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REDUPLICATION AND SYLLABIFICATION IN ILOKANO

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This article presents an analysis of the productive morphophonemic phenomena in a dialect of Ilokano (N. Philippines). The analysis bears on three theoretical points. First, we argue that the rules creating well-formed syllable structure, hence syllabification itself, must apply cyclically. Second, a reduplication pattern of this dialect provides support for the theory of Prosodic Morphology (McCarthy and Prince (forthcoming)). The template for reduplication can be straightforwardly characterized in prosodic terms, but not segmentally. Third, we suggest that Ilokano exhibits 'antitransfer', i.e. the copying of a glide as a vowel in reduplication, and discuss the implications of Ilokano antitransfer for the theory of reduplication proposed by Steriade (1988).

Introduction

Ilokano, a major language of the Philippines, is spoken in northern Luzon, in many other locations in the Philippines, and in emigrant communities in the United States and elsewhere. This article describes part of the phonological system of one dialect of Ilokano, based on extensive data from several consultants. Our intent is in part to present data from Ilokano that are not available or systematically discussed in the existing literature. However, our main focus is on questions of phonological theory.

We address three issues. One is syllabification: how a set of rules converts raw underlying forms into well-formed surface syllables. Such rules include Glottal Epenthesis, Glide Formation, Metathesis, and others. We argue that in an analysis in which as much information about syllabification as possible is derived by rule, syllabification must apply cyclically. This adds to the

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mounting evidence (Kiparsky (1979), Steriade (1982), Harris (1983), Ito (1986)) that syllabification is in general a cyclic process.

We next treat the reduplication system, where we show that Ilokano abundantly confirms a hypothesis made by McCarthy and Prince (forthcoming): the target of a reduplication rule must be defined prosodically, using notions such as 'heavy syllable', rather than as a particular sequence of consonants and vowels. We also note the existence of 'anti-transfer' in Ilokano reduplication, a phenomenon whereby a glide in the base form is reduplicated as a vowel; and assess the extent to which Ilokano antitransfer counterexemplifies the theory of reduplication proposed in Steriade (1988).

The variety of Ilokano we describe is that spoken by the second author and by three of her close relatives. All of them come from the city of Laoag, and currently live in Los Angeles. We have found that even among these four speakers, there is phonological variation, and our data also differ in some respects from descriptions in the literature. We therefore caution that our observations are not guaranteed to be replicable with all other Ilokano speakers. However, examination of earlier work leads us to believe that the data we describe are not unrepresentative.[1]

Where relevant, we express rules in moraic notation (Hyman (1985), McCarthy and Prince (forthcoming), Hayes (forthcoming), which is a modified version of CV Phonology (McCarthy (1981), Clements and Keyser (1983)).

The paper is organized in four main sections. The first section covers the segmental inventory, syllable structure, and the productive morphophonemic rules. The second section addresses cyclic syllabification, and the third discusses reduplication. In the fourth section, we show how the results of the preceding sections bear on the phenomenon of antitransfer. Finally, we briefly describe the remaining productive morphophonemic rules, and summarize our results.

1. Ilokano segments, syllables, and phonological rules

1.1. Segment inventory

Under (1) we list the sounds that can form surface contrasts in the dialect under discussion. Symbols have their conventional phonetic values, except for

[1] Major references on Ilokano phonology include Vanoverbergh (1955), Constantino (1959, 1971a), and Sibayan (1961). These accounts cover material we will not treat here, particularly allophonic variation and the unproductive, frozen morphophonemics.

the following: /r/ is tap [ɾ], /rr/ is a long trilled [r:], and /e/ is lax [ɛ]. Sounds whose phonological status is discussed below are enclosed in parentheses.

(1)	p	t	(č)	k		i		u
	b	d	(ǰ)	g		e		(o)
	(f)	s	(š)				a	
	m	n		ŋ				
		l						
		r						
	w		y		(ʔ),(h)			

The opposition between /o/ and /u/ has a precarious status. For some speakers, they appear to be allophones, with [o] occurring in final syllables, [u] elsewhere. Other speakers, probably those with more knowledge of Spanish and English, make a somewhat unstable distinction. However, there is much vacillation, with a given word often allowing both possibilities. Speakers that have an /o/–/u/ opposition retain the prohibition on /u/ in final syllables observed by speakers for whom [o] and [u] are allophones.[2]

/č/, /ǰ/, and /š/ always occur with a short [y]-like offglide, and may be phonemicizable as /ty/, /dy/, and /sy/; see below. We lack the evidence to decide this issue.

/h/ occurs in borrowings, such as *hwés* 'judge', *ʔahénte* 'agent', and *hamón* 'ham'. It also occurs in one native word: *haʔán*, an optional variant of the negative marker *saʔán*. /f/ is rarer, less firmly integrated into the phonology, and is usually replaced by /p/: *fyésta, pyésta* 'fiesta'; *filipínas, pilipínas* 'Philippines'.

It is difficult to determine whether [ʔ] is present in underlying representations; we address this question in section 2.2.

All consonants except [f,h,ʔ] may appear as geminates. The vowels may occur as long, but only under certain phonological and morphological circumstances discussed below; vowel length need not be present in underlying forms.

The location of stress is a lexical, unpredictable property of stems, but obeys certain restrictions. Stress may only occur in certain locations: some stems have penultimate stress, some have final stress, and a handful of borrowings have antepenultimate stress. The addition of a suffix to a stem

[2] [u] may occur in final syllables if it is followed by /y/: *bábuy* 'pig'.

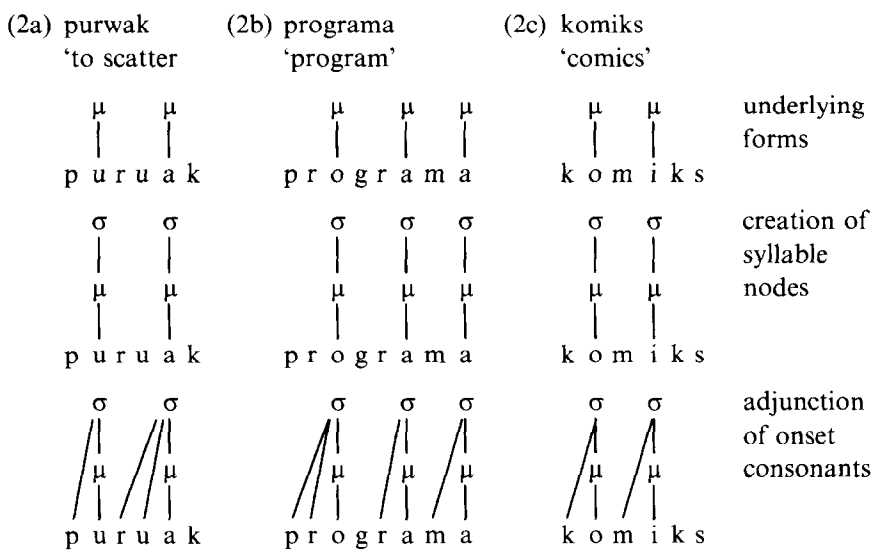
normally draws the stress one syllable to the right. For detailed discussion, see Vanoverbergh (1955: 28–31).

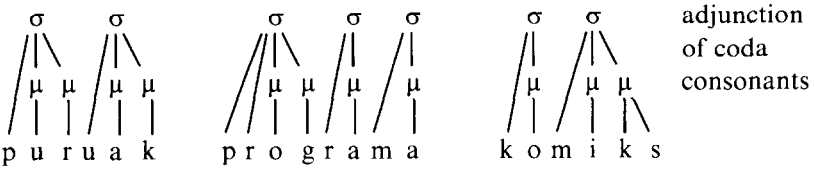
1.2. Syllable structure

Ilokano syllables take the form $C_1^3VC_0^2$. Most syllable-initial consonant clusters are of the form *C + glide*, with a few *C + liquid* in borrowings. Here are representative examples; /./ indicates syllable division: *pur.wák* 'to scatter', *pis.kír.ya* 'fish pond', *ʔá.rak* 'wine', *prog.rá.ma* 'program', *pyás* 'kind of fruit', *pwék* 'kind of owl'.

Syllable-initial triple clusters are of the form *C + liquid + glide*: *ʔem.plyá.do* 'employee', *ʔin.dús.trya* 'industry', *bryát* 'rip apart'. With the exception of *bryát*, these occur only in borrowed words; they are rare and unstable for some speakers. Syllable-final clusters are confined to borrowings: *kó.miks* 'comics', *nárs* 'nurse', *kyú.teks* 'nail polish', *láyt* 'light', *pé.liks* 'proper name', *ʔéks.tra* 'extra'.

In our analysis of syllable structure, we assume a version of moraic theory proposed in McCarthy and Prince (forthcoming) and developed in detail in Hayes (forthcoming). In this theory, the construction of syllables proceeds as follows. Vowels appear in underlying forms dominated by a mora (symbolized /μ/), in order to distinguish them from underlying glides. In syllabification, each underlying mora is made the head of a separate syllable, symbolized /σ/. Next, onset segments are adjoined to the syllable node, and coda segments are adjoined to the syllable by placing them under a second mora. The derivations in (2) illustrate this.





Note that in (2a), underlying /u/ and /w/ are distinguished from each other by the presence of a mora on the vowel and the absence of a mora on the glide, following the basic assumption of prosodic theory that these segments differ prosodically, not segmentally.

The surface assignment of moras to syllables in our analysis indicates the distribution of phonological weight: coda consonants in Ilokano render their syllable heavy, represented formally by the extra mora, but onset consonants make no difference to syllable weight. There are two reasons why closed syllables must be counted as heavy in Ilokano. First, closed syllables act as heavy in the reduplication system, described in detail below. Second, the distinction between closed and open syllables is referred to in the Ilokano stress system: all native words with closed penults have final stress (see Vanoverbergh (1955: 28–29)).[3]

Syllable division in Ilokano works as follows. Intervocalic consonants are made the onset of the following syllable, so that *VCV* is divided *V.CV*, as in other languages. Sequences of the form VC_1C_2V are syllabified $VC_1.C_2V$, even where C_1C_2 can appear word-initially: compare *pur.wák* 'to scatter' with *rwár* 'outside'. For longer strings, it is usually impossible to determine syllable division, because phonological diagnostics are unavailable and native speaker intuitions are insecure in this area.

Finally, it should be noted that on the surface, every syllable in Ilokano has at least one onset segment. The way in which this requirement is enforced by various phonological rules is discussed below.

1.3. Morphology; overview of rules

To motivate the phonological rules that follow, it will be helpful to go over the Ilokano morphological system briefly. Ilokano morphology allows for prefixes, infixes, suffixes, reduplication, and enclitics. Infixes are usually

[3] In the dialect we describe, this final stress may optionally retract to the penult, so that native words with closed penults have vacillating stress. In contrast, final stress in words with light (i.e. open) penults remains consistently on the final syllable.

placed before the first vowel of the base. The bound morphemes that may follow a stem fall into two categories, true suffixes and enclitics. There are only two true suffixes, *-an* and *-en*, but they play a central role in the morphology: they have multiple functions and can combine with prefixes to form circumfixes. Most roots have at least one form suffixed with *-en* or *-an*. Enclitics, such as *-ko* 'my, by me' and *-mo* 'your (sg.), by you (sg.)', do not cohere phonologically with the stem, and in some versions of Ilokano orthography are written as separate words.

For many of the phonological rules that follow, the crucial environment is set up by the addition of *-an* or *-en* to a vowel-final stem. The general picture is that *-an* and *-en* by themselves are not well-formed syllables, so that some kind of adjustment must be made to establish well-formedness.

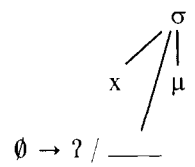
The straightforward cases occur when *-an* or *-en* is suffixed to a consonant-final stem. Here, the ordinary pattern of syllabification asserts itself, making the stem-final consonant the onset of the suffixal syllable: *tú.lad* 'to mimic', *tu.lá.den* 'mimic-goal focus'; *gá.taŋ* 'to buy', *ga.tá.ŋen* 'buy-goal focus'; *ta.ráy* 'to run', *pag.ta.ra.yán* 'place to run to'; *sá.ŋit* 'to cry', *pag.sa.ŋí.ten* 'to cause to cry'. Note that in all these examples, stress is pulled one syllable to the right, by a rule we will not formalize here.

In the remaining cases, where *-an* and *-en* are not preceded by a consonant, the basic syllabification principles cannot establish well-formedness, and some phonological rule applies to allow for a well-formed syllable. We review several such rules below.

1.4. Glottal Epenthesis

When the stem ends in /a/, the /a+a/ or /a+e/ sequence created by suffixation is normally resolved by inserting a glottal stop between the two vowels. Anticipating some later observations, we write the rule as in (3a). The notation should be read as follows: if a syllable lacks an initial consonant, a glottal stop is inserted to fill the empty onset position.

(3a) *Glottal Epenthesis*

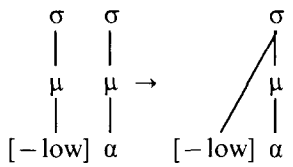


(3b) pyá	'health'	/pag-pyá-en/	→	pag.pya.ʔén	'to make healthy'
bása	'to read'	/bása-en/	→	ba.sá.ʔen	'read-goal focus'
čyénda	'store'	/čyénda-an/	→	čyen.dá.ʔan	'marketplace'
sáka	'foot, leg'	/pag-sáka-an/	→	pag.sa.ká.ʔan	'place where one walks barefoot'

1.5. Glide Formation

Glottal Epenthesis normally takes places if the stem-final vowel is /a/. The remaining vowels to be considered are /i/, /e/, and /o/. (/u/, where it is phonemic, does not occur stem-finally.) When a stem ending in /i,e,o/ is suffixed with *-an* or *-en*, the resulting hiatus is resolved by converting the stem-final vowel to a glide: /i/ and /e/ become /y/, and /o/ becomes /w/. We express the rule below in moraic notation. The rule should be interpreted as follows: a non-low syllable nucleus loses its syllabic status, becoming the onset of a following vowel-initial syllable. For /e/ and /o/, an additional process we will not formalize makes the glide phonetically high.

(4a) *Glide Formation*



(4b) babáwi	'to regret'	babawy-én	'regret-goal focus'	
masáhe	'massage'	masahy-én	'massage-goal focus'	
komádre	'godmother of one's child'	pag-komadry-án	'the reason why there are *komadres*'	
maného	'driver'	manehw-án	'drive-goal focus'	
sáŋo	'front'	pag-saŋw-én	'to cause to face forwards'	
sánto	'saint'	pag-santw-án	'to make into a saint'	

Glide Formation is ordered before Glottal Epenthesis, since when the rules compete for a single form, it is Glide Formation that takes precedence.

1.6. Concomitants of Glide Formation: Compensatory Lengthening and Palatalization

Glide Formation is sometimes accompanied by an optional process of

compensatory lengthening: the consonant that precedes the newly created glide may become geminated, as in *lúto* 'to cook' ~ *luttw-én, lutw-én* 'cook-goal focus'; *miki* 'wheat noodle' ~ *pag-mikky-án, pag-miky-án* 'place where wheat noodles are made'. Compensatory lengthening is described and analyzed in some detail in Hayes (forthcoming); we will not repeat this material here.

When the coronal obstruents /s/, /t/, and /d/ come to stand before a /y/ due to Glide Formation, they are palatalized to /š/, /č/, and /j/, respectively, as in *kaʔási* 'sorry for' ~ *kaʔaššy-án* 'to feel sorry for'; *pléte* 'fare' ~ *pleččy-án* 'pay someone's fare-goal focus'; *ʔádi* 'younger sibling' ~ *ʔajjy-án* 'treat as a younger sibling-goal focus'. The rule may be stated as follows:

(5) *Palatalization*

$$\begin{bmatrix} +\text{coronal} \\ -\text{sonorant} \end{bmatrix} \rightarrow [-\text{anterior}] \,/\, \underline{\quad} \begin{bmatrix} -\text{cons} \\ -\text{back} \end{bmatrix}^{\sigma\,/\,\mu}$$

1.7. Metathesis

A small number of roots in Ilokano end in the sequence /V?o/. When these are suffixed with *-an* or *-en*, the /o/ undergoes Glide Formation, placing the [?] in preconsonantal position, a location where it never occurs in underlying forms. The [V?wV] sequence may then be optionally adjusted to [Vw?V] by metathesizing [?] and [w]:

(6a) *Metathesis*

? w
1 2 → 2 1 (optional)

(6b) ba?ó	'rat'	pag-ba?w-án, pag-baw?-án	'place where rats live'
tá?o	'person'	ta?w-én, taw?-én	'to repopulate'
?ag-sa?ó	'to speak'	pag-sa?w-én, pag-saw?-én	'to cause to speak'
?ag-ga?ó	'to dish up rice'	pag-ga?w-án, pag-gaw?-án	'place where rice is dished up'
da?ó	'kind of tree'	pag-da?w-án, pag-daw?-án	'place where *daos* are planted'

2. Cyclic syllabification in Ilokano

In this section, we turn to our first theoretical issue: the way in which phonological rules convert underlying segmental sequences into well-formed surface syllables. Our discussion incorporates a diverse set of interrelated phenomena: the distribution of [ʔ], alternations between [ʔ] and ∅, the distribution of vowels and glides, and syllabification. We propose an analysis of these areas under which syllabification take place cyclically.

2.1. The distribution of [ʔ]

We begin by describing the distribution of [ʔ], which unlike most other sounds of Ilokano, is restricted and largely predictable. In section 1.4, we used suffixal alternations to motivate a rule of Glottal Epenthesis (3a). In this section, we account for the distribution of [ʔ] by proposing that most or all of its occurrences are derived by Glottal Epenthesis. To justify this analysis, we will describe in some detail the surface distribution of glottal stops.

To start, we mention the only environment in which [ʔ] contrasts with zero: /C ___ V, internal to a root. There are about 160 roots in Constantino's (1971b) dictionary containing internal *CʔV* sequences, including *samʔít* 'sweet', *gorʔón* 'kind of bird', *diramʔós* 'to wash one's face', and *pusʔóŋ* 'abdomen'. One also finds minimal and near-minimal pairs for [ʔ] vs. zero: *labáy* 'to serve food on a plate' vs. *labʔáy* 'bland'; *sáŋat* 'to inspect' vs. *saŋʔát* 'to climb up'; and *pirák* 'gem, money' vs. *perʔák* 'to break'. In this one context, [ʔ] might be set up as an underlying segment, though we suggest an alternative below.

In all other environments, [ʔ] does not contrast with zero. For instance, there is no contrast between [ʔ]-initial and vowel-initial morphemes. After a pause, a morpheme that doesn't begin with any other consonant must begin phonetically with [ʔ]. We have included these post-pausal [ʔ] in our transcriptions for clarity, although they seldom are recorded in grammars, and never appear in Ilokano orthography.

Intervocalically in roots, as in *babáʔi* 'woman, girl', *poʔón* 'root', and *gaʔéd* 'eagerness', there is again no contrast between [ʔ] and zero, because hiatus is forbidden in Ilokano; *VV* sequences are phonologically excluded.[4]

When a morpheme that begins with [ʔ] in isolation is placed after another morpheme, the patterning of the data is more complex: sometimes [ʔ] is

[4] In fluent speech we have occasionally noticed vowel sequences; these arguably result from fast-speech deletion of [ʔ]; see below.

obligatory, sometimes it is absent, and sometimes it alternates freely with zero. This pattern is discussed in detail below; for present purposes it suffices to say that in no case do the facts justify an underlying contrast between vowel-initial and [ʔ]-initial morphemes.

Lastly, in syllable-final position, [ʔ] does not occur in underlying forms. Phonetic [ʔ] appears syllable-finally as a fluent-speech variant of /t/, derived by the following rule:

(7) */t/ Weakening*
t → ʔ / ___ C (optional, fluent speech only)

For example, *ʔiʔlóg* 'egg' is a fluent-speech variant of *ʔitlóg*; and *ʔagaʔ-dúlse* 'to smell like candy' is a fluent-speech version of *ʔagat-dúlse*. Since /t/ Weakening is optional, it is clear that such forms have underlying /t/.[5] Syllable-final [ʔ] may also be created by Glide Formation, as in (6b), though such instances are often resolved by Metathesis (6a).

2.2. *An analysis for [ʔ]*

To summarize the facts: (a) The distribution of [ʔ] is almost entirely predictable. (b) Unlike other sounds, [ʔ] is confined to syllable-initial position, except when derived by late rules. (c) Both hiatus ([VV]) and utterance-initial vowels are forbidden; that is, no syllable may begin with a vowel on the surface. (d) Based on the alternations in suffixes (section 1.4), there is good reason to posit a rule inserting [ʔ] in syllable-initial position, namely Glottal Epenthesis (3a).

A reasonable inference is that these facts are connected. To capture the connection, we follow Constantino (1959) in suggesting that [ʔ] is not phonemic, but is always derived by Glottal Epenthesis (3a). It will be recalled that the Glottal Epenthesis rule inserts [ʔ] only in onset position; thus the non-appearance of [ʔ] in codas (except where derived by late rules) is accounted for. Moreover, Glottal Epenthesis is obligatory, so that the absence of utterance-initial vowels and of hiatus is also predicted.

Here are examples of the proposed [ʔ]-less underlying forms and derivations:

[5] In the dialect described by Constantino (1971a), the prefixes *ʔagat-/ʔagaʔ-* 'to smell like' and *pagat-/pagaʔ-* 'to reach up to' may only be pronounced *ʔagaʔ-, pagaʔ-*; and thus may have been restructured with phonemic /ʔ/. McKaughan and Forster's (1963: 3.2) examples of syllable-final /ʔ/ have /k/ in the dialect described here; e.g. *saʔdo* 'draw water' is *sakdó*.

(8a) *Post-pausal [ʔ]*	(8b) *Intervocalic [ʔ]*	
/árak/ 'wine'	/dáit/ 'sew'	underlying forms
á.rak	dá.it	syllabification
ʔá.rak	dá.ʔit	Glottal Epenthesis (3a)

In what follows, we will explore some of the consequences of the hypothesis that [ʔ] is always a derived segment.

One consequence is that the syllabification of intervocalic consonants would have to be made contrastive (cf. Constantino's 'phonemic syllable boundary' (1959: 186)). For example, the distinction between *labáy* 'to serve food on a plate' and *labʔáy* 'bland' would be represented as the contrast between /la.báy/ and /lab.áy/ respectively. The form /lab.áy/ has a syllable beginning with a vowel, and undergoes Glottal Epenthesis to become [lab.ʔáy].

We note that morphemes of the *labʔáy* type are somewhat unstable. In particular, many of them have two pronunciations, one without the [ʔ] and one with, as in (9):

(9)	samʔít, samít	'sweet'
	duŋʔáw, ʔduŋáw	'to lament'
	dorʔóy, ʔdoróy	'to rot'
	pawʔít, pawít	'to send by means of someone'

Moreover, some words that have *CʔC* in Constantino's (1971b) dictionary have lost the [ʔ] in the dialect described here, for example *piŋó* 'to twist the ear of' (*piŋʔó* in Constantino (1971b)). The gradual disappearance of [ʔ] from this position could be interpreted as the slow elimination from the lexicon of underlying contrasts of syllable division. Such contrasts clearly are a marked phenomenon, if they are to be allowed at all in phonological theory.

The alternative to allowing contrastive syllabification is to suppose that /ʔ/ is a phoneme, even though it is predictable in the vast majority of its occurrences. While this is not an insuperable objection, we will see below that the hypothesis of phonemic /ʔ/ poses serious problems in characterizing the distribution of glides and vowels.

A compromise position would be to allow /ʔ/ as a phoneme, but only in the / C ___ V environment. Any empirical differences between this proposal and our proposal of contrastive syllabification would be quite subtle, and we know of no evidence to decide between the two hypotheses. A decision on this point will not be crucial to what follows.

2.3. *Glottal Epenthesis is cyclic*

We will assume, then, that at least all predictable instances of [ʔ] are derived by Glottal Epenthesis, and will offer support for this assumption in what follows. Proceeding on this basis, we next show that Glottal Epenthesis must be applied cyclically, for two reasons.

First, consider the behavior of suffixed words in which Glottal Epenthesis could in principle apply twice, as in underlying /pag+bao+an/ 'place where rats live' (cf. *baʔó* 'rat'). The problem that such forms raise is that the correct output can be obtained neither by applying Glide Formation first (yielding **pagbawan*), nor by applying Glottal Epenthesis first (yielding *pagba*ʔoʔan*). Only cyclic application, with Glide Formation preceding Glottal Epenthesis within the cycle, derives the correct result:

(10)	/bao/	base form	
	ba.o	First cycle:	syllabification
	---		Glide Formation (4a)
	ba.ʔo		Glottal Epenthesis (3a)
	pag-ba.ʔo-an	Second cycle:	circumfixation of *pag-...-an*
	pag.ba.ʔo.an		syllabification
	pag.baʔ.wan		Glide Formation
	---		Glottal Epenthesis
	(pag.baw.ʔan)		Metathesis ((6a), optional)
	[pagbaʔwan], [pagbawʔan]	outputs	

The other argument for cyclic application concerns the differing behavior of prefixes and suffixes, discussed below.

2.4. *Vowels and glides*

As Constantino (1971a: 3) points out, the distribution of vowels and glides in Ilokano stems is partly predictable. We will show in this section that this distribution provides support for the claim that [ʔ] is epenthetic.

In postvocalic position, there is a contrast between non-syllabic /y,w/ and syllabic /i,o,u/ (where the latter are preceded by epenthetic [ʔ]):

(11)	laʔílo	'affectionate'	kay-kaysá	'to unite'
	gaʔígi	'a whinny'	péyso	'truth'
	kaʔimíto	'star-apple tree'	deytá	'that (near hearer)'

babá?**i**	'woman, girl'	bay**báy**	'ocean, beach'
da?**úlo**	'leader'	la**wláw**	'around'
tá?**o**	'person'	?al**dáw**	'day'

As shown in (2a), we represent this contrast underlyingly by attaching moras to vowels, but not to glides.

Prevocalically, however, there is essentially no glide-vowel contrast. The distribution of prevocalic glides and vowels within roots is outlined below:

(12a) *Distribution of vowels and glides before vowels within roots*

/y/	/i/	/w/	/u/	/o/
*yi	i?i, *ii, *iyi	wi	*u?i, *ui, *uwi	*o?i, *oi, *owi
ye	*i?e, *ie, *iye	we	*u?e, *ue, *uwe	*o?e, *oe, *owe
ya	*i?a, *ia, *iya	wa	*u?a, *ua, *uwa	*o?a, *oa, *owa
yo	*i?o, *io, *iyo	*wo	u?o, *uo, *uwo	o?o, *oo, *owo
yu	*i?u, *iu, *iyu	*wu	u?u, *uu, *uwu	*o?u, *ou, *owu

(12b) *Examples of existing sequences*

/i?i/ *rabi?i* 'night', *lamí?is* 'cold', *kirrí?it* 'to dry in the sun'
/ye/ *kuyegyég* 'hanging loosely', *pyék* 'chick', *geyyém* 'friend'
/ya/ *maryá* 'Maria', *yáman* 'to be thankful', *kópya* 'copy'
/yo/ *yo* '2 pl. enclitic', *?áyo* 'to pacify', *yodyód* 'to droop (var.)'
/yu/ *dalayúdoy* 'to drip', *?uyúkan* 'honeybee', *kyúteks* 'nail polish'
/u?o/ *?atibú?or* 'smelly', *lu?óm* 'ripe', *bú?oŋ* 'to break'
/u?u/ *pag-?u?uŋ-án* 'place where mushrooms are grown', *pag-tu-tu?ún-an* 'to pile up'
/o?o/ *bo?ók* 'hair', *?ago?ó* 'place name', *ró?ot* 'leaves, litter'
/wi/ *táwid* 'to inherit', *wiŋíwiŋ* 'to shake one's head', *swítik* 'cheater'
/we/ *pwésto* 'place', *tíweŋ* 'naughty', *bariweŋwéŋ* 'to whirl'
/wa/ *dwá* 'two', *?agáwa* 'be careful', *dáwat* 'ask for'

These data can be summarized as follows. Glides may not occur either before or after homorganic vowels (*/yi/, */iy/, */wu/, */uw/); nor may the rounded glide /w/ occur before or after the rounded vowel /o/. Moreover, as the distribution of asterisks indicates, we find a kind of complementary distribution: abstracting away from epenthetic [?], a sequence of /i/, /o/, or /u/ followed by a vowel is well-formed if and only if the corresponding glide-vowel sequence is ill-formed. Lastly, hiatus (/VV/) is forbidden.[6]

[6] The sequence /o?u/ does not occur. This may reflect a different constraint not involving [?]: /oCu/ sequences of any sort are quite rare, and occur mostly in borrowings. Recall that for some speakers, [o] is the allophone of /u/ occurring in final syllables.

We know of one exception to these generalizations: the form *piyápi* 'to sit with the legs dangling', which by our description should be *pyápi* (cf. many parallel forms such as *pyá* 'health', *pyás* 'kind of fruit', *pyáno* 'piano', *pyék* 'chick', *pyár* 'trust', *pyésta* 'fiesta', *byág* 'life', *byáhe* 'trip', *byáŋ* 'to be nosy', and *byérnes* 'Friday').

We propose the following formal account for the generalizations stated above. First, to rule out */iy/, */yi/, */uw/, */wu/, */wo/, and */ow/, we propose the language-specific filters under (13), which forbid the appearance of a glide adjacent to a homorganic vowel. The filters are formulated in terms of moraic phonology, with segmental translations below.

(13) *Homorganicity filters*

(a) * μ and its mirror image
i i
= */yi/, */iy/

(b) μ and its mirror image
[+round] [+round]
= */wu/, */uw/, */wo/, */ow/

The importance of moraic representations in the formalization of the filters will be made clear below.

The homorganicity filters rule out a large number of the ill-formed sequences in (12a). The remaining ill-formed cases follow from two basic constraints: (a) Hiatus is forbidden. (b) If in a sequence $[V_1?V_2]$, Glide Formation could apply to V_1 were it not for the presence of the intervening [?], then $[V_1?V_2]$ is an ill-formed sequence.

To account for this pattern, we adopt two assumptions. First, as argued earlier, intervocalic [?] is not an underlying segment, but is derived by Glottal Epenthesis. Since Glottal Epenthesis is obligatory, this ensures that hiatus cannot appear on the surface. Second, we assume that Glide Formation is applicable within roots. For example, if an underlying form such as /nuáŋ/ exists, it must be realized on the surface as [nwáŋ], not *[nu?áŋ]. (c) Glide Formation is subject to the homorganicity filters, and thus is blocked if its output would be *[yi], *[wu], or *[wo]. For example, underlying /ii/ cannot undergo Glide Formation, because this would produce *[yi]. When Glide Formation is blocked by a homorganicity filter, Glottal Epenthesis may then separate the two vowels. Sample derivations are as follows:

(14)	'water buffalo'	'chick'	'awhile'	'root'	'fire'	'fan'	
	/nuáŋ/	/piék/	/biít/	/poón/	/púor/	/paíd/	underlying forms

nwáŋ	pyék	BLOCKED	BLOCKED	BLOCKED	---	Glide Formation (4a)
---	---	bi?it	po?ón	pú?or	pa?íd	Glottal Epenthesis (3a)
[nwáŋ]	[pyék]	[bi?it]	[po?ón]	[pú?or]	[pa?íd]	output

As can be seen, this analysis captures the overall distribution of vowels and glides. Where the homorganicity filters block Glide Formation (*bi?it, po?ón, pú?or*), we get vowel sequences separated by [?]. If the structural description of Glide Formation is not met, as in *pa?id*, we also get [V?V]. Finally, if Glide Formation is applicable and the homorganicity filters are not, we get a glide-vowel sequence (*nwáŋ, pyék*). Sequences like *[i?a], *[o?i] are correctly ruled out, because their input forms would have to be /ia/, /oi/, which would be converted by Glide Formation to [ya], [wi].

Note that the required ordering of Glide Formation before Glottal Epenthesis is independently motivated, as shown by cases where the environment for both rules is created by suffixation (4b).

We believe the analysis constitutes an argument that intervocalic [?] are epenthetic. The sequences of vowels that cannot flank [?] are precisely the sequences to which Glide Formation can apply. But Glide Formation cannot apply to two vowels unless they are adjacent. Therefore, if we are to use Glide Formation to account for the missing root-internal sequences, then the input forms must not include an intervening [?].

To make the argument more rigorous, we must rule out an alternative account: that is, to complicate the Glide Formation rule, allowing it to apply across an intervening [?]. Such a rule would simultaneously create a glide and remove the [?], deriving for example [ya] from /i?a/. This would guarantee the absence of /i?a/ and other illegal sequences in roots. However, this alternative turns out to be untenable: as we will see later on, there is evidence (from the prefix system) that Glide Formation does not apply across an intervening [?].

The derivations in (14) assume that prevocalic glides within roots are represented underlyingly as vowels. This is not the only possibility, as these segments might also be represented in a more concrete analysis as glides. We assume underlying vowels, at least for roots such as *rwár* 'outside' that appear as monosyllables on the surface. The reason is that this allows us to maintain as a generalization that all native roots other than bound forms have at least two syllables underlyingly (e.g. /ruar/). However, our analysis would also be compatible with a more concrete underlying representation for prevocalic glides. The crucial point is that Glide Formation acts as a filter on the lexicon, preventing any form that meets its structural description from surfacing phonetically.

2.5. *Glide Formation is cyclic*

Like Glottal Epenthesis, Glide Formation can be shown to be cyclic. The basis of our argument is the fact that Glide Formation normally triggers compensatory lengthening of the preceding consonant (see section 1.6).

Consider a form like *byág* 'life'. Assuming this is derived from underlying /biág/, then a naive expectation is that the surface form should be **bbyág*. However, this is a grossly ill-formed syllable in the Ilokano canon. Following Ito (1986) and others, we assume that unsyllabifiable segments are deleted by convention; for this reason /biág/ surfaces as [byág].

Consider next the prefixed form *ma-byág* 'alive'. Here, we might expect to see compensatory lengthening of the stem-initial consonant, since the prefix vowel would allow the geminate /bb/ to be syllabified. But here again the correct form is *mabyág*, not **mabbyág*. The great majority of similar forms pattern in the same way; cf. *pyá* 'health' ~ *na-pyá* 'healthy-adj. marker', *bwá* 'betel nut' ~ *naka-bwá* 'chewing betel nut', *pyár* 'to trust' ~ *ma-pyár* 'trustworthy', *kyák* 'tweeting of a bird' ~ *maka-kyák* 'feels like tweeting'. Compensatory lengthening is found only in a small number of relic forms, such as *meyka-ddwá* 'the second' (cf. *dwá* 'two') and *ma-ttwáŋ* 'to fall over' (cf. *twáŋ* 'sense of falling'). The latter stem occurs without compensatory lengthening in *maŋi-twáŋ* 'to cause to fall down'.

The problem of accounting for the distribution of compensatory lengthening can be solved if we assume that Glide Formation applies cyclically. For those few forms where Glide Formation induces stem-initial gemination, we suppose that the entire form, including the prefix, is listed as a basic lexical entry, and thus escapes the application of cyclic rules on the stem cycle. Note that the absence of a stem cycle in a small set of frozen forms is not a phenomenon unique to Ilokano; see Chomsky and Halle (1968: 112,116) for similar cases from English.

Our account derives the distribution of compensatory lengthening as follows.

(15)

'healthy'	'where noodles are made'	'fall over'		
/pia/	/miki/	/ma-tuaŋ/	base forms	
pi.a	mi.ki	ma.tu.aŋ	First cycle:	syllabification
y	---	w		Glide Formation (4a)

p.pya	---	mat.twaŋ		compensatory lengthening
pya	---	---		erasure of unsyllabifiable segments
na-pya	mi.ki-en		Second cycle:	affixation
na.pya	mi.ki.en			syllabification
---	y			Glide Formation
---	mik.kyen			compensatory lengthening
[na.pya]	[mik.kyen]	[mat.twaŋ]	output	

The crucial stage in these derivations is the first cycle for *na-pya*. Because the prefix vowel is not present on this cycle, the first half of geminate /pp/ cannot be syllabified, and thus is erased. Affixation on the next cycle then yields the surface form. For *ma-ttwaŋ*, the prefix is present on the first cycle, so the effects of compensatory lengthening may surface.

The analysis thus far leads us to one of our main points: if Glottal Epenthesis and Glide Formation are cyclic rules, then syllabification itself arguably is cyclic as well. The reason is that both Glottal Epenthesis and Glide Formation are rules that repair ill-formed syllable structures, eliminating onsetless syllables. The Ilokano facts provide support, then, for the claims of Kiparsky (1979), Ito (1986), and others that syllabification is a cyclic process.

2.6. Morphological structure and Glottal Epenthesis

The joining of morphemes into words is accompanied by alternations between [ʔ] and zero. For example, when a consonant-final prefix is attached to an underlyingly vowel-initial stem, the stem may optionally appear with an initial [ʔ] (generally in more deliberate speech, as we have cited such forms above), or it may appear without [ʔ], with the prefix-final consonant appearing in syllable-initial position.

(16)	/nag-arádo/	nag.ʔa.rá.do, na.ga.rá.do	'plow-actor focus-past'
	/nag-inóm/	nag.ʔi.nóm, na.gi.nóm	'drink-actor focus-past'
	/maŋ-áyo/	maŋ.ʔáyo, ma.ŋá.yo	'to comfort-transitive actor focus'

/maŋ-ípon/	maŋ.ʔi.pon, ma.ŋí.pon	'to catch an *ipon* (small fish var.)'
/pag-apúy-en/	pag.ʔa.pu.yén, pa.ga.pu.yén	'cook rice-causative'
/pag-inném-en/	pag.ʔin.ne.mén, pa.gin.ne.mén	'do something six times' (cf. *ʔinném* 'six')
/pakin-unég-en/	pa.kin.ʔu.ne.gén, pa.ki.nu.ne.gén	'put inside' (cf. *ʔunég* 'inside')

Reduplicated forms behave just like forms with consonant-final prefixes: *ʔas-ʔáso, ʔas-áso* 'dogs'; *naka-ʔay-ʔayát, naka-ʔay-ayát* 'be very loving'; *ʔ-um-ad-ʔadó, ʔ-um-ad-adó* 'is becoming increasingly many'; *ʔag-(ʔ)ib-(ʔ)iblèŋ* 'is relieving the bowels'.

However, this optionality is not found at the juncture of a consonant-final stem and a vowel-initial suffix. In these cases the stem-final consonant must resyllabify, and no [ʔ] may appear: *túlad* 'to mimic', *tu.lá.den* 'mimic-goal focus', not **tu.lád.ʔen*; and similarly for all parallel forms.

Another way that the morphology may place a consonant before a vowel is infixation. Ilokano infixes are consonant-final, and are usually placed before the first vowel of the stem: *t-um-ugáw* 'to sit down' (cf. *ʔag-tugáw* 'to sit'), *ʔ-um-inóm* 'drink-actor focus casual' (cf. *ʔinóm* 'drink'), *ʔ-in-aldáw* 'every day' (cf. *ʔaldáw* 'day'). An infix is never followed by an inserted [ʔ], thus **tum.ʔu.gáw*, **ʔum.ʔinóm*, **ʔin.ʔal.dáw*.

The question that arises is why the sequence /C + V/ appears optionally as [CʔV] in one morphological context (prefix + stem), but only as [CV] in others (stem + suffix, infix + vowel). The answer, we believe, lies in the claim made above that Glottal Epenthesis is a cyclic rule. Consider examples for the three relevant cases. For *nag-ʔarádo* ~ *nag-arádo* 'plow-actor focus past', the domain of the immediately preceding cycle is /arádo/ 'plow'. Glottal Epenthesis applies on this cycle to give *ʔarádo*, thus making available a [ʔ] for the next cycle. For *tuláden* 'mimic-goal focus', the earlier cyclic domain is /tulad/ 'mimic', to which Glottal Epenthesis is not applicable; and the same holds true for *t-um-ugáw* 'sit down', whose earlier cyclic domain is /tugáw/ 'sit'. It is this contrast among the three cases that is arguably responsible for the differences in surface form.

To make this cyclic account work, we must posit an additional rule to derive variants like *nag-arádo*. We write this rule as follows:

(17) *Glottal Deletion*
$? \rightarrow \emptyset$ / C ___ (optional, limited to derived environments)

This rule optionally deletes the [ʔ] derived on the preceding cycle. The limitation to 'derived environments' (cf. Kiparsky (1973)) is intended to prevent the rule from deleting [ʔ] after a consonant within a morpheme, as in *samʔit* and similar forms (section 2.1). It is possible, however, that Glottal Deletion applies sporadically even within roots, as the forms of (9) suggest.

When a prefix preceding a [ʔ]-initial stem ends in a vowel, the [ʔ] is retained:[7]

(18)	/na-ímas/	→ naʔímas	'tasty-adj. marker'
	/na-ímon/	→ naʔímon	'jealous-adj. marker'
	/na-údi/	→ naʔúdi	'last-adj. past'
	/ma-íliw/	→ maʔíliw	'homesick-adj. pres.'
	/ka-adó-an/	→ kaʔaddwán	'most' (cf. *ʔadó* 'many')

The rules of Glottal Epenthesis and Glottal Deletion combine to produce the correct outputs as follows:

(19)	'plow-actor focus past'	'mimic-goal focus'	'sit down'	'drink-actor focus casual'	
	/arado/	/tulad/	/tugaw/	/inom/	base forms
					First cycle:
	a.ra.do	tu.lad	tu.gaw	i.nom	syllabification
	ʔa.ra.do	---	---	ʔi.nom	Glottal Epenthesis (3a)
					Second cycle:
	nag-ʔa.ra.do	tu.lad-en	t-um-u.gaw	ʔ-um-i.nom	affixation
	nag.ʔa.ra.do	tu.la.den	tu.mu.gaw	ʔu.mi.nom	syllabification
	---	---	---	---	Glottal Epenthesis

[7] This oversimplifies the situation, as our statement of Glottal Deletion really is valid only for elicitation forms. In more fluent speech, [ʔ] may delete in a wide range of environments, not all of them postconsonantal. Numerous factors influence whether a [ʔ] will delete in fast speech. For example, deletion is favored when neither the preceding nor the following vowel is stressed. The sequences /aʔi/, /aʔu/, and /aʔo/ particularly favor [ʔ] loss. Frequent words appear to lose [ʔ] more readily than rare words. We will not attempt to describe fast-speech [ʔ] deletion rigorously here.

(na.ga.ra.do)	---	---	---	Glottal Deletion (17) (optional)
[nag?arado], [nagarado]	[tuladen]	[tumugaw]	[?uminom]	outputs

The inelegant part of this account is the need to posit a rule of Glottal Deletion as well as a rule of Glottal Epenthesis. However, this seems unavoidable if one accepts the conclusion, argued for above, that Glottal Epenthesis is cyclic. Assuming cyclic application, the [?] in *nag-arado* is already present at the end of the first cycle, so we must be dealing with a case of optional deletion rather than optional insertion. Moreover, we will see shortly that the Glottal Deletion analysis provides a straightforward account of where the rules of Glide Formation and Glide Insertion may apply. We address this topic in the next two sections.

2.7. Glide Insertion

Recall that when a suffix is attached to a root ending in a non-low vowel, that vowel undergoes Glide Formation (4a). However, a prefix ending in a non-low vowel does not undergo this rule. Instead, the prefixal vowel remains, and hiatus is resolved by the appearance of a glide, as follows:

(20) *Glide Insertion*

?i-óper	→	?iyóper	'dip in water-directional'
?i-ólog	→	?iyólog	'bring down-directional'
?i-aplág	→	?iyaplág	'spread-directional'
?i-unég	→	?iyunég	'bring inside-directional'
?i-ijjáy	→	?iyijjáy	'put there-directional'
?agi-ábut	→	?agiyábut	'to reach'
ma?i-ukbós	→	ma?iyukbós	'to be spilled'
?agi-áwat	→	?agiyáwat	'to hand something to'

We give the relevant rule the name Glide Insertion, but we will postpone a formalization until the next section.

The [iy] sequences formed in this context are fairly short phonetically. Nonetheless, they are clearly distinct from glides, as is shown by near-minimal pairs such as *yáman* 'be thankful' vs. *?iy-ánta* 'to soak'; *yóyo* 'yoyo' vs. *?iy-ólog* 'to bring down'. A true glide-initial word genuinely begins with a glide; but a word with [iy] begins phonetically with the [?] inserted before all initial vowels.

2.8. *Competition among rules*

At this point we can consider the following problem: we have three distinct rules, all of which can apply to resolve a hiatus of the form *non-low* $V+V$: Glide Formation (4a), Glide Insertion (illustrated in (20)), and Glottal Epenthesis (3a). An adequate analysis must specify which rule applies in which context. First, we review the facts.

(*a*) When a *nonlow* $V+V$ sequence occurs underlyingly *within a root*, Glide Formation wins out (cf. (14)).

(*b*) When a *nonlow* $V+V$ sequence is created by adding a vowel-initial *suffix* to a vowel-final root, Glide Formation wins out (cf. (4b)).

(*c*) When a *nonlow* $V+V$ sequence is created by adding a vowel-final *prefix* to a vowel-initial base, the outcome is Glide Insertion, as in (20).

(*d*) Glottal Epenthesis, ordered last, gets to apply *when the vowel on the left is /a/*. This can arise for prefixes as well as suffixes; cf. (3b) and (18). Glottal Epenthesis also may apply root-internally, when Glide Formation is blocked by the homorganicity filters (14).

(*e*) There is one additional environment in which Glottal Epenthesis and Glide Insertion may apply. Glide Formation, while a productive process, is not fully automatic. In certain borrowed forms, and in certain forms to which *-an* and *-en* are not normally attached, the vowel sequence resulting from suffixation can be resolved by applying Glottal Epenthesis or Glide Insertion instead, as in (21).

(21)	yóyo	'yoyo'	pag-yoyo?-én	'to cause to play with a
			pag-yoyow-én	yoyo'
	trabáho	'to work'	trabahw-én	'work-goal focus'
			trabaho?-én	
			trabahow-én	
	básІ	'sugar cane wine'	?pag-baššy-án	'place where sugar cane
			pag-basí?-an	wine is made or con-
			pag-basíy-an	sumed'
	?ag-síne	'go to the movies'	?pag-siny-án	'movie theater'
			?pag-sinéy-an	
			pag-siné?-an	
	líbro	'book'	pag-librow-án	'place for books'

In these words, Glottal Epenthesis and Glide Insertion compete with one another, and native intuitions are insecure concerning which pronunciation is

to be preferred. This is probably to be expected where new forms are being accommodated within the system.

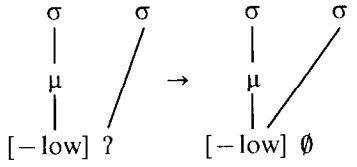
Consider now how a formal analysis might account for these facts. The relative ordering of Glide Formation and Glottal Epenthesis has already been established: Glide Formation must come first, so that if it is applicable it will take precedence (cf. (4b)).

The interaction of Glide Formation and Glide Insertion is more complex, in that a different rule applies depending on the morphological context. That is, in prefixes, Glide Insertion always takes precedence, whereas at a stem-suffix boundary, Glide Formation usually takes precedence.

The normal analytical procedure in such a case is to set up various phonological junctures (e.g. as in Chomsky and Halle (1968)) or morphological levels (as in Lexical Phonology; Kiparsky (1982)), assigning individual rules to particular junctures or levels. However, we saw in the case of Glottal Epenthesis, where there is also a prefix-suffix distinction, that there is little support for this strategy in Ilokano. Rather, the dependence of the outcome on morphological structure can be deduced directly from the cyclic status of the rule. Ideally, we would like to do the same for Glide Insertion.

This can be done, provided we formulate Glide Insertion in the right way. Consider a derivation with Glide Insertion, such as /ʔi-óper/ → [ʔiyóper] 'dip in water-directional'. Since Glottal Epenthesis is cyclic, it will apply on the first cycle to yield *ʔóper*. On the next cycle, /i-/ is prefixed, giving *iʔóper*. Thus if we are to derive the right output, the derivation must not actually insert a [y], but rather must replace [ʔ] with [y], as follows:

(22) *Glide Insertion*



Here, the 'insertion' of a glide is simply rightward autosegmental spreading of the preceding vowel's segmental quality, displacing the former [ʔ].

Once we have formulated Glide Insertion in a way consistent with the cyclic analysis, the problem of determining which rule resolves hiatus, Glide Formation or Glide Insertion, is solved automatically. The reason is that in all cases where Glide Insertion is called for, Glottal Epenthesis will have created a [ʔ] earlier in the derivation; whereas in all the cases where Glide

Formation is called for, Glottal Epenthesis has not yet applied. This is illustrated below with sample derivations.

(23) 'spread-dir.' 'life' 'place where wheat noodles are made'

/aplag/	/biag/	/miki/	base forms	
ap.lag	bi.ag	mi.ki	First cycle:	syllabification
---	byag	---		Glide Formation (4a)
ʔap.lag	---	---		Glottal Epenthesis (3a)
---	---	---		Glide Insertion (22)
i-ʔap.lag		pag-mi.ki-an	Second cycle:	affixation
i.ʔap.lag		pag.mi.ki.an		syllabification
---		pag.mik.kyan		Glide Formation, compensatory lengthening
ʔi.ʔap.lag		---		Glottal Epenthesis
ʔi.yap.lag		---		Glide Insertion
[ʔi.yap.lag]	[byag]	[pag.mik.kyan]	outputs	

Because the rules apply cyclically, in *ʔiy-aplag* a [ʔ] is inserted before Glide Formation could ever apply, forcing the hiatus to be resolved ultimately by Glide Insertion. In *byag* and *pag-mikky-an*, however, the cyclic domains are such that Glide Formation gets to apply first, resolving the hiatus and blocking the other rules.

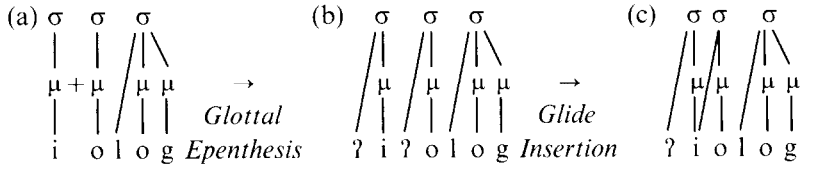
The analysis extends straightforwardly to the exceptional cases of Glottal Epenthesis and Glide Formation across a suffix boundary, shown in (21). For example, the stem /libro/ 'book' must be marked as an exception to Glide Formation; hence when the suffix *-an* is added, it is converted by Glottal Epenthesis to /libroʔan/, then altered by Glide Insertion to the surface form *librow-an* 'place for books'. Similarly, the recently borrowed stem /yoyo/ must be marked as an exception to Glide Formation and optionally to Glide Insertion as well. If both Glottal Epenthesis and Glide Insertion apply, we derive *pag-yoyow-én* 'to cause to play with a yoyo'; and if only Glottal Epenthesis applies, the intermediate form *pag-yoyoʔ-én* appears as a surface variant. As noted above, forms such as those of (21) are mostly borrowed, and it is not surprising that they can be exceptions to more than one rule.

2.9. The homorganicity filters, nonlinear theory, and the OCP

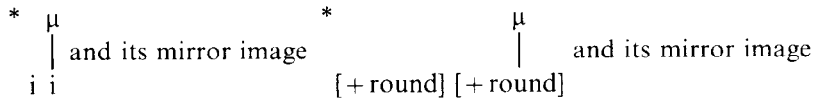
A striking aspect of Glide Insertion is that its output appears to violate the

homorganicity filters (13): it derives /iy/ and /ow/, which are ill-formed in roots. However, this exceptionality is superficial, in that such sequences are not exceptions if Glide Insertion is expressed in prosodic formalism, as in (22). Under our analysis, Glide Insertion is actually an assimilation rule (/ʔ/ → [y] or [w]), and is expressed as spreading, as is standard in most nonlinear theories. For this reason, a phonetic [iy] sequence derived by Glide Insertion does not actually constitute a sequence on the segmental tier, as is shown below with a derivation of *ʔiyólog* 'bring down-directional' from /i-ólog/ (only crucial steps shown):

(24) *[ʔiyólog] from /i-ólog/*



(25) *Homorganicity Filters*



The homorganicity filters rule out only true segmental sequences; thus the doubly-linked sequence derived by Glide Insertion in (24c) does not violate them. In contrast, the structures that would be derived by Glide Formation (*/yi/, /*wu/, from /ii/, /uu/) are genuine segmental sequences, and are ruled out by the filters.

The homorganicity filters are strongly reminiscent of the Obligatory Contour Principle (OCP; see McCarthy (1986) and other work). This suggests that their effects might be derived directly from the OCP, rather than being stipulated on a language-specific basis. An additional fact supports this conjecture: it appears that the filters are not applicable across morpheme boundaries; which as McCarthy points out, is a characteristic property of the OCP. In particular, a [y + i] sequence occurs in forms like *ʔiy-ijjáy* 'put there-directional', derived by Glide Insertion from /i-ijjáy/, and in *ʔiy-inóm* 'to give someone a drink' from /i-inóm/ (as above, the [iy] sequences are permitted because they are due to spreading).

Despite this suggestive evidence, it is not a straightforward matter to replace the homorganicity filters with the OCP, because of two facts. First, an OCP analysis must not rule out underlying /ii/, which is well-formed; cf. the

examples under (12b). The homorganicity filters allow this sequence, since they apply only when exactly one segment in the vocoid sequence bears a mora. Second, in dialects where /o/ and /u/ are phonemically distinct, */ow/ and */wo/ do not form OCP violations, the /w/ being [+high], the /o/ [−high]. Thus the Ilokano facts arguably support Odden's (1988) contention that the OCP is not a single monolithic constraint, but instead takes on significant modifications and idiosyncrasies in individual languages.

2.10. Discussion

We have tried to show in the preceding sections that the distribution of both [ʔ] and prevocalic glides and vowels can be predicted if we adopt a slightly abstract phonological analysis. There is no question that the forms of Ilokano show recognizable patterns for these sounds, and our analysis is one way of capturing these patterns.

It cannot be proven at this stage that the deep underlying forms we posit are valid. Native speakers do appear to be conscious of the distinction between prevocalic glides and vowels, and of the presence or absence of [ʔ]. Indeed, the phonemic illusions tend to go the other way: if in the course of a derivation [ʔ] is created by Glottal Epenthesis, but later deleted by the (probably post-lexical) rule of Glottal Deletion, speakers tend to 'feel' the presence of a [ʔ], as in [nagarádo] (/nag-arádo/, sometimes felt to be [nagʔarádo]. In Mohanan and Mohanan's (1984) version of Lexical Phonology, [ʔ] would be included in the 'lexical alphabet' but not the 'underlying alphabet' of Ilokano. That is, while [ʔ] is excluded from the deepest underlying representations, it is inserted by cyclic – hence lexical – rules, and its presence is therefore accessible to the intuitions of native speakers (Mohanan (1986)).

It may be relevant that the orthography most often used for Ilokano corresponds in many ways to our proposed underlying representations. Most [ʔ] do not appear in spelling; only those appearing root-internally after a consonant show up orthographically. These are spelled as a hyphen, suggesting an aberrant syllabification, just as in our analysis (cf. section 2.2). Moreover, many glides, including those in the environment / C ___ V and those derived by Glide Formation before suffixes, are spelled with vowel letters. The orthographic system is well designed to spell each morpheme in a constant way, no matter how it appears phonetically. In particular, the effects of Glide Formation, compensatory lengthening, Glide Insertion, Glottal Epenthesis, Palatalization, and Metathesis are usually not reflected in orthographic form.

Obviously, orthographies reflect history and tradition as much as they do synchronic phonological structure. It is worth noting, however, that Ilokano orthography is somewhat fluid; in particular, it has only in recent decades eliminated orthographic conventions due to Spanish, such as the use of *qu* for /k/ before front vowels. The fact that speakers continue to be comfortable with morphophonemic spelling suggests that they may internalize something like the morphophonemic system we have posited.

3. Reduplication

Ilokano has a reduplication system of some complexity and theoretical interest. In this section, we describe and analyze Ilokano reduplication, and argue that the facts provide support for the theory of Prosodic Morphology proposed by McCarthy and Prince (forthcoming) and further developed by Steriade (1988).

In Prosodic Morphology, the targets of reduplication rules are specified prosodically rather than segmentally. That is, the rules that specify the amount of material to be copied are stated not in terms of segment sequences, such as *CVC-* (Marantz 1982), but rather as prosodic categories, including 'heavy syllable', 'light syllable', and 'metrical foot'. McCarthy and Prince (forthcoming) and Steriade (1988) differ on the mechanism by which the prosodic target is achieved, but the claim that the target of reduplication is prosodic rather than segmental in character is common to both accounts.

We will show that one reduplication pattern of Ilokano strongly supports the notion of prosodic targets in reduplication: this pattern appears quite complex and heterogeneous when considered as a segmental sequence. Prosodically, however, it is uniform, consisting always of a heavy syllable.

3.1. Basic data

There are two principal reduplication processes in the dialect we describe, which we will call 'heavy' and 'light'. Heavy reduplication most often copies the initial consonant or consonants of the stem, plus a vowel, plus the next consonant. It marks a number of morphological categories: for example, in nouns it marks plurality (26a), in adjectives it marks the comparative and the intensive (26b), and in verbs it marks the progressive and plural action (26c).

(26a)	kaldíŋ	'goat'	kal-kaldíŋ	'goats'
	púsa	'cat'	pus-púsa	'cats'
	ǰyánitor	'janitor'	ǰyan-ǰyánitor	'janitors'
	yóyo	'yoyo'	yoy-yóyo	'yoyos'
(26b)	kuttóŋ	'thin'	naka-kut-kuttóŋ	'very thin'
	butéŋ	'afraid'	naka-but-butéŋ	'very afraid'
	na-ʔalsém	'sour'	naka-ʔal-ʔalsém	'very sour'
	na-pintás	'pretty'	na-pin-pintás	'prettier'
	na-lagdá	'durable'	na-lag-lagdá	'more durable'
(26c)	sáŋit	'to cry'	ʔag-saŋ-sáŋit	'is crying'
	taráy	'to run'	ʔag-tar-taráy	'is running'
	trabáho	'to work'	ʔag-trab-trabáho	'is working'
	dígos	'to bathe'	nag-dig-dígos	'bathed-plural actor'

Light reduplication copies the initial consonant or cluster of the stem, plus the following vowel. It also marks a large number of morphological categories: for example, it occurs with the prefix *si-* to mean 'covered with, filled with' (27a), with the prefix *ʔagin-* to mean 'to pretend to' (27b), and in verbs it marks characteristic or easily performed action (27c).

(27a)	liŋʔét	'perspiration'	si-li-liŋʔét	'covered with perspiration'
	bunéŋ	'kind of knife'	si-bu-bunéŋ	'carrying a *buneng*'
	pandilíŋ	'skirt'	si-pa-pandilíŋ	'wearing a skirt'
	róʔot	'leaves, litter'	si-ro-róʔot	'covered with litter'
	ǰyáket	'jacket'	si-ǰya-ǰyáket	'wearing a jacket'
(27b)	dáʔit	'to sew'	ʔagin-da-dáʔit	'pretend to sew'
	sáŋit	'to cry'	ʔagin-sa-sáŋit	'pretend to cry'
	ǰyánitor	'janitor'	ʔagin-ǰya-ǰyánitor	'pretend to be a janitor'
	trabáho	'to work'	ʔagin-tra-trabáho	'pretend to work'
(27c)	tugáw	'to sit'	ʔag-tu-tugáw	'sits restfully'
	sála	'to dance'	ʔag-sa-sála	'characteristically dances'

3.2. *Vowel length from reduplication*

Heavy reduplication is of special interest in that it often induces vowel length. Long vowels in Ilokano are predictable in their distribution, and can in every case be derived by phonological or morphological rule. Most long vowels are derived by a rule lengthening stressed vowels in non-final open

syllables, stated under (14a). Since the addition of an affix usually shifts the position of the stress one syllable to the right, the same root can appear with different vowels lengthened.

(28a) *Open Syllable Lengthening*
$\acute{V} \rightarrow \acute{V}: / \_\_\_ CV$

(28b) /ʔarapáʔap/ → [ʔarapáːʔap] 'imagine'
/ʔarapaʔap-en/ → [ʔarapaʔáːpen] 'imagine-goal focus'

Since lengthening by this rule is completely automatic, we do not record it in our transcriptions, other than in the example just given.

The other source of vowel length is heavy reduplication. When a root of the form $C_0VʔVX$ is reduplicated, we get $C_0V\text{:-}C_0VʔVX$, rather than the expected $C_0Vʔ\text{-}C_0VʔVX$:

(29) dáʔit	'to sew'	ʔag-daː-dáʔit	'is sewing'
róʔot	'leaves, litter'	roː-róʔot	'leaves, litter-pl.'
púʔot	'awakening'	ʔag-puː-púʔot	'is waking up'
saʔó	'word'	ʔag-saː-saʔó	'is talking'
paʔíd	'fan'	ʔag-paː-paʔíd	'is fanning'
raʔót	'ambush'	ʔag-raː-raʔót	'is ambushing'
kaʔót	'something gotten by putting one's hands into something'	kaː-kaʔót	'idem-pl.'

Although this vowel length is not always observed in other dialects, it is fairly easy to hear in the dialect we describe. The length distinction is particularly plain in near-minimal pairs such as *roː-róʔot* 'litter-pl.' vs. *protína* 'protein', *puː-púʔot* 'is waking up' vs. *putíput* 'to tie up', and *raː-raʔót* 'is ambushing' vs. *paratú* 'funny, amusing'. The distinction can also be heard by comparing heavy and light reduplications of the same stem, as in *puː-puʔón* 'roots, origins' vs. *si-pu-puʔón* 'covered with roots'; or *ʔag-daː-dáʔit* 'is sewing' vs. *ʔag-da-dáʔit* 'to sew characteristically'.

Consider now the problem of how lengthening by reduplication should be described. The pattern of the data given so far is deceptive, in that it suggests a purely phonological account. Note that [ʔ] is missing in syllable-final position in Ilokano, except for cases in which it is derived by late rules. Thus it would be feasible to posit for Ilokano a commonplace rule of glottal loss with compensatory lengthening. Such a rule would derive vowel length as follows:

(30) /dait/ 'sew'

da?it	First cycle:	Glottal Epenthesis (3a)
da?-da?it	Second cycle:	reduplication
da:-da?it		Glottal Loss:
		V? → V: / ___]$_{syl}$

While this works straightforwardly, there are additional facts which suggest to us that this solution is not sufficiently general. These facts have to do with monosyllabic stems, which reduplicate aberrantly. Consider first monosyllabic stems that end in a single consonant. These reduplicate not by copying the whole stem (i.e. C_0VC-C_0VC), but by lengthening the vowel:

(31) tra:-trák	'trucks'	(*trak-trák)
ba:-bás	'buses'	(*bas-bás)
?ag-ŋya:-ŋyáw	'is meowing'	(*?ag-ŋyaw-ŋyáw)
pag-či:-čip-en	'to make into a chief'	(*pag-čip-čip-en)

It is not easy to explain why this reduplication pattern should arise; our conjecture is that the rules responsible for heavy reduplication are somehow prohibited from copying the entire stem. In support of this, note that those monosyllabic stems that end in a vowel cannot undergo heavy reduplication in the normal way (e.g. *dwá* 'two', **dwa:-dwa*; *lwá* 'tear (noun)', **lwa:-lwa*). Such stems reduplicate instead by using a glide vocalization process, described below. Although we cannot explain why heavy reduplication should respect a prohibition on total copying, such a prohibition or its equivalent provision would be necessary in any adequate analysis.[8]

The crucial point for the present argument is that in forms like *tra:-trák*, reduplication creates long vowels, even though nothing would justify a syllable-final [?] at any stage of the derivation. This throws into doubt the phonological solution to the vowel length problem suggested under (16).

There is one additional class of monosyllabic stems to be considered: the few borrowed monosyllabic stems that end in a consonant cluster also reduplicate by lengthening the vowel, rather than by copying the first C_0VC sequence: *na:-nárs* 'nurses' (**nar-nárs*), *bi:-bíks* 'Vicks ointments' (**bik-biks*), *la:-láyt* 'lights' (**lay-layt*). Again, we do not know why this restriction should hold; we simply must assume it as part of the basis of our argument. As

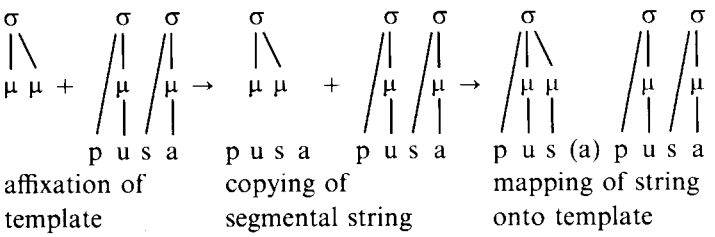
[8] Curiously, light reduplication *is* allowed to copy the entire stem, as in *?agin-čya-čyá* 'to pretend to be an aunt', *si-swa-swá* 'filled with pomelos'.

before, the point is that the phonological solution of (16) is not general enough to account for all cases of vowel length, because in the *CVCC* cases there is no [ʔ] present that could trigger compensatory lengthening.

A more general account of the facts is available under the prosodic view of reduplication. We formally specify the template for heavy reduplication as being a heavy (i.e. bimoraic) syllable, represented as in (32a). This template is filled according to the principles of prosodic morphology: the segmental string of the base is copied in a position accessible to the template, and the copied material is associated with the template by the syllabification rules of the language, amplified with language-particular mapping conventions. A simple example, in which the initial *CVC* sequence is mapped onto the template, appears in (32b).

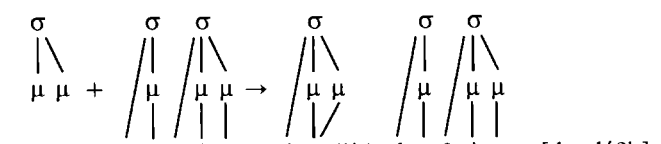
(32a) *Heavy Reduplication Template*

(32b) *pus-pusa* 'cats'



In other cases, copying of C_0VC is not possible. For example, in *da:-dáʔit* 'is sewing' and parallel forms, C_0VC copying is forbidden because [ʔ] cannot occur syllable-finally at this stage of the derivation. In this case, a heavy syllable is achieved by lengthening the vowel instead:

(33)



In the case of *tra:-tràk* 'trucks', the prohibition on total copying of the stem means that /k/ cannot be mapped onto the template, leading to the same

result. Finally, in cases like *na:-nárs* 'nurses', the (rather mysterious) prohibition on copying a final cluster consonant also leads to vowel lengthening in order to provide a heavy syllable.

3.3. Gemination from reduplication

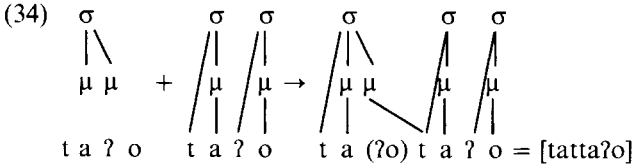
There is an additional way of obtaining a heavy syllable when initial C_0VC is not copyable: gemination of the stem-initial consonant. This can arise in Ilokano under varying circumstances.

In the dialect we describe, a restricted set of stems reduplicates with gemination: *tat-tá?o* 'persons', *bib-bi?it-en* 'to do briefly' (cf. *bi?it* 'brief'), *tat-ta?ód-en* 'the state of appearing' (cf. *tá?od* 'to become apparent'), *bab-babá?i* 'women, girls'. Since this is not the general pattern, these forms must be lexically marked to undergo this aberrant reduplication.

In the somewhat different dialect described by Vanoverbergh (1955:39), gemination is a regular process: all initially-stressed stems with medial [?] reduplicate by geminating the stem-initial consonant, as in *?ag-dad-dá?it* 'is sewing'. (In the dialect we describe, the stem *dá?it* is regular, and reduplicates as *?ag-da:-dá?it*.)

Such geminated forms involve the following associations of segmental material and prosodic template:

(34)



These instances of gemination again corroborate the theory of prosodic morphology, in that the sole common characteristic of the various ways in which heavy reduplication can be realized is that a heavy syllable is somehow created.

3.4. Reduplication and initial clusters

Additional complexities arise when the stem to be reduplicated begins with a consonant cluster. In particular, we find a process of glide vocalization, whose analysis provides an interesting challenge to formal theories of reduplication. As the facts are somewhat involved, we will first go through them systematically.

First, stems beginning with clusters of the form *C+liquid* reduplicate by copying the whole cluster: *?ag-trab-trabáho* 'is working', *kris-krisčyáno* 'Christians', *pleg-plégis* 'creases', *klas-kláse* 'classes'.

If the cluster is of the form *C+glide*, however, then there are often two possibilities: it can be treated just like a *C+liquid* cluster, or the copied material can consist of the stem-initial consonant, plus a long vowel homorganic with the glide.

(35) *Heavy Reduplication*

bwáya	'crocodile'	na-ka-bway-bwáya, na-ka-bu:-bwáya	'is acting like a crocodile'
lwálo	'prayer'	?ag-lwal-lwálo, ?ag-lu:-lwá:lo	'is praying'
pyék	'chick'	pye:-pyék, pi:-pyék	'chicks'
ŋyáw	'to meow'	ŋya:-ŋyáw, ŋi:-ŋyáw	'is meowing'

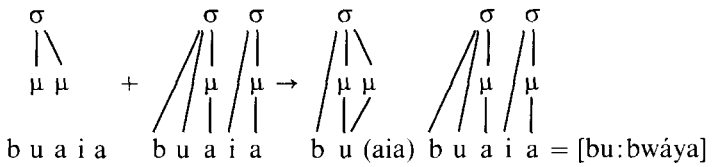
(36) *Light Reduplication*

kwárto	'room'	si-kwa-kwárto, si-ku-kwárto	'be locked up in a room'
pyár	'to trust'	?agin-pya-pyár, ?agin-pi-pyár	'pretend to trust'
pyésta	'fiesta'	?agin-pye-pyésta, ?agin-pi-pyésta	'pretend to be celebrating'

For many words, only one of the two logical possibilities is acceptable. In such instances, the acceptable form is usually, though not always, the one in which the glide is copied as a glide, not as a vowel: *bwaŋ-bwáŋay*, *??bu:-bwáŋay* 'is being responsible for'; *swak-swáko*, *??su:-swáko* 'pipes'; *pyan-pyáno*, *?pi:-pyáno* 'pianos'; *myer-myérkoles*, **mi:-myérkoles* 'Wednesdays'. Thus stems must be lexically marked for whether or not they may undergo the glide vocalization process. We note that in many cases, native intuition is insecure concerning whether the variant with a vocalized glide is acceptable, and making well-formedness judgments is difficult.

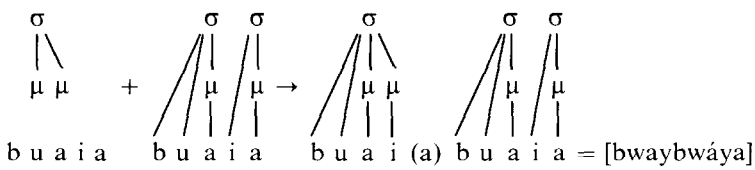
In any event, the next task is to provide a formal account of glide vocalization in reduplication. Intuitively, what we want is to give reduplication the option of filling the reduplication template with the phonetic quality of the glide, 'stretching' it into a vowel. Since moraic theory assumes that vowels and glides have identical segmental representation, differing only in the associated prosodic structure, the vocalization outcome can be expressed straightforwardly:

(37)



The *bway-bwáya* variant would be derived as follows:

(38)



Having assumed this much freedom in assigning segments to prosodic positions, we must also discuss the logically possible but unattested cases.

If /u/ were mapped onto the first mora and /a/ onto the second, we would derive **bua.bwá.ya*, with a /ua/ diphthong in the reduplicated syllable. Our account here is based on a proposal of McCarthy and Prince (forthcoming), who argue that prosodic mapping obeys language-particular well-formedness conditions on segments and syllables. Ilokano disallows all rising diphthongs, including /ua/. Thus according to McCarthy and Prince's proposal, the mapping algorithm would be prevented from filling the reduplication template with the sequence *bua*.

The phonotactics of Ilokano also prevent the vocalization of liquids. Thus *kláse* must reduplicate as *klas-kláse*, not *[kl̩:-kláse], since Ilokano does not tolerate syllabic liquids.

The ill-formed mapping **buy-bwáya* is phonotactically possible, since /uy/ is a possible diphthong in Ilokano. This form is excluded by a different principle posited by McCarthy and Prince: aside from cases of onset simplification, reduplication must map continuous sequences of the segmental string; thus the segment /a/ is not skippable.

To exclude **bwa:-bwáya*, we make the following assumption, which is based roughly on proposals of Marantz (1982):

(39) A segment may be linked only once to the prosodic structure, unless a double linking is necessary to create a well-formed representation.[9]

[9] In addition, individual reduplication rules must have the ability to stipulate double linking as the only option, to account for the appearance in other languages of invariant *CVV-* reduplication.

For example, if in the mapping of /buaia/ the /u/ is initially assigned to the onset to form a glide, as in (25), then the /a/ may not form a double linking, because the alternative of linking /i/ to form the diphthong /ay/ produces a well-formed output. If, however, the /u/ is initially assigned to the first mora to form a vowel, as in (24), then it may (and must) also spread to the second mora, because the only alternative at this stage would be to create the ill-formed syllable /bua/.

Note that principle (39) also rules out vowel lengthening in forms without initial clusters. An example is **sa:-sáŋit* 'is crying', where principle (39) forces the output *saŋ-sáŋit*.

Finally, we note that when a glide is stem-initial, it cannot vocalize in reduplication: cf. *yáman* 'grateful' ~ *ʔag-yam-yáman*, **ʔag-i:-yáman* 'is being grateful'; *yagyág* 'to harangue' ~ *ʔag-yag-yagyág*, **ʔag-i:-yagyág* 'is haranguing'; *yóyo* 'yoyo' ~ *yoy-yóyo*, **ʔi:-yóyo* 'yoyos'; *watwát* 'to exercise' ~ *ʔag-wat-watwát*, **ʔag-u:-watwát* 'is exercising'. The ill-formed outcomes can be avoided if we assume that mapping is required to fill the onset position, which is obligatory in Ilokano. Thus glide vocalization is possible only when the glide is preceded by a consonant that can fill the onset, thus freeing the glide to vocalize by mapping onto the following mora.

To conclude this section, the theory of Prosodic Morphology, supplemented with the principle stated in (39), allows for an adequate account of the outputs available in the heavy reduplication of stems beginning with *C + glide*.

3.5. Template satisfaction by resyllabification

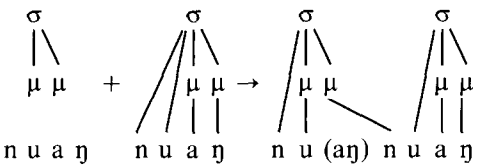
There is one more way in which the template for heavy reduplication may be satisfied; namely through the resyllabification of the initial consonant of a stem-initial cluster.

The crucial evidence here concerns again the cases in which glides are vocalized in reduplication, as in *nu:-nwáŋ* 'water buffalo-pl.'. There is one additional observation about such cases that we have not yet accounted for: the vocalized vowel need not appear as long, so that *nu-nwáŋ* and parallel forms are also acceptable. Such free vowel length is not observed for the long vowels derived from *CVʔ-* initial stems, as in *da:-dáʔit* 'is sewing'; for these stems, the first vowel must reduplicate as long.

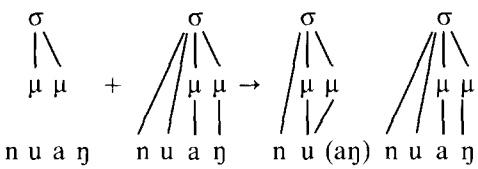
To account for this pattern, we posit that the heavy syllable requirement for heavy reduplication may optionally be satisfied by annexing the stem-initial consonant into the first syllable: *nun.wáŋ*. When this happens, the

reduplicated vowel cannot be lengthened, because the second mora of the reduplication template has already been filled. The following derivations illustrate the proposal:

(40) *Template Filled by Resyllabification: [nun.waŋ]*



(41) *Template Filled by Lengthening: [nu:.nwaŋ]*



Note that such a resyllabification is a natural one, since Ilokano normally divides intervocalic clusters as *VC.CV*.

Our hypothesis is supported by a pattern of allophonic variation. In the dialect we describe, the phoneme /r/ normally is voiceless syllable-finally, voiced elsewhere. When we reduplicate a stem beginning with /r/ followed by a glide, using the glide vocalization option, the following correlation is observed: if the glide is vocalized as a short vowel, then the stem-initial /r/ is voiceless; but if the glide is vocalized as a long vowel, then the stem-initial /r/ is voiced, as follows: *rwar* 'outside' ~ [rur̥.wár], [ru:.rwár] 'further outside'; *rwáŋan* 'door' ~ [rur̥.wá.ŋan], [ru:.rwá.ŋan] 'doors'. The facts of /r/ allophony suggest that vowel lengthening is blocked just in case the stem-initial /r/ has been resyllabified to fill the reduplication template, as our analysis claims.[10]

To summarize this section: Ilokano has five ways to insure that the output of heavy reduplication is indeed a heavy syllable: copying of C_0VC (section 3.1), vowel lengthening (3.2), gemination of the stem-initial consonant (3.3), vocalization of a glide as a long vowel (3.4), and annexation into the reduplicated syllable of the initial consonant of a stem-initial cluster (3.5).

[10] Against our hypothesis we note that native intuition prefers the syllabifications *ru.rwár* and *ru.rwá.ŋan*. This may be due to the influence of the morphological boundary, as the intuition is not a strong one; the strongest preference is simply not to break the word into syllables.

Considered as segmental processes, these form a disparate group. But from the viewpoint of prosodic morphology, the cooccurrence of these processes makes perfect sense; they essentially exhaust the set of plausible ways in which reduplication could form a heavy syllable. Thus Ilokano strongly supports the claim of prosodic morphology that the targets of reduplication processes are prosodically defined. To summarize our account, we state the rules for heavy reduplication in Ilokano as follows:

(42) *Heavy Reduplication*

(a) Prefix a prosodic template consisting of a heavy syllable; i.e.

(b) Copy the segmental string of the base, and fill the template by mapping segments onto it from left to right.

(c) The onset position of the template is obligatorily filled.

(d) Provided (c) is respected, [−low, −cons] segments in certain lexically-marked stems may be mapped onto either onset or mora positions.

(e) The rightmost segment of a stem, and coda consonants in monosyllabic stems, may not be mapped.

(f) If the second mora of the template cannot be filled by mapping (either because this would violate a phonotactic condition, or because of condition (e)), then it is filled as follows:

(i) In lexically marked stems, by leftward spreading of the stem-initial consonant.

(ii) In cluster-initial stems, by reassignment of the first stem consonant to the second mora of the reduplication template (optional).

(iii) If neither of the preceding options is taken, by rightward spreading of the copied vowel.

The analysis is presented in full detail, for explicitness. However, many of its aspects actually form part of the general theory of prosodic morphology, such as the direction of mapping and the requirement that reduplication respect language-specific phonotactic constraints.

4. Antitransfer in Ilokano

The Ilokano facts bear on a recent debate in prosodic morphology, concerning the mechanism by which morphological templates are filled.

Much recent work, stemming from Marantz (1982), posits that only the segmental material of the stem is copied, and that the template is filled by a process of mapping the segmental material onto the prosodic template. We have adopted this assumption in the analysis above.

It is significant that the raw segmental string lacks information that is present in the full base form: in particular, current theories of non-linear phonology construe the distinctions between vowels and glides, and between short and long segments, as distinctions of how the segmental material is incorporated into prosodic structure, rather than as properties of the segmental base.

Combining the mapping hypothesis with prosodic representation of syllabicity and length, we predict that reduplication will fail to copy prosodic properties. That is, whether a vocoid copies as a glide, a long vowel, or a short vowel should be determined by the prosodic shape of the reduplication template, and not by any distinctions present in the base.

By now it has become clear (see Levin (1983), Clements (1985a), and other work) that this prediction is not correct. In reduplication systems, glides usually copy as glides, short vowels as short vowels, and long vowels as long vowels. Deviations from this pattern normally occur only when they are required to fill the reduplication template; as when a short vowel lengthens to yield a heavy syllable. The term 'transfer', proposed by Clements, has been used in most recent work for the copying of prosodic information in reduplication. The issue of transfer is raised forcefully in a recent paper by Steriade (1988), who proposes a theory of template satisfaction in which transfer is the expected outcome, rather than a peculiarity. Briefly, Steriade proposes that the first stage of all reduplication processes is full copying of the stem, complete with prosodic structure. The prosodic target of reduplication is achieved by trimming the copied stem back according to certain specific principles. The principles are set up so that transfer will always take place, except where adjustment (e.g. vowel lengthening) is needed to satisfy the prosodic template. An example of such adjustment is the reduplication of *dáʔit* as *da:-dáʔit*, where the form without adjustment, **daʔ-dáʔit*, would violate syllable canons.

Steriade's full-copying proposal is a very simple solution to a large class of problems; i.e. all cases of transfer in the reduplication literature immediately

become unproblematic if reduplication always copies prosodic structure. Her theory also has the virtue of making clearly falsifiable predictions. In particular, since the full prosodic structure is always copied, we should never find instances of *antitransfer*; i.e. a change in the prosodic form of a segment (i.e. in syllabicity or length) that is not motivated by the need to satisfy the template.

Ilokano in fact has cases of just this sort; cf. examples from above like *na-ka-bu:-bwáya* 'is acting like a crocodile', *pi:-pyék* 'chicks', where glides are copied as vowels. In such cases, the copying of a glide as a vowel is not required in order to satisfy the template; this is clearly shown by the existence of the optional variants *na-ka-bway-bwáya* and *pye:-pyék*, in which the template is satisfied without glide vocalization.

In what follows, we will assess the implications of Ilokano antitransfer for Steriade's hypothesis.

4.1. Antitransfer under Steriade's theory

Most of the analysis above of Ilokano reduplication could be carried over straightforwardly into the theory proposed by Steriade. In particular, the various language-specific conditions on reduplication can be appropriately translated and carried over into a Steriadean analysis (42e,f), or indeed fall out from it automatically (42c). The difficulty arises in provision (42d), which in a mapping analysis allows for antitransfer. Since Steriade's account allows only for total copy of the stem, followed by trim-back to the size of the template, it cannot allow for a rule like (42d) which depends crucially on the mapping process.

The pattern of Ilokano antitransfer can be better understood by considering its history. Comparative evidence, as well as the distribution of forms in the lexicon, indicates that historically Ilokano did not tolerate syllable-initial clusters; many words that now begin with *C+glide* originally began with *C+nonlow vowel*, and attained their present form as a result of Glide Formation. In the earlier forms, the reduplication pattern would have been as follows: *buáya* 'crocodile' ~ *bu:-buáya* 'crocodiles' (cf. Proto-Austronesian **buhaya*; Dempwolff 1938). Once Glide Formation entered the language, the alternation would look like *bwáya* ~ *bu:-bwáya*. The new reduplicated form *bway-bwáya* clearly is the result of taking *bwáya*, rather than *buáya*, as the base for reduplication.

The historical origins of Ilokano antitransfer suggest a possible synchronic analysis: suppose that surface *bwáya* is derived from underlying /buáya/ by

Glide Formation. If we allow reduplication to precede Glide Formation in certain instances, this will derive the *bu:-bwáya* variants, and the *bway-bwáya* variants can be derived by applying reduplication after Glide Formation. Such derivations do not exhibit antitransfer, and are thus compatible with any version of prosodic morphology, including Steriade's. The plausibility of the analysis is increased by the argument of section 2.4: we noted that only if Glide Formation is allowed to apply within roots can the root-internal distribution of glides and vowels be adequately described.

Unfortunately, a closer look at the phonology of Glide Formation suggests that this analysis is untenable. For two independent reasons (sections 2.5, 2.8), Glide Formation must be a cyclic rule. Thus in the proposed analysis, underlying /buaya/ would have to be converted to *bwaya* before the cycle on which reduplication applies. For this reason, reduplication must involve actual vocalization of the glide, not copying of a vowel that later becomes a glide.

Another option to consider is to formulate the synchronic grammar to derive only the *bway-bwáya* variants, and to regard the *bu:-bwáya* variants as historical relics, simply listed in the lexicon. This is not completely unreasonable, since as we noted in section 3.4, in cases where there is only one acceptable form, this is usually the form with transfer, not antitransfer. It seems fairly clear to us that the transfer forms are the more productive and more widely acceptable choice.

However, it is probably going too far to characterize the antitransfer forms as historical relics, as this would underestimate the degree to which the older reduplication pattern lingers on as a somewhat-productive option. In particular, some Spanish borrowings that *always* had glides can reduplicate with the vocalized-glide pattern, for example the forms of (36). Moreover, for a small set of stems, the *bu:-bwáya* pattern is the only possibility. These stems have the form $C+glide+V$, and to use the *bway-bwáya* pattern would violate the prohibition on copying of the whole stem, mentioned in section 3.2: *lu:-lwá*, **lwa:-lwá* 'to shed tears' (cf. *lwá* 'tear'); *na-pi:-pyá*, **na-pya:-pyá* 'healthier' (cf. *pyá* 'health'); *bu:-bwá*, **bwa:-bwá* 'betel nut-pl.'.

Moreover, the language provides a clear example of what real relic forms would look like; namely the few words in which compensatory lengthening reflects the earlier stage of the language when Glide Formation was not yet cyclic (section 2.5): *meyka-ddwá* 'the second' (cf. *dwá* 'two') and *ma-ttwáŋ* 'to fall over' (cf. *twáŋ* 'sense of falling'). Such forms are extremely rare, and are vastly outnumbered by cyclically derived forms such as *maŋi-twáŋ* 'to cause to fall down'.

Thus the historical-relic hypothesis must face the following question: when Glide Formation became a cyclic rule, the stem-initial gemination alternations it had earlier induced disappeared almost entirely. But reduplicated forms like *bu:-bwaya*, which had also originated at the earlier stage of non-cyclic Glide Formation, remain as a relatively productive option. The great difference between the two phenomena suggests that the formal grammar of Ilokano must provide an account of the *bu:-bwáya* variants, and not simply list them as relic forms. This necessitates the recognition of antitransfer as a synchronic process.

Is Steriade's theory, which forbids antitransfer, thereby falsified? In the view of Clements (1985b: 246), it would not be. Clements notes that through the accidents of history, languages can develop rules that falsify otherwise valid cross-linguistic generalizations. Ilokano antitransfer is a clear example of this: it is not a fresh, productive phenomenon, but rather is an accident, the result of the appearance of Glide Formation in Ilokano grammar and its shift to cyclic status. The fact that variants like *bway-bwáya* have come into being, and that they appear to be gradually displacing variants like *bu:-bwáya*, suggests that Ilokano is in the process of eliminating antitransfer. This in turn suggests that antitransfer is something languages naturally avoid.

Thus if we allow ourselves to discount the accidents of history in evaluating general theories, Steriade's proposal is not truly falsified by the Ilokano data. Moreover, if we assume that one task of a theory is to point out marked situations that a language will tend to eliminate, the Ilokano facts could even be construed as supporting Steriade's account, since it provides no natural analysis in precisely those cases that appear to be receding from the grammar.

5. Miscellaneous

The main body of this article, though organized on theoretical lines, comes fairly close to describing all of the productive, non-allophonic rules of Ilokano. It is this class of rules that is least thoroughly treated in the existing literature. Since there are only two rules we have found that we have not yet mentioned, we add them here to complete our description.

5.1. Stress shift

When a long vowel is derived by reduplication, the main stress of the word may optionally be retracted onto it, as in *sa:-saʔó, sá:-saʔò* 'words';

ʔag-ŋi:-ŋyáw, ʔag-ŋí:-ŋyàw 'is meowing'. Although the judgment is delicate, we believe that the formerly main stressed syllable retains a secondary stress. We thus write the rule, informally, as follows:

(43) *Stress Shift*
V: X V́ → V́: X V̀

In our transcriptions we have provided only the form with unretracted stress, but the retracted form appears always to be possible. Note that the only long vowels that are eligible to acquire stress by (43) are the long vowels derived by reduplication; long vowels derived by open syllable lengthening already bear main stress by virtue of the structural description of that rule.

Stress shift is important in comparing our description with that found in earlier work on dialects of Ilokano. Vanoverbergh (1955: 31, 38–39, 223) states that stems of the *saʔó* class (i.e. non-initial stress, medial [ʔ]) reduplicate as *sá-saʔò*, with obligatory stress shift. Vanoverbergh does not say whether the reduplicated vowel is long or short. Our conjecture is that this vowel is probably long in the dialect Vanoverbergh described. In general, Vanoverbergh concentrates his description on phonological properties that, unlike length, are reflected in Ilokano orthography. If our conjecture is correct, then the dialect we discuss differs from the Vanoverbergh dialect only in that stress shift is optional rather than obligatory.

Bernabe et al. (1971: 180–181) describe a dialect in which the syllable created by heavy reduplication always bears strong stress, even when it has a short vowel, as in *na-pín-pintás* 'prettier' (cf. *pintás* 'pretty'). In this dialect, the long vowels found in cases like *na-lá:-laʔiŋ* 'more intelligent' can be derived straightforwardly, since stressed vowels always lengthen in open syllables (see (28a)). The dialect we describe differs from the Bernabe et al. dialect, however, in that the copy syllable may be stressed only if it contains a long vowel; that is, we find contrasts like *ʔag-da:-dáʔit, ʔag-dá:-dàʔit* 'is sewing' vs. *ʔag-saŋ-sáŋit* (only) 'is weeping'. For this reason, we analyze lengthening as basic and stress shift as a secondary effect.

5.2. Reduced reduplicated forms

In fluent speech, reduplicated forms in Ilokano may appear in phonologically reduced versions. In particular, in those morphological categories calling for heavy reduplication, light reduplication may appear instead, as in *ʔag-sa-sáŋit* for *ʔag-saŋ-sáŋit* 'is weeping', *ʔag-tra-trabáho* for *ʔag-trab-trabáho* 'is

working', *?ag-pla-plánčya* for *?ag-plan-plánčya* 'irons', and similarly for other forms. As would be expected, words that reduplicate with a long vowel appear with a short vowel instead in fluent speech, as in *?ag-da-dá?it* 'is sewing'.

A second kind of reduction involves cluster simplification: in stems beginning with *C + liquid*, only C is copied, as in *ka-kláse* 'classes', *pe-plégis* 'creases', *ta-trahédya* 'tragedies', *pu-prútas* 'fruits', and *ki-krisčyáno* 'Christians'. Both processes are limited to casual speech; some of our consultants apply reduction in colloquial speech but do not accept reduced forms in elicitation.

Consonant reduction does not occur in forms that have undergone full heavy reduplication; thus forms like **kas-kláse*, 'classes' **kis-krisčyáno* 'Christians', **dam-dráma* 'dramas', and **te:-tren* 'trains' are not possible. The reason for this, we believe, is that the two reductions differ in the speaking rate required for them to apply: light-for-heavy substitution takes place in moderately fluent speech, whereas cluster reduction takes place only in quite fluent speech. Any speaking rate fast enough to allow cluster reduction would induce light-for-heavy substitution as well.

Both reduction processes are limited to reduplicated forms. For example, it is not possible to say *tabáho* for *trabáho* or *káse for kláse*. Similarly, the long vowels derived by lengthening in open syllables (rule (28a)) are also preserved in casual speech, and initial closed syllables that are not derived by reduplication do not lose their final consonants.

Steriade (1988) conjectures that simplification of the syllable onset to a single consonant forms part of a universally determined set of parametric options for reduplication templates. The facts just cited support this claim, as Steriade's theory allows the reduplication rule to be stated as a single process: the onset-simplification parameter is allowed to vary in its value between careful and fluent speech.

6. Conclusion

We have emphasized two areas in this description. One is syllabification: we have argued that a set of several rules is responsible for converting raw underlying forms into well-formed surface syllables. These rules must apply cyclically, arguing that Ilokano syllabification is itself cyclic.

The other area of theoretical interest we have treated is reduplication: we have argued that the diverse surface realizations of heavy reduplication in

Ilokano support the theory of Prosodic Morphology. The only common property of all the various realizations of heavy reduplication is a prosodic one; they all count as a heavy syllable.

Lastly, we have treated the phenomenon of antitransfer in Ilokano, arguing that it requires an analysis incompatible with the theory of reduplication proposed by Steriade (1988). However, in support of Steriade's theory we noted that antitransfer appears to be a historical accident, and that the language is in the process of eliminating the phenomenon.

To conclude, we list the phonological rules we have proposed, with the required orderings.

(44)	(4a)	Glide Formation	(cyclic, precedes Glottal Epenthesis, Palatalization, and Metathesis)
	(3a)	Glottal Epenthesis	(cyclic, precedes Glide Insertion and Glottal Deletion)
	(22)	Glide Insertion	(precedes Glottal Deletion)
	(17)	Glottal Deletion	(optional)
	(43)	Stress Shift	(optional)
	(5a)	Palatalization	(precedes /t/ Weakening)
	(6a)	Metathesis	(optional)
	(28)	Open Syllable Lengthening	
	(7)	/t/ Weakening	(optional, fluent speech only)

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