Chapter 36

Central vowels in the Kru language family: Innovation and areal spreading

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While Proto Kru and many languages on both sides of the East-West divide today show a set of 9 oral vowels, a subset of Eastern Kru languages attests a much higher inventory, with up to five distinctive central vowels, resulting in a thirteen vowel +ATR set. The locus for central vowel innovation appears to be in the Godié-Guibéroua region, with neighboring languages at varying stages of innovation. In this paper we attempt to document vocalic inventories, point to developing systems, and speculate on how such innovations occurred, including proximity to resonant liquids (especially in a CV 1 LV 2 environment where V 1 is reduced in various contexts) and to suffixal morpheme boundaries. In some languages, coexisting lexical variation (mʊ ~ mɤ 'go', Kagbʊwalı dialect of Godié) is one clear pathway to phonological change. Pressure for "rounding out" vocalic systems may also play a role in the unusually high number of innovated central vowels. Interestingly one Western language, Bakwé (Marchese 1989), also has a full set of central vowels, an apparent case of areal spreading. Vydrine's (2009) hypothesis of a wider cross-family spread of central vowels into southern Mande is also discussed. While this article only scratches the surface of this complicated puzzle, evidence points to intricate interaction between phonological change and areal spreading.

1 Introduction

A quick inventory of vowel systems in the Kru language family[1] reveals a striking diversity. While in Western Kru, with the exception of /a/, no phonemic central

[1]The status of the Kru language family within Niger-Congo is still subject to debate, having been proposed as independent (Westermann), a branch of Kwa (Greenberg), closely connected to Gur (Bennett and Sterk), and of late (Williamson & Blench 2000: 18) an offshoot of Proto West Volta Congo.

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Table 1: Kouya vowels

	Front		Central	Back	
	+ATR	−ATR		+ATR	−ATR
+high	i	ɪ		u	ʊ
−high	e	ɛ	a	o	ɔ

Table 2: Kouya ±ATR sets

−ATR		+ATR	
ɓʊ^{1} *lɛ*^{2}	‘buffalo’	*di*^{2} *de*^{2}	‘father’
tɪɓɛ^{33}	‘snake’	*ɓu*^{2} *ɓui*^{1}	‘smoke, vapor’
mɪɔ^{13}	‘tear’ (n.)	*ɓeli*^{23}	‘brother’
mʊ^{3} *mɔɛ*^{44}	‘smile’ (v.)	*petu*^{41}	‘grass’
ɓʊɪ^{4}	‘flower’	*liɓo*^{33}	‘work’ (n.)

vowels are attested, in Eastern Kru, some languages have a full set, with 5 out of 13 vowels being central (or back unrounded). Citing numerous shared features in South Mande and Kru, Vydrine (2009) proposes that central vowels may be one of several areal features of the Ivorian forest region, cutting across genetic boundaries. Thus in this paper, we attempt to:

- explore the innovation of central vowels in Eastern Kru, examining the extent and possible means of this phonological innovation and
- evaluate the viability of areal hypotheses concerning the spread of central vowels within Kru and across its linguistic borders.

All Kru languages show a minimum of 9 oral vowels, featuring two sets of vowels based on the feature +ATR, and usually a strong vowel harmony system affecting word internal stems and suffix affixation. A typical system is seen in Kouya where vowels occur in two sets (Table 1, adapted from Saunders 2009: 50).

Words are made up of either + or − ATR vowels (Table 2) with /a/ co-occurring with both + ATR vowels (Table 3).[2]

[2] As is traditional in Kru literature, in the examples to follow and throughout this paper, tones are marked by raised superscripts. Most Kru languages show four level tones: high (1), mid-high (2), mid (3), and low (4). Exceptionally Godié has only three level tones (high, mid, low), with only remnants of a fourth tone (Gratrix 1975).

Table 3: Kouya words with /a/ with both ±ATR sets

−ATR		+ATR	
kʊa^{11}	'bone'	*bita*^{41}	'mat'
kpɛ^{2} *la*^{1}	'to refuse'	*te*^{2} *la*^{2}	'porcupine'
yɪ^{1} *ɓa*^{1}	'desire, want'	*gba*^{2} *gbo*^{3}	'partridge'

Despite its non-participatory status in vowel harmony, /a/ usually patterns in other ways as −ATR. In terms of frequency, −ATR vowels are more frequent than +ATR, and most suffixes (verbal suffixes, noun class markers and other nominal suffixes) are underlying −ATR. Casali (2008) notes in dominant harmony languages, affix harmony involves assimilation of [−ATR] to [+ATR] vowels, a fact that seems to hold in our Eastern Kru samples, for example, in Godié where rightward assimilation frequently shows a −ATR to +ATR shift, as in the following example of object clitics in Godié:

(1) Godié (Marchese 1975)

/ɔ^{2} *bi*^{2} *bie*^{2} ɔ^{2}/	'he begs him' (person)
bibiǿ ɔ	(vowel elision)
[*ɔ bibi o*]	(vowel harmony)

2 More elaborate systems

Though both Western and Eastern Kru attest the standard 9 oral vowel system, several Eastern Kru languages (and Western Bakwé) have much larger phonemic vowel inventories, with many additional central (or back unrounded) phonemic vowels[3], as seen in Table 4.

Within Western Kru, no phonemic central vowels are attested, except in Bakwé, which lies contiguous to Eastern Godié (see Maps 1 and 2 below). For over a century (Delafosse 1904), Bakwé has been classified as a Western Kru language based on important isoglosses such as **t/s** ('tree' *tu/su*^{3},); **ny/ng** ('name', 'woman');

[3]Researchers have used both terms. Central vowels in Kru are not rounded. In acoustic studies, Grégoire (1972) has called these vowels in Bété of Guibéroua *central* (see also Zogbo 1981: 15). In other descriptions, Werle & Gbalehi (1976: 61) as well as Kipré (2005: 7) analyze them as *back unrounded*. In Goprou's more recent study of Kpɔkolo, a Bété dialect (2010; 2014: 177), findings are somewhat skewed. For vowels [ɨ, ɵ, ʌ, and a], a female speaker shows F2 readings around 1500 Hz, indicating a clear central position, while [ɵ] positions itself as a back rounded vowels (under 1500 Hz), as does [ʌ] in male speakers. This issue is important but out of the scope of this paper.

Table 4: Vowel inventories in Eastern Kru languages

Language	Number of Vowels	Number of Central Vowels (excluding /a/)
Godié	13	4
Koyo	13	4
Guibéroua Bété	13	4
Gbawale	13	4
Daloa Bété	12	3
Kpɔkolo	11	2
Gaɓʊgbʊ	11	2
Guébie	10	1
Vata	10	1
Gbadi	9	0
Lakota Dida	9	0
Yocoboue Dida	9	0
Neyo	9	0
Kouya	9	0

Western *nɪ*[1] 'water' vs. PEK **nyu*[1]. (Marchese 1989). Curiously Lewis et al. (2014) classify Bakwé as Eastern. In this language and the four Eastern languages seen at the top of the table above (Guibéroua Bété, Gbawʌlɪ, Godié, Koyo), there is a full set of five phonologically contrastive central vowels, which correspond to vowel heights of the peripheral vowels and are also defined as +ATR, as seen in Table 5.

Table 5: Largest oral vowel system in Kru

Front	Central	Back	
i	ɨ [ɯ, ï][a]	u	(+high,+ATR)
ɪ	ʉ [ɤ, ɵ]	ʊ	(+high, −ATR)
e	ə	o	(-high, +ATR)
ɛ	ʌ	ɔ	(-high , −ATR)
	a		

[a]Differences among researchers in transcription complicate our task and it is difficult to identify the exact phonetic realization of such a variety of transcriptions, especially the symbol [ə] used as default schwa in languages without central vowels. As seen above, in languages with full central vowel sets, [ə] is a higher vowel than [ʌ] and is +ATR. In most instances, I tried to respect the author's original transcription.

Despite the fact that it is hard to find perfect sets of minimal pairs, native speakers clearly distinguish five central vowel qualities and can learn to read and write them without difficulty. In many languages, to establish a full set of contrasts, plural forms complete minimal pairs lists, as shown for Guibéroua Bété in (2), Godié in Table 6, and Bakwé in Table 7.[4]

(2) Guibéroua Bété (Werle & Gbalehi 1976)

*kpə*¹	‘chair’	*pə*³	‘cover’	*pʉ*¹	‘lie down’
*kpɨ*¹	‘chairs’	*pʌ*³	‘throw’	*kpa*²	‘mud’

Table 6: Godié (*Kagbʊwalɪ* dialect, Association Gwëjekʊmö 2004)

*li*¹	‘spear’	*lɪ*²	‘wealth/riches’
*lɨ*²	‘eat’	*lʉla*	‘grill, fry’
*luu*¹²	‘paddle’	*lʊ*¹	‘song’
*l*V² *l*V²	‘new’	*lɔ*³	‘law’
*laa*²	‘call’	*lʌ*³	‘bring’

Table 7: Bakwé (Centre de Traduction et d’Alphabétisation en langue Bakwé 2006)

*pa*³	‘enter’	*gɔ*⁴	‘to be old’	*go*⁴	‘to dig’
*pʌ*⁴	‘share’	*ga*⁴	‘vines’	*gʌ*⁴	‘affair’
*bɨ*² *tɨ*³	‘thorn’	*gɨ*⁴	‘plants’	*gʊ*⁴	‘tail’
*bʌ*³	‘to be’	*gʉ*⁴	‘eggs’	*gə*⁴/*gɪ*⁴	‘egg’
*bə*³	‘to tap’	*gu*⁴	‘to give birth’	*gɛ*⁴	‘vine’
*bʉ*²	‘ball (of something)’				
*bɨ*²	‘balls’ (PL)				
*ba*² *li*²	‘pick up’				

Within these systems, central vowels follow the rules of vowel harmony, with typical +ATR word-internal constraints, illustrated for Guibéroua Bété in Table 8 and Gbawale in Table 9.

[4]The adjective ‘new’ in Godie (Table 6) appears to be inherently +ATR and agrees with the noun it modifies, for example *lolo*, *lala*, *lələ*.

Table 8: Guibéroua Bété (Werle & Gbalehi 1976)

−ATR		+ATR	
kʉ³ ɓʌ³	‘to grab’	*ko⁴ su²*	‘fire’
tɪ² mʉ²	‘to pay the dowry’	*wuə²⁻⁴*	‘all’
gwʌ¹ zɪ³	‘medecine’	*nuə¹⁻¹*	‘mouth’

Table 9: Gbawale (Martine 1987)

−ATR		+ATR	
wʌ³ lɪ³	‘problem’	*di⁴ gbə³*	‘mortar’
kɔ⁴ kwɛ¹	‘chicken	*go⁴ və³*	‘tree trunk’
sɪ¹ kʌ¹	‘rice’	*do⁴ pe¹*	‘proper name’
zɪ³ kpɔ⁴	‘tomorrow’	*bi² do⁴*	‘to wash (oneself)
mɔ⁴ mʉ³	‘you’ (indep)	*ci³ gbe⁴*	‘yesterday’

As in most of these languages, /a/ occurs with both series, as shown for Gbawale in Table 10.

Table 10: Gbawale (Martine 1987)

−ATR		+ATR	
pɪa	‘buy’	*a⁴ zie³*	‘proper name*’
a⁴ mʉ¹	‘me’		
wa² mʌ³	‘them’		

These systems of 13 phonologically contrastive vowels constitute the largest oral vowel systems in the Kru language family.

2.1 Innovation of central vowels

Given that, with the exception of Bakwé, no central vowels occur in Western Kru, and that within Eastern Kru, several languages have no central vowels other than /a/, we are assuming Proto Kru had a basic oral 9 vowel system, as in Kouya today, with no central vowels. Central vowels would represent an important innovation in a defined area and/or sub-branch. In the following map, the dark black line

indicates the main West-East divide in Kru. Areas where full sets of 5 central vowels (darker blue) occur are distinguished from those with no central vowels (rose) and those with an incomplete set (lighter blue). As will be discussed later, the distribution of central vowels suggest an areal spread, across the West-East border, and outside of Kru into Dan, a Mande language.

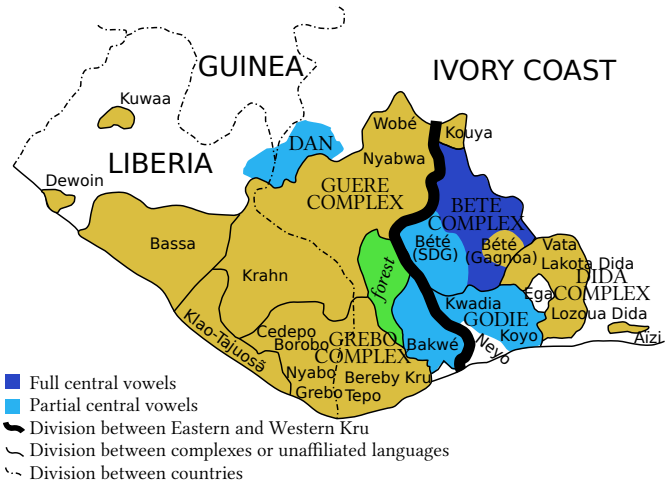

Figure 1: Map 1

2.2 Languages without the full set of central vowels

The top languages in Table 4 (Godié, Guibéroua Bété, etc.) along with Western Bakwé (all in darker blue) appear to be the locus of a major innovation which has not (yet?) affected some of the Eastern languages such as Neyo, Kouya, Gbadi, and various dialects of Dida. Examining those languages which have partial sets (light blue) may provide clues as to how full central series developed in certain languages.

2.2.1 Daloa Bété

Daloa Bétéslightly east and north of Guibéroua-Godié-Bakwé has three non-low central vowels (+ATR) but no low –ATR /ʌ/ (Zogbo 2005). /a/ occurs with both sets of +ATR vowels. This system is not as symmetrical as those three mentioned above. However, as far as we know, this dialect shows no signs of developing the –ATR counterpart /ʌ/:

Table 11: Kpɔkolo phonetic vowels

i	ɨ (ɯ)	u
ɪ	ʉ (ɤ)	ʊ
e	ə	o
ɛ		ɔ
	a	

2.2.2 Kpɔkolo

Kpɔkolo is a dialect of Bété spoken in 20 villages south of Gagnoa. Goprou (2010; 2014: 175, 179) cites the following phonetic vowel chart:

Table 12: Kpɔkolo phonemes

I	ɨ	u
ɪ	ɵ	ʊ
e		o
ɛ	ʌ	ɔ
	a	

He notes there are no contrastive minimal pairs for [ɨ] and [ɵ] except in singular-plural forms. He thus analyzes the two high central vowels as allophones of high front vowels high /i/ and /ɪ/, an analysis which might provide some insight into how central vowels develop historically. Vahoua (2011), however, provides good evidence that /ʌ/ has phonemic status in this dialect.

2.2.3 Gaɓʊgbʊ

Gaɓʊgbʊ spoken in Gagnoa, Lakota (to the south), and the villages in between, attests 11 oral vowels, including two high central (or back unrounded ones, Gnahore 2006: 5, 9).

Table 13: Gaɓʊgbʊ phonemic vowels

i	ɯ	u
ɪ	ɤ	ʊ
e		o
ɛ		ɔ
	a	

If the two high central vowels are truly phonemic, this language may be one step further than Kpɔkolo in the development of central vowels. Typical vowel harmony is present, with /a/ classified as –ATR.[5]

2.2.4 Guébie

This language, on the border between Bété and Dida, attests only one central vowel, phonetically higher than /a/. Hannah Sande (p.c.) reports that /a/ functions as –ATR and the higher central vowel as +ATR [ə]. As in other Kru languages, /a/ shows a tendency to occur with both + ATR. Sande notes an /-a/ suffix remains constant, no matter the ATR feature of a verbal root.

Table 14: Vata vowels according to Kaye (1980)

+ATR		–ATR	
i	u	ɪ	ʊ
e	o	ɛ	ɔ
ə		a	

2.2.5 Vata

Like Guébie, Vata shows signs of shifting to a 10 vowel system, with Kaye (1980: 70) also reporting an additional central vowel as part of the +ATR series. He notes "The 10th vowel, i.e. the advanced low vowel is not pronounced in the speech of all Vata speakers. Nevertheless, there are reasons to justify in every Vata dialect, a system of 10 vowels". In the following chart we suspect that what is marked as /ʌ/ corresponds to what most Kru researchers would write as /ə/, a +ATR vowel phonetically higher than /ʌ/:

Table 15: Vata vowels reanalyzed

+ATR		–ATR	
i	u	ɪ	ʊ
e	o	ɛ	ɔ
ʌ		a	

[5]Gnahoure's vowel chart presents the two high central vowels as –ATR (p. 9): *ɔzwa ja**ma*** 'Ozoua became light' and *Ɉai nyu**mɤ*** 'Jai became ugly' (2006: 25). In her examples /a/ combines with both +ATR: ga^{4}ji^{1} 'proper name', a^{4}mɪ^{3} '1 SG' (obj). More study is needed on how central vowels and the feature ATR combine.

2.2.6 Gbadi

Curiously, though Gbadi is classified as Bété, with the exception of /a/, it attests no central vowels (C. Goprou, p.c. & H. Tebili, word list), underlining the issue of frequent mismatches between ethnic/social perceptions and linguistic classifications.

What is striking here is that some languages seem to be developing central vowels "from the top", with high central vowels (Gaɓʊgbʊ, Daloa Bété), while others (Vata, Guébie) appear to be developing them "from the bottom". In Kpɔkolo, it would appear a lower central vowel /ʌ/ has become phonemic, but it may be the two higher conditioned central vowels will one day become phonemic as well.

3 Historic sources for central vowels

Based on the hypothesis that Proto Kru had a nine vowel oral system, the source of central vowels will now be examined. Our research shows that these vowels develop from both front and back vowels as well as central /a/, but the most frequent cases involve front vowels *i, *ɪ, and *e, and central *a. It is important to note that the emergence of central vowels in Kru never results in the disappearance of peripheral vowels in any given vocalic system.

Below reconstructions from Proto Eastern Kru (PEK) are proposed and traced to their current forms mainly in Godié, a language which shows a very high number of central vowels. In almost all cases the central vowel in question retains the same features for vowel height and +ATR as the proto form. Here we concentrate on *sources* of innovated central vowels, being able to identify very few conditioning factors.

However, it will be noted that a very frequent environment for central vowels to emerge is in the environment of CLV, a fact which will be discussed below. Note that in virtually all Kru languages, /l/ has a variety of allophones (flap n, l, r) in CLV and in some languages implosive ɗ, Marchese 1979/1983). Dialects of Godié are cited when known (jlʉkɔwalɪ, kagbʊwalɪ, and koyo).

Proto back vowels may also give central reflexes, though not as frequently and perhaps following a more complicated path §3.

Note that examples of proto back vowels *u, *o, and *ɔ giving a central reflex are rare. One example might be PEK *ɓlo* 'one' → *ɓlʉ* (Godié, jlʉkɔ dialect). Cases of low vowels *Ɛ and *ɔ giving a central vowel are equally rare.

Table 16: *i → ɨ in Godié CLV

PEK	*ɓli^{2} or ^{3}	'fall'	Kouya, Gbawale, Gaɓʊgbʊ	→	*ɓlɨ^{2}*	Godié
PEK	*zli/e	'fish'		→	*zlɨ^{2}*	kagbʊwalɪ
PEK	*mli	'bite'		→	*mlɨ^{2}*	jlʉkɔwalɪ, kagbʊwalɪ, koyo
In some CV words beginning with /l/, often pronounced as implosive ɗ (probably *ɗ)						
PEK	*li^{2}	'eat'	Kouya, Dida, Gbawale, Gaɓʊgbʊ, Vata	→	*lɨ*	jlʉkɔwalɪ, kagbʊwalɪ

Table 17: *ɪ → ʉ in Godié

PEK	*ŋlɪ^{1}	'name'	Neyo, Dida Guibéroua Bété, Daloa	→	*ŋlʉ^{1}*	Godié, Koyo [*ŋ̌ʉ̌^{1}*]
PEK	*dɪ^{2}	'news'	Dida, Daloa Bété; Kouya *dɪ*^{1} 'chat', 'talk'	→	*dʉ^{1}*	Godié, Koyo [*dɨ^{1}*]
PEK	*a^{4}mɪ^{1}	'1 SG EMPH'	Kouya, Gaɓʊgbʊ	→	*a^{3}mʉ^{1}*	Godié
PEK	*nɪ^{1}	'and (then)'	Guibéroua Bété	→	*nʉ^{1}*	Godié

4 Mechanisms for central vowel development

The question as to how these phonologically contrastive central vowels developed from an original 9 vowel proto system is a main concern here. What caused languages to move from a seemingly stable Proto system towards a more complex one, with full or partial sets of central vowels? For the moment, putting aside the question of language contact and areal features, we will explore possible phonetic and phonological explanations of this development.

4.1 Phonetically motivated centralization

Of course the development of central vowels is not unique to Kru or to Africa. Central vowels involve less tongue displacement than peripheral vowels. Thus

Table 18: *a →ʌ in Godié

PEK	*mla^2	'swallow'	Dida, Koyo, Neyo, Guibéroua, Daloa	→	$mlʌ^2$	Godié [$mʌňʌ$]
PKru	*$mla^{1/2}$	'drink'	Gaɓʊgbʊ mla^3; Tepo mna^2, Nyabwa mna^2	→	$mlʌ^1$	Godié [$mʌňʌ^1$]
PEK	*$kwala^{12}$	'tortoise'	Kouya $kwlaa^{12}$; Gaɓʊgbʊ $kwala^{12}$	→	$kwlʌ^{12}$	Godié
PEK	*kpa^2la^2	'bottle'	Bakwé	→	$kpʌlʌ^1$	Godié (Kagbo)
PEK	*sa	'pick (up)'	Dida, Gaɓʊgbʊ, cf. Wobe *saa* 'choose'	→	$sʌ$	Godié
PEK	*ka^3	'have'	Kouya ka^3	→	$kʌ^3$	Godié, Gbawale
PEK	*ga^3	'to be awake'	Kouya	→	$gʌ^3$	Godié

Table 19: *ʊ → ʉ

PEK	*$zʊ$	'shame'	Neyo $zʊʊ^{2\text{-}3}$, $zʊ^1$, Daloa $zʊ^2$	→	$zʉ^3$	Godié
PEK	*$mʊ^2$	'go'	Dida	→	$mʉ^2$	Godié
PEK	*$ngbʊ$	'five'	Kouya	→	$n^3gbʉ^2$	Godié[a]

[a]See also $n^4gbɤ^3$, Kodia (Leidenfrost, p.c.).

quite naturally many languages develop central allophones. Welmers (1973: 23, 25) notes phonetically conditioned centralizing tendencies of both front and back vowels in certain Mande languages, for example Kpelle where "short front unrounded vowels /i, e, ɛ/ have centralized allophones [ɨ,ə] after most consonants in monosyllables and in some types of bisyllabic forms". Within Kru, Bentinck (1978) notes centralized realizations in sentence final position and after labiovelars.

However, more compelling is what appears to be a universal tendency for central vowels to emerge in proximity to resonant liquids /r/ and /l/ as well as their nasal counterparts. Well known examples are high front vowels becoming central in such environments in Middle English, for example, with *bird* losing its short "I" and evolving into a central vowel (Hickey, MS). Lynch (2015: 76) notes

in Proto Oceanic a central vowel reflex in Iaai: *o > i, ə, as when **roŋoR* 'hear' becomes /ləŋ/ or /liŋ/. Though he cites no conditioning factor, the r-l connection seems clear. Closer to home, Morton (2012) notes a high *ɪ gives rise to a high central /ɨ/ phoneme before liquids and nasals in Anii, an Akan language.

In Kru languages, where the typical syllable structures are V, CV, CVV, CCV (where C_2 is a liquid or sonorant), many researchers note the appearance synchronically of a central transition vowel in CLV words. Marchese (1979/1983: 98) initially described the phenomenon as following:

> In many cases, a transition vowel appears between the first consonant and [l]. The quality of this vowel is determined by the main vowel. If the main vowel [i.e. V2] is central or back, the transition vowel is identical to the main vowel. If it is a front vowel, the transition vowel is generally a central vowel of the same height.

Obviously the vowel carries the same ATR feature as the primary vowel, as seen in Table 20.

Table 20: Godié

front vowel			central and back vowel		
/yli^1/	[y$^{\text{ɨ}}$li]	'eye'	/ɓlɨ^1...kʊ^1/	[ɓ$^{\text{ɨ}}$lɨ]	'pick up'
/gwlɛ/	[gw$^{\text{ʌ}}$lɛ]	'remain'	/ɓlʉ^3/	[ɓ$^{\text{ʉ}}$lʉ]	'one (certain)'
			/plʌ^2/	[p$^{\text{ʌ}}$lʌ]	'enter'

In Kouya, an Eastern language with no contrastive central vowels, Saunders reports a phonetically predictable central transition vowel which he writes as [ə], usually when V is a front vowel or /a/:[6]

Table 21: Kouya (Saunders 2009)

/yra^3/	[y$^{\text{ə}}$ra]	'to look at'
/plE^2/	[p$^{\text{ə}}$lE]	'liver'
/fli^{41}/	[f$^{\text{ə}}$li]	'forest'

We note for back vowels, as in Godié, the epenthetic vowel is identical to the primary vowel: /ɓlo/ [ɓ$^{\text{o}}$lo] 'one'.

[6]The exact nature of [ə] is not known, but Saunders (p.c.) reports there is no violation of + ATR harmony.

For Western Glaro, where there are no central vowel phonemes, Wolfe (p.c.) reports that retracted /ɪ/ becomes central in fast speech in certain words such as /nyɪnɔ/ 'woman/wife'. Note that here C_2 provides the expected liquid-nasal environment.

Of course while current synchronic analyses vary, with some positing epenthetic vowel insertion and others an underlying dissyllabic $C_1V_1C_2V_2$ with a subsequent reduction, it is clear that historically these sequences derived from dissyllables. Reduction to one syllable CLV is precipitated by C_2 being a liquid or nasal sonorant and tones on both vowels being identical. Identical tones speed up the realization of the word, which *favors* a centralized transitional vowel rather than a full one. A difference in tone on V_1 and V_2 blocks the reduction process. Compare w**i**^{2}li^{2} 'goat' vs. w**o**^{3}lo^{4} 'look' in Gbawale (Martine 1987: 20, 31) or the Godié examples in (9) to words like gɔ^{3}lʊ^{1} 'canoe' and lu^{3}lu^{2} 'tamtam' where no reduction occurs.

Note, however, that in many languages, a reduced CLV functions synchronically as a single syllable (see Gratrix 1975 for Godié).[7] It is interesting to note, however, that linguists who are native speakers of Kru languages often opt for $C_1V_1C_2V_2$. Thus Kipre (2015) argues strongly for a synchronic underlying two syllable structure in Daloa Bété. Guehoun, as well, as a native speaker of Lakota Dida, notes in the case of CLV "the transition vowel is predictable [but] "when enunciating the word, when they are asked to slow their speech or to pronounce the sequences of a words with insistence, they pronounce two syllables". He also notes "a child learning to speak automatically says CLV words as CVLV, without the word becoming unintelligible." (1993: 55–56). Thus Guehoun proposes /ngɛlɛ/ 'odor' for [nglɛ], and /kpo^{3}ke^{3}le^{3}/ 'bench, chair' for [kpokle].

4.2 Pathways of development

While the above discussion shows that central vowels are phonetically predictable, it does not provide a pathway for these sounds becoming phonemic. At this stage, considering the data, we can only suggest possible pathways. However, Kpɔkolo may serve as a good example of a language that appears to be currently developing central vowels. In this language, Goprou (2014: 191) notes centralization in a similar environment as outlined in the preceding section (liquid-sonorant), but with dissimilar tones. Another a native speaker linguist, he too posits identical vowels as underlying:

[7]Note also in all Kru languages, when alveolars (+cor) are involved, /l/ → r, and the vowel disappears completely, for example, t^{ʊ}lʊ 'to blossom' → [trʊ], enhancing perception as one syllable (Marchese 1979/1983).

(3) Kpɔkolo
/bɪ^{4}lɪ^{2}/ 'neck' →[bəlɪ]
/kɪ^{1}lɪ^{4}/ 'first' → [kəlɪ]

He thus posits [ə] as an allophone of /ɪ/, and likewise for [ɨ] as an allophone of /i/. He notes however that for the latter, there are some minimal pairs, but only in a singular-plural paradigm. As noted, this language has apparently developed a lower central phonemic vowel /ʌ/ (Vahoua 2011). Our major problem is finding a pathway for development for these central vowels in Kpɔkolo and other innovating languages.

One possible pathway might be the development of a central vowel V_1 position and the loss of the final syllable CV_2, leaving the new vowel in a contrastive CV# position. Unfortunately however, we have found few examples which could justify this scenario. Also arguing against this hypothesis is the fact that Western languages, showing the most word final syllable reduction, have not developed any central vowels. Another possibility is that rightward assimilation (a common Kru process in vowel harmony) would affect V_2, with V_1 taking on a central quality and then coming to dominate V_2. This would give a central vowel in a primary vocalic position where it would come into contrast with peripheral vowels, for example: *kpala → kp^{ʌ}la → kplʌ.*

4.3 The effect of morpheme boundaries

Examples above open up another possible pathway for central vowel development. Kru languages are primarily suffixing. Historically noun class suffixes have interacted and often coalesced with stem final vowels. To these forms are added plural markers and, in some languages, definite suffixes (Marchese 1979/1983; Zogbo 2017). Verbs as well carry object clitics but also aspectual markers, causative, and other transitivity-changing suffixes. In some of our data, these instances of vowels "coming together" at morpheme boundaries seems to effect word (and syllable?) structure, resulting in some centralizing phenomena.

For example, the environment *noun + class marker* is clearly to be reconstructed for Proto Kru. Did this environment create a context where central vowels emerged in a single syllable? To give an example, current variant forms such as /kpʊ̈/ and /kpʉ/ 'oil' can be seen as deriving from *kpV + *ʊ, root + noun class suffix. In all likelihood the form could have been *kpɪ+ *ʊ, where in some languages the first vowel was centralized, as in Godié and Bété (/kpʉ/). In others the initial stem vowel was lost and the noun class marker took its place yielding (/kpʊ/).

It is worth noting that Kru plurals—most often marked with human suffix -*ʊa* or non human -*ɪ*—have a peculiar feature of effecting upward centralization, a process which is hard to account for synchronically on a strictly phonological level in Eastern Kru and Bakwé (Marchese 1979/1983). This is particularly predominant in Godié, for example, in singular plural pairs such as li^{1}/l**ɨ**^{1} 'spear', mɪɪ$^{1\text{-}2}$ m**ʉʉ**$^{1\text{-}2}$ 'boat', kpʌ/kp**ʉ** 'herd'. While mu + -*ɪ* might give m**ʉʉ**$^{1\text{-}2}$, it is hard to derive l**ɨ**^{1} from li + -*ɪ*.[8] It is as if the mere presence of the plural morpheme boundary produces heightening and centralization. Goprou (2014) also reports a similar centralization of back vowels (which he describes as unrounding, but could also be considered as fronting) in the environment of plural –ɪ. Thus Kpɔkolo shows central vowels on the surface in plural forms but not in underlying ones:

Table 22: Kpɔkolo (Goprou 2014: 202-206)

/pʊ^{2}lʊ^{3}/ + ɪ	→ /pʊlɪ/	→ [pɵlɪ]		'piece' + PL
/so^{4}lu^{2}/ + ɪ	→ /solu + ɪ/	→ /soli/	→ [sʏli]	'pail + PL'
/kɔ^{2}lɪ^{2}/ + ɪ	→ [kʌlɪ]			'bamboo + PL'
/mu^{4}du^{2}/ + ɪ	→ mudu + i	→ mudi	→ [m**ɨ**di]	'(finger)nail' + PL

Note that this is basically the same CLV environment as the transition vowels in other languages[9], and it is again a question of vocalic assimilation of back vowels moving front. Welmers (1973) notes a similar "derounding" as well as fronting of back vowels /o/ and /ɔ/ in Kpelle when followed by a front vowel, either directly or after an intervening /l, r, n/. As Goprou, he calls these centralized forms "allophones" of other vowels. Welmers notes however, that "native speaker reaction "strongly favors the interpretation of the underlying vowel, in this case /o/ and /ɔ/".

The data from Kpɔkolo confirms yet again the "weakness" of the position of the first vowel in a CVCV [lateral/sonorant] word. Clearly the C_LV environment lends itself to centralization in Kru (and cross-linguistically), but the addition of a morpheme boundary seems to add "additional weight" to this tendency. For Koyo, Kokora (another native speaker, 1976: 39) cites the form /mala+à/ [m**ɨ**lá-à] (drink-PERF PAST) where in addition to the CVLV environment, we think the "added weight" of the rightward morpheme boundary causes the first /a/ to weaken, and here, to heighten as well. Another example comes from Nyabwa where no

[8]According to morpho-phonological rules *li + ɪ* should give lii (assimilation, vowel harmony) and mɪɪ + ɪ, mɪɪɪ.

[9]We might suspect that d in the last example is a reflex of *ɗ.

phonemic central vowels exist. Bentinck (1978: 50) reports phonetic centralizing of the vowel /e/, at the end of conjugated verbs in a CV + V environment: /ɪm^{2} li^{3} e^{4} pɪ^{2}tɛ^{4}/ (I eat-SUFFIX banana) 'I'm eating a banana'. Word boundaries may also come into play, as seen in the following examples from Lakota Dida, where Guehoun (1993: 47) reports a phonetic /a/ → [ə] development, which seems a "change in progress":

Table 23: Lakota Dida

/ɔ^{3} sa^{3} ka^{4}fi^{1}/	→ [ɔ sə kəfɪ]	'He's picking coffee'
/ɔ^{3} la^{4} du^{1}tʊ^{3} bo^{3}du^{4}kwo^{2}/	→ [ɔ lə dutʊ bodukwo]	'He brought a package to the village chief'
/ɔ^{3} ka^{4} cɛ^{1}/	→ [ɔ kə cɛ]	'He has noise (he's loud)'

Despite these various scenarios, we cannot say exactly *how* allophones or phonetic realizations become contrastive phonologically. Neither do we know if these changes occurred early on, i.e. high up in the Eastern Kru tree and consequently spread, or even (though extremely less probably), whether the innovation occurred in Bakwé and slowly spread eastward into Eastern Kru (See discussion below).

We do know, however, as is well attested in all types of linguistic change, that variation plays an important role in the adoption of central vowels. Indeed, in the *kagbʊwalɪ* dialect of Godié, *mʊ* and *mʉ* 'go' are in free variation, while in the *jlʉkɔ* dialect the central vowel has become the standard form. In Lakota Dida Guehoun (1993: 48) notes that /a/ and [ə] are often in free distribution, "…since a speaker can use or not use either realization without it affecting the meaning of the message." It would thus hardly be surprising if this dialect of Dida develops a slightly higher phonemic central vowel to join /a/, with each occurring in its own separate harmonic set.

4.4 Pressure for symmetric systems

Casali (2008: 501, 502) notes that a 9 vowel systems with five [–ATR] and four [+ATR] vowels, where "a contrastive non-high [+ATR] counterpart of /a/…is absent" are "extremely common (numbering, by any reasonable estimate, in the hundreds) and are geographically and genetically widespread within Niger-Congo and Nilo-Saharan". He further notes that while 10 vowel languages are not the most common within NC, many ATR languages "have nine contrastive vowels, with a tenth vowel on the surface, a predictable [+ATR] variant of /a/ that occurs in the neighborhood of [+ATR] vowels". This seems to be Kaye's mysterious 10th

vowel in Vata. Certainly however, while symmetry in vowel systems is not universal, it is common for languages to attempt to "round out" their vocalic systems (Welmers 1973: 21). This tendency seems to be at work in Kru today, for example, in Guébie, where a 10th vowel /ə/ seems to have emerged to balance out the +ATR vowel harmony system (Sande, p.c.).

One final observation seems important in regards to the high numbers of central vowels in some Eastern Kru languages and Bakwé. It may be significant that in Western languages, where phonemic central vowels have not developed, there are full sets of nasalized vowels, whereas in the languages with central vowel phonemes, nasalized vowel phonemes do not exist or are marginal (Marchese 1979/1983). So it may be that the size of the vowel inventory may be a factor in central vowel formation in Kru. In Western Kru the full vowel inventory may have blocked the development of central vowels, due to limits on perception, while in Eastern Kru, where nasalized vowels do not appear contrastively (and presumably may have been lost), space has been created to allow for such a development. At this point, we cannot affirm this, but the complimentary distribution, noticed in other parts of Africa (Rolle 2013), is most intriguing. Note that this explanation would work for Kru but not for Dan (southern Mande) where both sets (central and nasalized) do co-occur (see below).

5 The areal hypothesis

Examining southern Mande and Kru languages, Vydrine (2009: 92, 112) proposes an "Upper Guinean Coast Sprachband" sharing numerous features, including +ATR, vowel harmony, a high vowel inventory (7+), nasalized vowels, asymmetry of oral and nasalized vowels, lack of nasal consonants, at least three or more level tones, consonant homo-resonance, implosives, labiovelars, v and z, high frequency of CVV feet, locative nouns, and, importantly for this study, central or back unrounded vowels. While these observations are intriguing, it is important to note that some of the above features are not systemically shared by *both* Western and Eastern Kru. Thus, while most Western Kru can be analyzed as having nasalized vowels with no nasal consonants, Eastern Kru does not exhibit this behavior. And while Eastern Kru attests central or back unrounded vowels, Western Kru does not.

In this section, we would like to consider the details and/or implications of areal sharing of central vowels as it affects this region. In exploring this areal hypothesis, several questions emerge:

- First, within Kru itself, how much of the central vowel phenomenon is due to *areal contact*? Or are central vowels a result of *genetic affiliation* (for example, an innovation in PEK occurring, say, before Guibéroua Bété and Godié split)?
- Regarding the Kru-Mande areal connection, what is the locus/source of central vowel innovation and which direction is the borrowing/language contact going?
- What factors might play a role in the spread of centralization? What are the possible scenarios and what might this tell us about the history of the Kru peoples and their interaction with Mande populations?

5.1 Internal spreading of central vowels within the Kru language family

Within Eastern Kru, it is clear that central vowels are emerging, which may well be a case of family-internal areal spreading. The question remains: are languages such as Guébie and Kpɔkolo adopting central vowels because of natural phonetic developments (internal phonological processes and pressure as described above), or rather, is this a case of language contact? Or are both factors at work? Kru languages constitute complex and numerous dialect chains and when speaking, Kru peoples regularly "switch back and forth", adapting words to be understood by other Kru speakers. Thus contact as well as phonological processes seem likely influences.

Most noteworthy as a candidate for areal spreading is Bakwé, traditionally considered a Western Kru language.[10] This language seems to have acquired a full set of central vowels through language contact or areal spreading. Leidenfrost (p.c.) points out that the Bakwé, who are a very small group, pride themselves in speaking other languages and in the fact that their neighbors cannot speak their language. Though culturally they have been greatly influenced by Western Guere culture, having incorporated Guere masks (who, it turns out, must speak Guere!), their small number and sociolinguistic profile might make them susceptible to influence from adjacent and currently much larger Godié-Guibéroua Bété groups to the east. Also note in Figure 1 Bakwé is today separated from related Western languages by the huge Tai forest. However, questions remain. If this such contact and borrowing did occur, it is hard to know why Bakwé, which is contiguous to Godié, would borrow central vowels, while Kouya, contiguous to

[10]Linguistic evidence confirms this classification, as well as strong oral tradition (Centre de Traduction et d'Alphabétisation en langue Bakwé 2013).

Bété, would resist incorporating them! Another hypothesis is that Bakwé itself first innovated central vowels, which spread either to a Proto Eastern Kru ancestor, or spread slowly (as is still happening) throughout Eastern Kru (especially the Bété complex), but this seems less probable.

5.2 Central vowels spreading across language families

Cases of borrowing of central vowels across language families is not uncommon. M. Harley (p.c.), notes that in Western Chadic, Ywom and Goemai with 7 vowels (including 3 central vowels), "appear to have developed a third central vowel through contact with the neighbouring Tarok (a Benue-Congo language), which has an identical 7-vowel system." Southern Mande includes two Dan languages with vowel systems which closely resemble Kru systems, in that full series of central vowels are present. Eastern Dan attests the following:

Table 24: Eastern Dan vowels (Vydrine 2009)

Oral vowels			Nasal vowels		
i	ɯ	u	ĩ	ɯ	ũ
e	ɤ	o			
ɛ	ʌ	ɔ	ɛ	ʌ	ɔ
æ	a	ɒ	æ̃	ã	ɒ

With the exception of Goo, other languages of the southern Mande group and of other Mande branches do not have central vowels. Though it is possible that these languages underwent similar processes as Kru in developing central vowels, Vydrine (2009) is probably correct in assuming that these languages must have been influenced by Kru languages through language contact. This scenario is more likely (than the other way around, with Kru borrowing from Mande), since far more Kru languages show centralization than is the case in Mande, where, besides these 2–3 affected languages, central vowels are virtually unknown. In the map below, we see Kru languages with central vowels, those without and the area where they are attested in Mande languages.

We note that Akye, an Akan language spoken by peoples who immigrated from Ghana, also attests two central vowels[11] (ɤ and ʌ). We have yet to investi-

[11]Bogny, Joseph, "Typological features template for Attie", https://typecraft.org/tc2wiki/Typological_Features_Template_for_Attie.

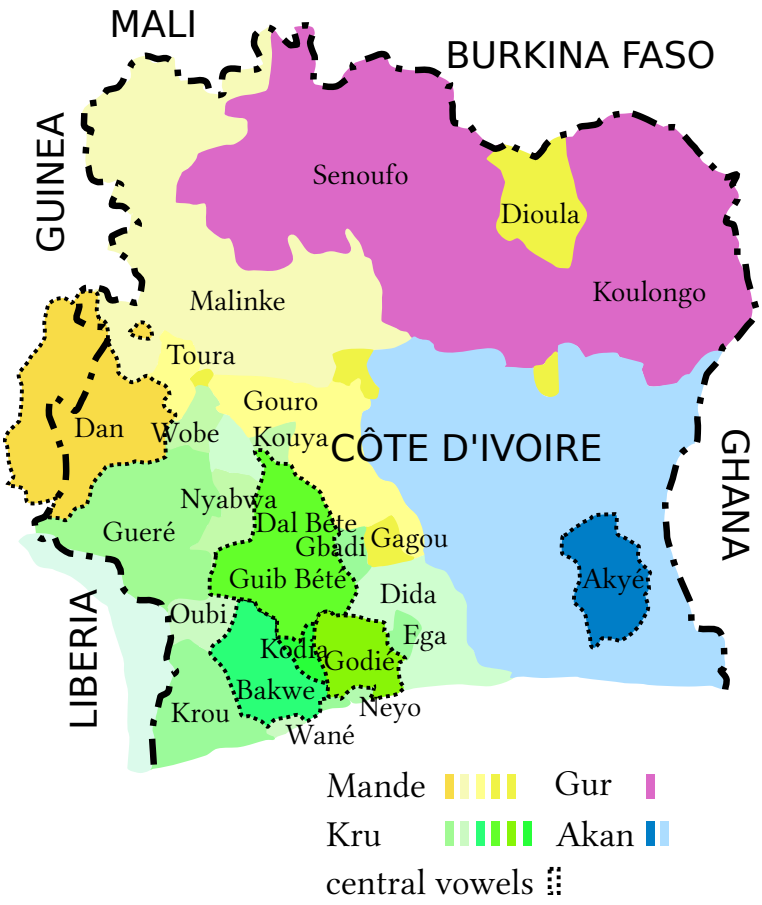

Figure 2: Map 2

gate this link, which may point to another case of language contact and areal spreading of central vowels in this region.

6 Historical explanations

As the above map demonstrates, one problem with the areal hypothesis concerning central vowels in subsets of southern Mande and Kru is that currently Dan is separated from the centralizing Eastern languages by a huge space occupied by Western Kru, where central vowels have not innovated. This fact suggests that historical explanations may need to come into play. If central vowels are a shared feature of Mande and Kru, this would suggest at some point the Dan peo-

ples and the ancestors of the Godié-Bété branch of Eastern Kru and/or Bakwé were geographically contiguous. Thus, in this case, linguistic evidence may help us determine certain people movements.

Despite late oral traditions describing a movement of Kru peoples from west to east (i.e. from Liberia into the Ivorian forests), it is commonly accepted that the Kru were once located much further north, and then were pushed down into the forest by the Mande expansion. S. Lafage (1983) traces the Kru immigrations towards the south in three stages:

- 14th to 18th century: Mandes and Kru were positioned "on the Niger", with the Mande pushing small Kru groups into the forest.
- 15th century onward: the Kru move towards the coast (in light of European trade, including the slave trade).
- 18th century: the arrival (in waves) of the Akan from the East would have pushed the Krus further south and west. Kipré (2005: 68) notes as well that in the 18th there were early Akan infiltrations and a certain "akanization" of certain Dida villages.

Though the individual Kru groups appear to be fairly autonomous, Kipre also notes a high level of contact not only between Kru themselves, but between Kru and Mande groups, describing a process of "compression":

[in Côte d'Ivoire] …several peoples were in contact with one another, interpenetrating each other, whether easily or not, certainly not without conflict. There were frequent confrontations between Gouro and Bété, between Gagou and Bété, between Dan and Wè during this time frame. Also we have here a "transition zone" where several peoples are **pressed together in a kind of "metissage culturel"**… Niabwa and Nidedboua are squeezed between Wè and Bété; the Bakwé's are squeezed in between the Southern Kru and the Bété…."

This kind of geographic as well as socio-cultural 'compression' point to conditions which could easily lead to linguistic borrowing and the development of areal features. Kipre goes on to note (2005: 69) that within Côte d'Ivoire the "progressive interpenetration of peoples makes the idea of ethnic groups as 'pure peoples' (or races) inappropriate".

What do these facts tell us? Probably that present territorial placements of various ethnic groups do not reflect past history. It is likely, for example, that the Dan tribes came into contact at an earlier period with parts of what today is the Godié-Bété branch of Eastern Kru, where central vowels were innovated. Despite the fact that the Mande would be considered the "dominators" over the last three to four centuries (Lafage 1983; Vydrine 2009: 108), it is possible that

the Mande super-stratum assimilated some of the substratum language features, especially on the phonological level. Recent scholarship suggests other "higher" areal features for a wider region such as a common S AUX O V word order may have come from the other direction, namely from Mande to Kru (Güldemann 2008; Sande et al. 2019). Besides past historical contact and borrowing, it is clear that foreigners of all provenances (Mande, Akan, etc.) have penetrated and continue to penetrate into the rich and fertile Kru territory.[12] Will such mixing lead to more language change and sharing of other linguistic features?

7 Conclusions

In this study, we have tried to go beyond Vydrine's initial observations (2009), to study in some detail the innovation of central vowels in a subset of Eastern Kru languages, with the locus of initial change presumably being the Godié-Guibéroua Bété complex, possibly before this group subdivided into today's individual languages. It seems highly probable that Bakwé, a Western Kru language, but contiguous to Godié, has acquired central vowels through language contact. It may be the case that current central vowel innovations maybe constitute cases of language contact within the Kru group itself. However, Western Kru has, for whatever reasons, resisted any such innovation, perhaps due to its already very full vowel inventory.

In terms of the wider region, it would appear that two or three southern Mande languages have indeed incorporated central vowels through language contact, despite what appears to be a dominator-dominated social scenario.[13] Our data might suggest that the innovation of central vowels in Godié-Bété occurred rather early, that the Dan-Kru contact occurred sometime after that, but still quite some time ago, in a linguistic and geographical setting quite different from that of today. It is possible the Godié-Guibéroua Bété were initially in closer geographic contact with Dan-Glio than Western Wè was (currently contiguous to Dan), and that the Godié-Guibéroua Bété group "moved on", pushing further down into the forest into their current position, while the Wè peoples seem to

[12] Lafage (1983: 54) notes for example that in Côte d'Ivoire today in Kru regions, Krus are in the minority, for example in the prefecture of Daloa, prior to 1980, the following figures held: Kru (from the region) 27.81 %; Non Ivoirians, 25.49 % ; Akan, 18.74 %; N. Mande,13.64%; S Mande, 9.71%; Gur, 4.57.

[13] Bonny Sands (p.c.) suggests that in some African cultures, speaking "differently" is a way for leaders to gain social status and upward mobility. Could this be behind the adoption of Kru central vowels among the Dan dialects?

have moved in between them and their Mande neighbors. It remains to be seen if any traditional accounts or historical evidence exists to justify such a scenario.

The conditions and mechanisms leading to central vowel innovation are multiple and certainly have not all been identified. The means by which areal features propagate is also not clear, but hopefully we are beginning to better understand these kinds of phenomena, and we may learn more as we continue to watch central vowels emerging (and perhaps spreading) within Kru (and beyond).[14]

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Abbreviations

1	first person	PL	plural
PERF	perfective	SG	singular

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[14]The examination of Akye central vowels is certainly a subject for further research.

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