngdìng dialect and the l-infixed words in the Tàiyuán dialect], *Yǔyán yánjiū* 语言研究 1, 1994, 65–78.

Wáng Lì 王力, *Hànyǔ yǔyīnshǐ* 汉语语音史 [The phonological history of Chinese], *Wáng Lì wénjí* 王力文集 10, Jǐnán 济南: Shāndōng jiàoyù 山东教育出版社, 1987.

Wáng Lì 王力, *Hànyǔ yǔyīnshǐ* 汉语史稿 [Towards a history of the Chinese language], revised edition, Běijīng 北京: Kēxué 科学出版社, 1958.

Xú Tōngqiāng 徐通锵, "Shānxī Píngdìng fāngyán de 'érhuà' hé Jìnzhōng suǒwèi de 'qiàn-l-cí' 山西平定方言的 '儿化' 和晋中所谓的 '嵌l词' " [Ér-affixation in the Píngdìng dialect of Shānxī Province and so called 'l-infixed words' in Central Shānxī], *Zhōngguó yǔwén* 中国语文 6, 1981, 408–415.

Yakhontov, Sergei Yevgenevich, "Sočetanija soglasnyx v drevnekitajskom jazyke" [Consonant clusters in Old Chinese], Moscow: 25th International Congress of the Orientalists, 1960.

Zhèngzhāng Shàngfāng 郑张尚芳, *Shànggǔ yīnxì* 上古音系 [Old Chinese phonology], Shànghǎi 上海: Shànghǎi jiàoyù 上海教育出版社, 2003.

Zhèngzhāng Shàngfāng 郑张尚芳, *Shànggǔ yīnxì* (dì èr bǎn) 上古音系（第二版） [Old Chinese phonology (2nd Edition)], Shànghǎi 上海: Shànghǎi jiàoyù 上海教育出版社, 2013.

XUN GONG
YUNFAN LAI