Consonant clusters

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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) /ˊtsʅɤŋ/ ‘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), /ˊklu/ ‘early’ in the Fúróng 芙蓉 variety corresponds to affricate /ˊtlu/, /ˊtsu/ 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.ṇac* and Kinnauri (Bodic) /stiʃ/; Zbu Rgyalrong /tə-sɲəv˥˩/ ‘nasal mucus’ to Burmese *ṇap*, 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$_{l}$ < *ʔˤas < OC *ʔˤak-s 'hate (v.)', cf. *è* 惡 *ak$_{l}$ < OC *ʔˤak 'bad'; *nèi* 內 *nwʌjH$_{l}$ < *nˤuts < OC *nˤ[u]p-s 'inside', cf. *nà* 內 (later 納) *nʌp$_{l}$ < OC *nˤ[u]p 'bring in'.

3. Reconstructing Initial Clusters Using xiéshēng

Consider the character *mái* 霾 *mɛj$_{ll}$ '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$_{lll}$ '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$_{lll}$ could indicate the pronunciation of *mɛj$_{ll}$.

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$_{II}$ < *bˁrak 'white' and *bó* 泊 *bak$_{I}$ < *[b]ˁak '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 *tʂɛj$_{II}$ < *tsˁr[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$_{II}$ < *pˁret 'eight' and *bǎi* 百 *pæk$_{II}$ < *pˁrak '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$_{II}$ < *kˁroŋ '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-tʕroŋ-s ‘strike’ in the Baxter-Sagart system, would be revised to *r-N-tʕoŋ-s and compared with Tibetan *rdung* < *ʔⁿd- ‘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 *kla:g in contrast to *gé* 格 *kæk$_{||}$ ‘go to’ < *kra:g.

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 *ŋ̊-, but also *l̥- (*r̥- in later reconstructions), for the *xiéshēng* connections *th-/*l-: *tǐ* 體 *thejX$_{|V}$ < *r̥ʕij? ‘body’ and *lǐ* 禮 *lejX$_{|V}$ < *rʕij? ‘rites’, as well as *θ- (*l̥- in later reconstructions) for *th-/*j-: *tōu* 偷 *thuw$_{|}$ < *l̥ʕo ‘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-nʕər ‘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-gij?-s 'show' derived from *shì* 視 *dʑijH$_{|||}$ < *gij?-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 *ɲuwk$_{|||}$ 'meat' (Proto-Mǐn *nh-) is borrowed as /kɲuk^{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$_{\text{III}}$ ‘kind of wild cat’	*l̥iəg	*lĭə	[*ljəg]	*p·rɯ	*[g]rɯ	*p.rə
mái 霾 *mɛj$_{\text{II}}$ ‘dust storm’	*mlɛg	*meə	[*mrəg]	*mrɯː	*mgrɯɯ	*mˁrə
héi 黑 *xək$_{\text{I}}$ ‘black’	*χmək	*xĕk	*hmək	*hmlɯːg	*m̥hɯɯg	*m̥ˁək
mò 墨 *mək$_{\text{I}}$ ‘ink’	*mək	*mĕk	*mək	*mlɯːg	*mɯɯg	*C.mˁək
xū 戌 *swit$_{\text{III}}$ ‘eleventh earthly branch’	[*s̥iwĕt]	*sĭwĕt	[*smit]	*smid	*smig	*s.mi[t]
miè 滅 *mjiet$_{\text{IIIa}}$ ‘destroy’	*m̥iat	*mĭăt	*mjiat	*med	*med	*[m]et
jiàng 匠 *dzianŋH$_{\text{III}}$ ‘craftsman’	*dzˁi̥aŋ	*dzĭɑŋ	[*dzjaŋh]	*sbaŋs	*sbaŋs	*s.baŋ-s
zào 造 *tshauH$_{\text{I}}$ ‘go to’	*tsˁôg	*tsˁəu	*skhəgwh	*skʰuːgs	*skhuugs	*(mə)-tsʰˁu?-s
jiŭ 酒 *tsiuwX$_{\text{III}}$ ‘liquor’	*ts̥iôg	*tsĭəu	*tsjəgwx	*ʔsluʔ	*skluʔ	*tsuʔ
jīng 莖 *ɣɛŋ$_{\text{II}}$ ‘stalk’	*gˁĕng	*ɣeŋ	[*griŋ]	*greːŋ	*greeŋ	*m-k-lˁ<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 Yŭyánxué (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.

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