INITIAL CONSONANT CLUSTERS IN YATEÉ ZAPOTEC[1]

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0. The phonological systems of Zapotecan languages exhibit a number of properties which make them of broad linguistic interest.[2] A primary point of interest is the "fortis/lenis" feature, claimed to be the main distinction in the consonant systems of most Zapotecan languages. Another point of interest is the complex morphophonemics involved in the verbal morphology. Zapotec further has an extremely rich system of initial consonant clusters in some dialects, which is partially caused by and partially constrained by the interaction of the fortis/lenis distinction with the verbal morphology. The purpose of this article is to describe briefly the consonant cluster system in a dialect of Zapotec, and then to discuss this system in terms of the claims made by Greenberg (1978a) with regard to universal constraints on consonant cluster systems.

1. The phonemes of Yateé Zapotec are presented in table 1. As mentioned, the main distinction in the consonantal system is usually

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TABLE 1

THE PHONEMES OF YATEÉ ZAPOTEC

		Labial	Dental	Retroflex	Alveo-palatal	Velar	Uvular
Stops	Fortis	p	t			k	
	Lenis	b	d			g	
Fricatives/							
Affricates	Fortis		s	š	č[tš]		
	Lenis		z	ž	ǰ[dž]		γ
Nasals	Fortis	(M)	N				
	Lenis	(m)	n				
Liquids	Fortis		L				
	Lenis		l				
Glides						y	w
Tap/Trill			(r)				
Vowels i	o		iʔ	oʔ	iʔi	oʔo	
	e[ɛ]	a	eʔ	aʔ	eʔe	aʔa	

[M, m] are phonemic only in loanwords. /r/ occurs only in loanwords.

designated by Zapotecanists as fortis/lenis rather than voiceless/voiced. The phonetic phenomena which characterize this opposition include the following. (1) Fortis obstruents are always voiceless, while lenis can be voiced, partially devoiced, or voiceless. (2) Fortis stops and affricates always retain their stop closure, whereas lenis stops and affricates are often realized as fricatives. (3) Fortis obstruents are usually of longer duration than lenis obstruents (see table 2 for examples of typical allophones of two fortis and two lenis obstruents). (4) In the laterals and nasals, the fortis and lenis phonemes are primarily distinguished by length, with the fortis having about twice the duration of the lenis. Both are voiced, although the fortis lateral is usually partially devoiced medially and finally. The lenis nasal is homorganic to abutting consonants (and is velar in final position), but the fortis nasal can vary between a homorganic and a dental nasal in the environment of a labial or velar consonant or finally. It is because both fortis and lenis sonorants are voiced, and also because lenis obstruents are often devoiced, that the designation "voiced/voiceless" is not appropriate to the Zapotec system (see also Nellis and Hollenbach 1980).[3]

[3] The actual phonetic correlates of the fortis/lenis distinction are more complicated than indicated here. For example, the fortis/lenis consonants systematically interact with vowel length, vowel onset, and stress, and the duration of the obstruents interacts in a complex way with position and manner. A detailed study of these phonetic facts will be presented in Jaeger (in preparation).

TABLE 2

ALLOPHONES OF SOME FORTIS AND LENIS OBSTRUENTS

			Fortis				Lenis
/t/	→	*t·*	initially	/d/	→	*d, ḑ, ð, ð̧*	initially
		t:	medially			*d, ð*	medially
		tʰ	finally			*ð̧, θ*	finally
/č/	→	*č·*	initially	/ǰ/	→	*ǰ, ǰ̧, ž, ž̧*	initially
		č:	medially			*ǰ, ̣ž*	medially
		čʰ	finally			*ǰ̧, ž̧, š*	finally

˒ = partially voiced.

ˑ : = half-long, long.

The phonemes /w/, /y/, and /γ/ do not enter into fortis/lenis oppositions. Initially and medially, /w/ and /y/ are fully or partly voiced and somewhat fricated; finally they are voiceless. While they can change in voicing characteristics due to the influence of neighboring segments, they do not have the differences in length, frication, etc., characteristic of the fortis/lenis distinction, and in fact [w] and [w̥], for example, can be in free variation in some environments. (Note also that /w/ is characterized by marked lip rounding, which /g/, which is usually rendered as a velar fricative and thus can potentially be confused with /w/, does not have.)

The voiced uvular fricative /γ/ has the voiceless allophone [X] in the environment of voiceless consonants and word-finally, but there is no variation of length, stridency, etc., between [γ] and [X].

2. The verbal morphology in Yateé Zapotec consists of person-marking suffixes, and either single-consonant prefixes or stem-initial consonant mutation (or both) to signal certain aspects. There are a number of verb classes, and each class takes a different combination of aspectual prefixes and mutations. Examples of types of aspect markings are shown in table 3.[4] The most common aspectual prefixes are [š-, ž-]

4 All Zapotecan languages are tone languages. The tone markings used in this paper are: ´ high, ` low, ˇ rising, ˆ falling; mid tones are not marked. These tones are of course realized differently in different dialects, and not all dialects have the same number or types of tones. Yateé Zapotec has four tones: high, low, low-to-high rising, and high-to-low falling. In some cases we have standardized phonetic notation when citing forms from other sources. Further, since tonal information is not available in all of the sources cited, tone markings do not appear in all cited forms.

TABLE 3

EXAMPLES OF VERBAL MORPHOLOGY

(a) With stem-initial consonant mutation:

ǰóLá?	'I am reading'	(continuative aspect)
béLá?	'I read'	(perfective aspect)
góLá?	'I will read'	(potential aspect)

(b) With aspectual prefixes:

ẓzênágá?	'I am listening'
bzênágá?	'I listened'
wzênágá?	'I will listen'

(c) With prefixes and stem-initial consonant mutation:

zwá?	'I am living (in/at)'	nězlá?	'I know'
wzwá?	'I lived (in/at)'	wnèzlá?	'I knew'
swá?	'I will live (in/at)'	Nézlá?	'I will know'

(d) With stative prefix /n-/:

ngólébè?	'he is old'	nǰâksé	'is different'
ntónén	'it is long'	nLálè?én	'it is hot'
nsêdlá?	'I am studied in something'	nyéṣó	'is toasted'

for continuative, [w-, p-, b-] for perfective, and [w-] for potential. Further, there is a stative prefix, which is a lenis homorganic nasal (shown under (d) in table 3). Since most verbal stems begin with consonants, the consonant clusters produced by these prefixes are numerous and complex.

3. The initial consonant cluster system of Yateé Zapotec is shown in table 4. Several general points should be noted about this system. First, the system is richest in the areas affected by the verbal morphology; but there are a number of cluster types which exist independently of the verbal system, and most of the types which occur in verbs also occur in other lexical classes.

Second, there is an obvious tendency for clusters to be homogeneous, but it appears that the homogeneity of the clusters is not based strictly on a fortis/lenis grouping, but rather partly on a voiced/voiceless grouping. When both members of a cluster are obstruents, they are either both fortis (i.e., voiceless) or both lenis (i.e., voiced or partly voiced). But both fortis and lenis nasals and laterals (which are voiced) can follow lenis obstruents, since they are also voiced; in this case a fortis consonant combines with a lenis, where both have the same

TABLE 4

THE INITIAL CONSONANT CLUSTER SYSTEM OF YATEÉ ZAPOTEC

First Element	Second Element																			
	p	b	t	d	k	g	s	z	š	ẓ	č	ǰ	γ	N	n	L	l	r	w	y
p					pk		ps		pš		pč̌							pr*	pw*	
b				bd		bg		bz		bẓ		bǰ			bn		bl		bw	by
t									tš									tr*		
d										dẓ									dw	
k																			kw	
g																		gr*		
s	sp*		st								sč̌								sw	
z		zb		zd								0	zγ		zn				zw	zy
ṣ̌			ṣ̌t		ṣ̌k		ṣ̌s				ṣ̌č̌			šN	ṣ̌n	ṣ̌L			ṣ̌w	
ẓ̣		ẓ̣b		ẓ̣d		ẓ̣g		ẓ̣z				ẓ̣ǰ	ẓ̣γ	ẓ̣N	ẓ̣n	ẓ̣L	ẓ̣l		ẓ̣w	ẓ̣y
č̌													č̌γ							č̌y
ǰ										ǰẓ			ǰγ				ǰl		ǰw	ǰy
γ			γt						γš		γč̌	γǰ								
N				Nd		Ng					Mč̌*	Nč̌*								
n		nb	nt	nd	nk	ng	ns	nz	0	nẓ	nč̌	nǰ	0			nL	nl		nw	ny
l													lγ		ln					
w		wb	wt	wd	wk	wg	ws	wz	wš	wẓ	wč̌	wǰ	0	wN	wn	wL	wl	wr*		wy

* Occurs only in loanwords. 0 = probable gap in data.

voicing. Fortis obstruents usually are not followed by a voiced con-
sonant; when they are, it is either a fortis lateral or nasal, or a glide
(which does not enter into fortis/lenis oppositions), and it is usually part
of a verbal morphophonemic alternation.

The main type of cluster which can be heterogeneous with regard to
both voicing and fortis/lenisness is that which begins with a nasal. This is
due to the fact that the stative prefix, a lenis nasal, combines with nearly
all other consonants (note that /n-/ is also an aspectual marker for some
verb classes, e.g., *nwàbé?* 'he is carrying'). Therefore, clusters of voiced
(lenis) plus voiceless (fortis) consonants do occur (see table 3(*d*) for
examples). The fortis nasal has been found only before lenis stops in
native words (e.g., *Ngǎ* 'this'); these clusters are homogeneous in voicing
but not fortis/lenisness. However, in borrowed words, fortis nasal +
fortis (voiceless) obstruent clusters do occur: *Nčé* 'last night' (from
Spanish *anoche*).

4. We turn now to a discussion of the consonant cluster system of
Yateé Zapotec in terms of universals postulated for such systems.
Greenberg (1978*a*) researched the occurrence of initial and final cluster
types in 104 languages chosen to represent a broad sample of the world's
languages. He proposed forty universals, some of which are absolute and
some of which are implicational, which describe the likelihood of
occurrence of a large number of cluster types. In general, Yateé Zapotec
is in accord with these universal claims; however, there are several
universals to which it presents exceptions.

4.1. The first universal to be discussed has to do with initial semi-
vowels. Greenberg states that "voiced semivowels are not followed by
obstruents in initial systems" (1978*a*:259). However, in Yateé Zapotec,
nearly every obstruent in the system can be preceded by [w-], and often
there is no morpheme boundary between the [w] and the following
obstruent (see table 5 for examples).

Greenberg states this universal in very strong terms, noting that in his
data "there is no valid example of a voiced semivowel separated from a
syllable peak by an obstruent" (1978*a*:258-59). Because of the strength of
his claim, it would be useful to document carefully that the segment in
these clusters is actually a [w].

Spectrographic readings show a relatively short[5] voiced segment with
a definite formant structure and a second formant which moves rapidly

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[5] Spectrographic measurements show that these initial segments average 49 msec in
length, as opposed to, for example, medial unstressed vowels which precede a consonant
(average 91 msec), or medial stressed vowels which precede a consonant (average 169
msec). They are even somewhat shorter than the [w] which occurs as the second member
of a consonant cluster (average 79 msec).

TABLE 5

INITIAL [w] + OBSTRUENT CLUSTERS

wtăsàʔ	'I slept'	wšézìlè	'morning'
wbìɣ̌	'sun'	wkàʔà	'I removed'
wbèɣ	'hoe'	wčékwáʔ	'I will hit'
wzáʔà	'I ran'	wškénóʔ	'thank you'
		wsíâʔ	'I will throw'

upward. Although in other environments /w/ is often somewhat fricated (as noted above), the segment in question is not fricated and is clearly a semivowel-like segment. Articulatorily, the strong lip rounding, characteristic of /w/ in other environments, is present in this initial segment. So phonetically, this segment is clearly a voiced labio-velar semivowel.

Several other hypotheses for the identification of this segment were tried and rejected. For example, we found it unacceptable to analyze it as a nonsyllabic /u/ for several reasons. First, there is no [u] in this dialect in other environments. One could argue that analyzing it as a /u/ would make the vowel inventory of this language more regular (i.e., /i e a o u/ rather than /i e a o/). However, Maddieson (1979) argues that with a small segment inventory, the extreme values of the vowel space are less likely to be used, so that the /i e a o/ analysis is highly plausible for a four-vowel system.[6] While most other Zapotec languages are analyzed as having from five to seven vowels, at least two other Villa Alta dialects (Zoogocho [Long, n.d.] and Cajones [Nellis and Hollenbach 1980]) are analyzed as having the /i e a o/ system. Second, the behavior of this segment is decidedly unvowel-like, as it occurs only initially before consonants, and a vowel is unlikely to have such a restricted occurrence; also, there are no other vowel-initial words in this dialect. Further, its duration is much shorter than the usual duration for vowels in this dialect (see n. 5). And finally, it acts as an aspectual prefix, and all other basic aspectual prefixes are consonants.

Viewing this initial [w-] from the historical point of view sheds additional light on the problem. As shown in table 6, most other Zapotec languages have a full syllable (usually /gu-/) where Yateé has [w-] as an aspectual prefix; however, the two other Villa Alta dialects cited here have /gʷ-/. Note that in Zoogocho, initial /gʷ/ varies freely between [gʷ] and [w], indicating that other Villa Alta dialects also have these initial [w-] clusters (e.g., Zoogocho wniʔa 'rich', wsoeʔ 'he was

6 Note that in Crothers's (1978) discussion of universals of vowel systems, he cites as many languages with the system /i e a o/ as he does languages with the system /i e a u/ (see 1978:138).

TABLE 6

COMPARISON OF YATEÉ [w-] TO FORMS IN OTHER ZAPOTEC LANGUAGES

Language	Source	'(I/he)* slept'	'(I/he) asked'	'sun'	'firewood'
Villa Alta					
Yateé	Long (n.d.)	wtásàʔ (I)	wNábáʔ (I)	wbiǰ	wágé
Zoogocho	Pike (1948), Leal (1950),	gʷtasbeʔ (he)			wage
Yatzachi	and Butler (1976; 1978)	gʷtaseʔ (he)	gʷNab-	bgʷiž	gʷagə
Valley					
Santo Domingo .	Bartholomew and Yates (1974)	godyeʔsan (I)	gunab-		
Mitla	Briggs (1961)	gudyehsni (he)		gubihdz	
Isthmus					
Juchitán	Pickett (1955; 1978)	guʔusibeʔé (he)	gunaʔaba-	biǰ, gubiǰa	
Tehuano	Radin (1935)			gubiǰa	
Juarez					
Atapec	S.I.L. ms. (n.d.)	gut·a (lay down)		bitsa	waga
Ixtlan	Swadesh (1947)			ubitsá	(za)guágá
So. Mountain					
Texmeḷucan ...	Speck (1978)	bdásá (I)		(do)	
Lagueche	de Angulo and Freeland (1935)			bits	
Choapan	Lyman (1964) and Lyman and Lyman (1977)	gusibiʔ (he)	gunaʔaba (I)	obiǰa	
Rincón	Earl (1968)				wága

* Forms with the suffix [-be] are familiar; both formal and familiar 'he' can also be 'she'.

TABLE 7

COMPARISON OF ASPECTUAL PREFIXES

Santo Domingo (Valley)	Yateé	
rù-žíʔìǰán	d-žíǰáʔ	'I laugh'
gù-žíʔìǰán	w-žíǰáʔ	'I will laugh'
bà-žíʔìǰán	b-žíǰáʔ	'I laughed'

present').[7] It is likely that this prefix was originally a full syllable,[8] and that it has contracted to a single consonant in the Villa Alta dialects. Since vowel elision is a widespread process in Villa Alta Zapotec, this is not an unexpected development. In fact, all the Yateé single-consonant aspectual prefixes seem to have come from earlier full syllables (see table 7 for a comparison to a Valley dialect). Note that the Texmelucan dialect has also lost the vowel, but the labiality of the vowel has caused the original velar stop to become a labial.[9]

In the word for 'sun', there seems to have been more pressure to lose the original *gu syllable, possibly because it had no morphological significance (although the word may have originally been bimorphemic), and also possibly because the labiality of the [b] would cause any reduced syllable (e.g., [w] or [g^w]) to be somewhat perceptually re-dundant and therefore subject to loss. Several dialects which retain the [gu] as an aspect marker have lost it entirely in this word: Ixtlan has reduced it to [u], Choapan to [o], and Yateé to [w]. (Note the metathesis in the Yateé form; initial [g^w+b] sequences frequently metathesize in this dialect: Yatzachi bg^{w}eγ, Yateé wbèγ 'hoe'; Yatzachi bg^{w}isǝn 'it got wet', Yateé wbísàʔ 'I am getting wet'; see Butler 1980:123-35.) Finally, it appears from the words for 'firewood' that *g before vowels other than

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[7] Cajones Zapotec also has clusters which begin with [w-]: wbìn 'famine', w+lap 'harvest' (Nellis and Hollenbach 1980:96); however, since the verbal morphology is not discussed in this source, comparisons to the Yateé aspectual prefix [w-] cannot be made here.

[8] Swadesh (1947) reconstructs the fortis consonants as clusters or geminates and the lenis as single consonants; the lenis obstruents he reconstructs as voiceless phonemes. He would therefore reconstruct the aspectual prefix in question as *ku. However, for the sake of simplicity in this article, we refer to it as *gu (see also Suárez 1973).

[9] Choapan Zapotec (Lyman and Lyman 1977) has some verbal forms with initial [u-] which appear to bear a resemblance to the Yateé [w-] forms, for example, ugiáʔa 'I will go'. However, Lyman and Lyman explicitly state the environments in which /u/ is realized as phonetic [w], and they exclude this initial preconsonantal position. We assume, therefore, that this segment is realized as a [u] in Choapan Zapotec.

[u] remains [g] in Yateé, and that a [w] occurs in Yateé that corresponds to [w] in other dialects. Therefore, it appears that a highly natural process, [gu] > [w], has produced these unusual clusters.

Taking clues from these other dialects, we can reject two final possible hypotheses. (1) The segment cannot be analyzed as a [gw] cluster, as there is none of the frication characteristic of [g], and the formant structure is indicative of a sonorant. Further, the cluster /gw/ has not been found elsewhere in Yateé Zapotec, nor is there any independent evidence for positing /gʷ/ as a phoneme. (2) The segment cannot be considered a [gu] or [go] syllable. Phonetically it is clearly only one segment; further, it carries no phonemic tone, and all syllables in Yateé Zapotec have phonemic tone.

For all of these various reasons, we conclude that Yateé Zapotec presents a valid example of an initial cluster consisting of a voiced semivowel followed by an obstruent.

4.2. The second universal to be discussed here is related to the first. Greenberg (1978a:260) states that except for voiced nasal followed by homorganic unvoiced obstruent, a voiceless consonant is not preceded by a voiced consonant. The initial [w-] clusters just discussed are exceptions to this observation, although the [w] does tend to devoice in fast speech when followed by a voiceless consonant. For example, for the first word listed in table 5, two pronunciations are possible: [w̥tăsà] or [wtăsà].

Yateé Zapotec also has the nasal + voiceless obstruent clusters which Greenberg notes as being the rare exception to this universal. The lenis nasal is always homorganic to following consonants, as noted above (see (d) in table 3 for examples). The fortis nasal, while not always homorganic, has only been found before voiced obstruents in native words (although the potential for nonhomorganic fortis nasal + voiceless obstruent clusters does exist). In loanwords, however, these nonhomorganic clusters do occur, due to the vowel elision typical of Zapotec borrowings and the fact that nasals tend to retain the place of articulation of the source word. For example, *machete* was borrowed as [Mčêtʰ].

4.3. The third universal to be discussed is an implicational universal which, according to Greenberg, stems from the predominance of voiceless over voiced obstruents in the world's languages. The universal states that in initial sequences, the existence of at least one sequence of voiced obstruent + nasal or semivowel implies the existence of at least one sequence of unvoiced obstruent + nasal or semivowel (1978a:264). While, strictly speaking, this universal holds true in Yateé Zapotec, it could be taken to imply that voiced obstruent + nasal/semivowel clusters are the

TABLE 8

OBSTRUENT + NASAL OR SEMIVOWEL

dwáʔ	'maguey'	*kwăn*	'edible leaves'
žNâ	'red'	*šNôlè*	'white'
bnéʔé	'orchid'		
byáʔá	'I danced'		

marked type; however, they are the unmarked type in this language. Of the sixteen obstruent + nasal or semivowel clusters in native words, only four begin with voiceless obstruents (see table 8 for examples). This is due to the strong tendency toward homogeneity in voicing mentioned earlier. (Note that Greenberg also mentions homogeneity in voicing of clusters as a universal tendency in cluster systems—1978*a*:252.)

4.4. The fourth point has to do with combinations of sibilants. Greenberg mentions the "strong tendency for different types of sibilants ... not to combine" (1978*a*:257). Although the only universal he formulates regarding sibilants has to do with final clusters, initial sibilant combinations are also rare. While retroflex fricatives may not normally be classified as sibilants, in Yateé Zapotec the retroflex fricatives are quite high pitched, with energy starting between 1,500-2,000 Hz, and thus they could accurately be called sibilants. In any case, the initial sequences [šs] and [žz] are striking; examples are given under (*a*) in table 9.

Several other Zapotec languages allow sibilant clusters, in particular the other dialects of Villa Alta Zapotec (see (*b*) in table 9). Zoogocho allows numerous such clusters; however, when a sibilant cluster arises from prefixing the continuative aspect marker *ǰ-* [dž] to a stem beginning with [š, ž, ṣ̌, ẓ], the [dž] is simplified to [d]: *ǰ+žižbeʔ* = *džižbeʔ* 'he/she (fam.) laughs'. On the other hand, Lachixio (Southern) has an assimilation rule which creates sibilant clusters: the continuative prefix *r-* (flap) becomes [s] and [š] respectively before verb stems with initial [z] and [ž] (Persons 1979:125).

An informal review (conducted by us) of the over 200 languages summarized in the Stanford Phonology Archive revealed only one other language in which a combination of this type is possible: Jacaltec, a Mayan language. Greenberg mentions that some Mayan languages have cluster simplification rules designed specifically to disallow these sibilant clusters (1978*a*:270). However, in Jacaltec these rules are optional, so that both [šs] and [sš] clusters are in fact allowed (Craig 1977:413-15).

Many of the sibilant clusters in Yateé Zapotec arise due to the continuative aspect prefixes *š̌-*, *ž̌-*, since verbs with stem-initial [s, z]

TABLE 9

SIBILANT CLUSTERS

(a) Yateé Zapotec forms:

šsíàʔ	'I throw'	žzèlnìlé	'council'
šsôγáʔ	'I write'	žzíàn	'I hang it up'

(b) Forms from other Zapotec dialects:

Yatzachi: žšáʔ 'cooking vessel'   žsaʔ 'lard' (Villa Alta)
Mitla: šseʔni 'his voice' (Valley)
Zoogocho allows the following sequences (no examples available) (Villa Alta): zs zš
zž zš̌ zž̌ sš žs žš̌

(c) Comparison of continuative prefix:

'he/she listens'	'I run'
Yateé: ž̌-zênágbéʔ	Yateé: ž̌-záʔà
Choapan: ru-zenagabiʔ	Yatzachi: ǰ-zaʔa
Atapec: ru-ðánaga	Juchitán: ri-zá
	Texmelucan: r-zá̃

normally take these prefixes. As mentioned above, most other Zapotec languages have full-syllable aspect markers. For the continuative aspect, most have *rV-* (where *r* is a flap or a trill); some languages have both *rV-* and *r-*. The other Villa Alta languages, however, primarily take *ǰ-* (see (c) in table 9). If we assume that at some earlier stage all Zapotec languages had full-syllable prefixes, then it again appears that natural phonetic changes have produced these rare clusters; in this case a combination of the vowel elision common in Villa Alta Zapotec, and probably the change from **r* to the sibilant fricatives and affricates.

4.5. The last universal to be discussed has to do with final consonant clusters. Greenberg states that "every language with final clusters contains at least one cluster with a final obstruent in the dental-alveolar region" (1978*a*:268). But in native Yateé Zapotec words, the few final clusters all end in the voiceless allophone of the uvular fricative (e.g., [zápX] 'chayote vine', [gasX] 'black').[10] However, in Spanish loanwords, final clusters which arise due to the elision of a vowel can end in a dental if the Spanish word did so (e.g., [láps] 'pencil', from *lápiz*).

[10] Cajones Zapotec shows the same pattern, in that nearly all native final clusters end in a lenis uvular fricative which Nellis and Hollenbach (1980) symbolize as /R/: *bž̌idR* 'woodpecker', *gásR* 'black'. The only other possible final sequence is /kw/, and this occurs only morpheme- (not word-) finally.

5. Synchronic universals such as those discussed above are necessarily a reflection of diachronic changes. Greenberg (1978b:75) argues that "In general one may expect that certain phenomena are widespread in language because the ways they can arise are frequent and their stability, once they occur, is high. A rare or non-existent phenomenon arises only by infrequently occurring changes and is unstable once it comes into existence." In the case of Zapotec, however, it appears that several very natural and common sound changes have produced a complex system of initial consonant clusters including several extremely uncommon sequences. Specifically, vowel elision (or syllable reduction in the case of [gu] > [w]) has produced semivowel + obstruent and sibilant + sibilant clusters, among others.

Greenberg predicts that these clusters should be unstable and will eventually simplify in some way. The fact that initial [w] tends to devoice in fast speech before voiceless obstruents in Yateé Zapotec and the fact that other languages discussed here have rules for reducing sibilant clusters indicate that this simplification is underway at the phonetic level. However, it is likely that the Yateé clusters may be more stable than would otherwise be expected, because in many cases the initial consonant performs the important morphological function of marking verbal aspect. So, for example, [w] could not simply be dropped in initial clusters in verbs, since it alternates paradigmatically with $\emptyset$ in the aspect system (cf. (c) in table 3). In order for these clusters to be eliminated, the language would have to undergo major changes in its morphological system. Thus, it appears that the influence of the morphological system increases the viability of these otherwise unnatural clusters.

Rather than interpreting the data presented here as a contradiction to Greenberg's posited universals of consonant clusters, we believe that these rare exceptions are better seen as a reinforcement of claims that certain consonant sequences are more likely to occur than others. Yateé Zapotec presents a case where natural diachronic changes have led to an unnatural system of consonant clusters which, while showing some signs of instability, remains fairly stable due to its morphological significance.

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