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Segmental unmarkedness versus input preservation in reduplication

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1. Introduction

Reduplication creates new words by affixing a copy of all or part of the base word. This paper discusses types of reduplication from Chinese languages that differ in two ways from the most familiar and proto-typical cases. First, it is not obvious which piece of the output is the base and which is the affixed copy, and instead the outputs look more like compounds of a word with itself. Second, and the focus of this paper, the copies are imperfect, with various segments from the input being replaced by fixed segments, [l] in onsets, [i] in nuclei, and [ʔ] or [ŋ] in codas. I shall argue that these segmental replacements are the unmarked segments for these syllabic positions, and that this is an instance of The Emergence of The Unmarked (TETU), as discussed in Alderete et al (1998).

After a survey of the data, I begin by laying out the basic analysis of reduplication as a response to two constraints, ALLITERATE and RHYME. I then show how the ranking of these with respect to segmental markedness constraints gives rise to the segmental changes. In the next section I discuss the particular choice of unmarked segments, and propose a set of markedness constraints. The final two sections discuss cases where segmental markedness is violated on the surface in that the replacement segments do not appear to be the most unmarked ones. In the first case, a special requirement of secret languages forces an increase in markedness. In the second case, conflicting markedness constraints interact with the secret language constraint to produce surface marked segments.

2. Data:

The following sections show four patterns of reduplication: onset change, nucleus and coda change, syllable structure change, and "concealed reduplication".

2.1 Onset change in Chaoyang verbal reduplication:

The following data (Zhang 1979a,b, 1980, 1982) contrasts two types of morphology. The first set of data shows shows ordinary compounding, and full reduplication, while the second set shows onset-changing reduplication, where the second onset becomes [l], or [n] in the presence of nasality.

(1) *No onset change*:

a. *non-reduplicative compounding/affixation:*

teŋ tioʔ 'heavy weight'

b. *most types of reduplication, including verbal, nominal, adjectival/adverbial, measure word*

hou bui bui	'rain slight'	kuaŋ kuaŋ aŋ	'blush red'
haŋ toi toi	'alley's end'	zik zik tsiõ paŋ	'everyday go to work'

(2) Onset change:

a. *resultatives:*	kuaʔ	kuaʔ luaʔ tŋ	'cut off'
b. *directional complements*	kiã	kiã niã lai	'walk-come'
c. *durational complements*	paʔ	paʔ laʔ e	'pat once'

These data raise three puzzles: (i) Why do onsets change at all? (ii) Why do they change to [l] or [n]? and (iii) Why can only some onsets change? I will propose the following answers: (i) Onsets change to reduce markedness. (ii) [l] is chosen because it has the least marked place (Coronal), it is phonologically [-cont] in Chaoyang, making it a suitably low sonority segment for an onset, and it is voiced, which is the preferred laryngeal state in medial position. (iii) Marked onsets resist change if *either* a. they are the only surface correspondent of the input onset as is the case in non-reduplicative morphology *or* b. they are initial in the morphological word *or* c. they are final in X". This paper will provide detailed support for the answers to (i) and (ii), and for (iiia). On (iiib-c), see Yip (to appear).

The basic facts are given below:

(3) *a. Onsets become [l] if original onset and vowel are oral:*

kuaʔ luaʔ tŋ ‘cut off’ paʔ laʔ e ‘pat once’

tsuŋ luŋ ta ‘twist dry’ tui lui tik ‘pull straight’

b. Onsets become [n] if original onset or nucleus are nasal:

kiã niã lai ‘walk-come’ k’ŋ nŋ muã ‘hide things’

kuẽ nuẽ k’u ‘close-go’ mueʔ nueʔ tiau ‘finish up’

ŋaŋ naŋ tiau ‘dig out with nails’

c. Only onset of second syllable changes.

ts’u lu tik *lu ts’u tik * lu lu tik

d. Second syllable must have onset; first syllable may be onsetless

uãi nuãi tiau ‘dig out w. knives’ *uãi uãi tiau,*nuãi nuãi tiau

e. Nucleus and coda never change/ delete:

tsuŋ luŋ ta ‘twist dry’ *tsuŋ lun ta, * tsuŋ lu ta, *tsuŋ liŋ ta

siap liap (siap liap) ‘puckery’ *siap liat, *siap lia

2.2 Nucleus and coda changes: Chaoyang onomatopoeia

Some further data is of interest here. In onomatopoeia, Chaoyang has two additional reduplicative patterns. These show vowel and coda change in both patterns, and onset change in one of the two. The vocoids become [i], and any coda becomes velar, glottal, or deletes. The onset changes are the same as before.

(4) **Chaoyang onomatopoeia:**

Vocoids change to [i]: Ci(k /ʔ/ŋ) CV(C) kio

kʰi kʰa kio   tik tok kio

First vocoids & third onset change: Ci(k/ʔ/ŋ) CV(C) lV(C) kio:

kʰi kʰa la kio   tsi tsiau liau kio   piŋ paŋ laŋ kio

kik kiak liak kiõuãĩ nuãĩ kio

Coda change/loss: First coda becomes velar, glottal, or deletes

kʰiŋ kʰom kio   hiʔ hop lop kiohi hom lom kio

2.3 Syllable structure change: Fuzhou reduplication

A final set of data from Fuzhou (Zheng 1983), dialect, shows identical onset change in the second syllable (although Fuzhou has no morphemic nasality, so the onset is always [l]), but accompanied by simplification of the preceding rhyme to a CGV syllable with one of a reduced set of tones:

(5)	/pieu/	pie lieu ʒouʔ li	'squirt-come-out'
	/kuŋ/	ku luŋ......	'roll'
	/tau/	ta lau	'cover'
	/niaʔ/	nia liaʔ tɔ a	'blink once'
	/loʔ/	lo loʔ	'cover, sheath'
	/t^haiŋ/	t^ha laiŋ lɛ	'stand straight (lit: stick out chest)'

2.4 Concealed reduplication: Jin dialects

The following data from Jin dialects (Sagart 1998; synchronically not productive) do not look like reduplication at all, but infixation. However, I shall argue that it is an expected outcome from the interaction of markedness and reduplication under the analysis proposed here, and involves replacement of the first nucleus and coda with unmarked [əʔ] and of the second onset with the familiar [l].

(6) Yimeng:

pai	'to agitate'	pə(ʔ) lai	'to oscillate'
pən	'to run'	pə(ʔ) lən	'to run on all sides'

xua	'to draw'	xuə(ʔ) la	'to scribble'

(7) Huojia

paʔ	'to select, pick'	pə(ʔ) laʔ	'to manipulate (as an abacus)'
phau	'to dig'	phə(ʔ) lau	'to dig repeatedly'

In all four cases, I will argue for a markedness account of these facts.

3. Reduplication as self-compounding:

I start with the assumption that this type of (near) total reduplication is self-compounding (as suggested in McCarthy and Prince 1986 for English echo-words). Since both halves of the output have equal status, no base-affix relationship exists, so FAITH-BR constraints can play no role. Instead, FAITH -IO constraints relate each half to the input. (For related proposals which view reduplication in non-affixal ways, see Sherrard (1997), Raimy and Idsardi (1997), Struijke (2000) and Inkelas and Zoll (1999).) Reduplication is forced by constraints that require repetition, but I differ fromYip (1993,8) in subdividing these constraints (there called ECHO or REPEAT) into two that I will call ALLITERATE, and RHYME. This proposal immediately captures one obvious generalization missed by the standard base-reduplicant analysis of McCarthy and Prince 1995: the reduplicant and the copy are always adjacent, resulting in rhyming or alliterating *sequences*. I suggest that the real core of reduplication is an attempt to produce these sequences, and that rather than involving an abstract affix, reduplication is *caused* by RHYME and ALLITERATE constraints, where ALLITERATE governs the initial consonant, and RHYME governs the rest of the syllable, including any pre-nuclear glide.[1]

(8) ALLITERATE: Output must contain at least one pair of adjacent syllables with identical onsets

RHYME: Output must contain at least one pair of adjacent syllables with identical rhymes

Under the influence of these constraints, input segments may thus have two output correspondents (violating INTEGRITY); there is no base or affix in the familiar sense. For an input /pati/ there will be two outputs which fully satisfy both RHYME and ALLITERATE, [*pa*-pati] and [pati-*ti*], analogous to Tagalog [pag-*la*-lakad] and Chamorro [bunita-*ta*] respectively.

Note crucially that this analysis does *not* mean that reduplication necessarily copies syllables, something known to be untrue since Moravcsik 1978, Marantz 1982. Firstly, markedness considerations such as *COMPLEXONSET or NOCODA can result in "undercopying", as in Tagalog [*ta*-trabaho] or Ponapean [*ke*-kens] 'ulcerate' respectively. Secondly, if the rhyming portion precedes the alliterating portion, we get VC copy as in Tzeltal [nit-*it*-an], Oyakangand [*ed*-eder], or Mangarayi [gab-*ab*-uji]. In [nit-it]an], for example, the syllables [ni] and [ti] rhyme, and the syllables [ti] and [ta] alliterate.

To see how this works, consider a simple input /$b_1u_2i_3$/. In the absence of any Markedness constraints, this grammar will produce total reduplication, satisfying all constraints except IO-Integrity:

(9)

/$b_1u_2i_3$/	MAX-IO	RHYME	ALLITERATE	IO-INTEGRITY
☞ a. $b_1u_2i_3$ $b_1u_2i_3$				***
b. $b_1u_2i_3$ u_2		*!	*!	*
c. b_1u_2 b_1u_2	*!			**

The focus of this paper, however, is on types of reduplication where segments change, rendering the reduplication less than total, and the cause and nature of those changes. Alderete et al (1998) argue that some languages use unmarked segments in reduplication, and attribute it to the ranking of base-reduplicant faithfulness constraints below markedness constraints. The general schema for The Emergence of The Unmarked effect (TETU) is FAITH-IO >> MARKEDNESS >>FAITH-BR. I adopt this basic idea in this paper, but elaborate it to account for the differential treatment of different syllabic positions.[2]

In the approach advocated here, if MARKEDNESS >> ALLITERATE, onsets will become unmarked, and if MARKEDNESS >> RHYME, rhymes will become unmarked. Chaoyang and Fuzhou show a whole collection of patterns illustrating four of these interactions, and the fifth is illustrated by data from Jin. Again, no commitment to a base/affix distinction is needed. A hypothetical syllable /hop/ is used to illustrate the constraint rankings, which are construction-specific and therefore lexically specified just like an affix would be.

/hop/		Rankings
Pattern 1	hop hop	ALLITERATE, RHYME >> MARKEDNESS
Pattern 2	hop lop (+ suffix)	RHYME >> MARKEDNESS >> ALLITERATE
Pattern 3	hiʔ hop (kio)	ALLITERATE >> MARKEDNESS >> RHYME
Pattern 4	hiʔ hop lop (kio)	ALLITERATE, RHYME >> MARKEDNESS
Pattern 5	həʔ lop	MARKEDNESS >> ALLITERATE, RHYME

The alert reader will notice that patterns 1 and 4 have the same constraint ranking. Both patterns satisfy RHYME (with adjacent [op]'s) and ALLITERATE (with adjacent [h]'s), and the difference lies in the number of syllables in the output. I will assume that the trisyllabic pattern must be lexically specified, perhaps as requiring two binary feet in the output: (σ σ) (σ kio).

I shall now show in more detail how onset change, resulting in less than full reduplication, is caused by markedness pressures. The discussion is presented using data from onset change, but extends straightforwardly to rhyme change. The central idea is that in reduplication each input segment has two output correspondents, each of which incurs a markedness violation. Replacing one correspondent with a less marked segment is thus a way to improve matters with respect to markedness, without violating MAX-IO. I assume that the fixed segment is an introduced segment, in violation of DEP-IO, not a correspondent of an input segment. Consider what happens if we introduce into the above grammar the markedness constraint *LABIAL, ranked above ALLITERATE:

/bui/	MAX-IO	RHYME	*LABIAL	ALLITERATE
☞ a. bui lui			*	*
b. bui bui			**!	
c. lui lui	*! (b)			

Note that wholesale loss of /b/, as in candidate (c), is blocked by MAX-IO, the same constraint which blocks *any* loss of input segments in non-reduplicative contexts where there is only one output correspondent possible. On the other hand excessive retention of /b/ results in unecessary violations of *LABIAL, and thus /b/ is replaced by the less marked [l] in the second syllable. Note that a further candidate *[lui bui] is excluded by a prohibition on change to initial consonants, a type of positional faithfulness. See Beckman (1996) and Yip (to appear).

I will now justify the distinction between the two constraints that cause reduplication, RHYME and ALLITERATE. The argument rests on the resolution of a potential problem with a markedness account. Unlike marked segments in the onset, marked segments such as velars in the rhyme survive in both correspondents, in double violation of markedness: /siap/ reduplicates as [siap liap], and /ŋaŋ/ reduplicates as [ŋaŋ naŋ], not [ŋaŋ nan] or [ŋaŋ na]. Final coronals are not allowed in Chaoyang, but complete loss of one final coda would remove a marked segment, and a NOCODA violation, without a MAX-IO violation, and yet this does not happen. These facts argue strongly for a division of the constraint that produces reduplication into two parts, RHYME and ALLITERATE, with RHYME dominating markedness constraints, which in turn dominate ALLITERATE. This ranking will force onset change, while preserving rhymes intact. Once this division is made, the relative ranking of each constraint with respect to markedness will determine whether it is onset segments or rhyme segments which move towards unmarkedness, and thus allow us to explain the full range of reduplication patterns laid out in section 2..

Let us see how this works in a tableau. Note that the constraints are assessed gradiently. For each segment by which input and output differ in the presence or absence of some segment, or in the features of that segment, the candidate incurs one asterisk (but see below for fine-tuning in connection with the active role played by ALLITERATE in Kunshan).

(10) RHYME>> MARKEDNESS >> ALLITERATE

/ŋaŋ/	RHYME	*DORSAL	ALLITERATE
☞ a. ŋaŋ naŋ		***	*
b. ŋaŋ na	*!	**	*
c. ŋaŋ ŋaŋ		****!	
d. ŋaŋ ŋa	*!	***	

Candidates (b) and (d) have removed the marked Dorsal coda in the second syllable, but this causes a violation of high-ranked RHYME, so they are ruled out. Candidates (a) and (c) now pass down to *DORSAL, which assigns an asterisk for each Dorsal segment. Candidate (c), with four, loses to candidate (a), with only three, even though (a) violates the lower-ranked ALLITERATE.

Importantly, in the account presented here markedness both causes the loss and picks the best candidate. This was not the case in Yip 1993,8, where a single constraint,*ECHO (or *REPEAT), forced non-identity, and markedness chose the best candidate from those that satisfied *ECHO. In this paper, there is no need for the negative constraint *ECHO: markedness does all the work. There is good reason to prefer this approach. If markedness, not *ECHO, drives onset change, then inputs with already unmarked /l/ or /n/ onsets will not undergo further change. This is correct, as shown by examples like [lioʔ lioʔ e kiã] or [nuã nuã e]. *ECHO would wrongly predict onset change of some kind, even at the expense of a markedness *increase*. In the next section I turn to why [l] and [n] should be chosen as the unmarked segments, followed finally by a discussion of segmental and structural changes in the rhyme.

4. The choice of unmarked segments

Chaoyang has the following segment inventory: Notice importantly that /l/ occupies the inventory slot where /d/ would be expected on both historical and synchronic grounds, and that /l/ is flap-like in most Min dialects.

p	t	ts	k	i		u
pʰ	tʰ	tsʰ	kʰ	e		o
b	l		g		a	
		s	h			
		z				
m	n		ŋ			

Final consonants may be [m,ŋ, p,k]. Syllables may also end in a glottal stop. There are eight tones. Chaoyang syllables may be open, (C) (G) V (G) (ʔ), or closed, (C) (G) V C. Some examples follow:

(11) pou^{11} 'chew' pʰaŋ^{33} 'fragrant' mẽ:^{53} 'fast'

ŋiam^{55} 'surname' bi:ʔ^{11} 'hide' lok^{11} 'shake' siap^{11}

'forty' oiʔ^{55} 'narrowlauʔ^{11} 'lick'

iãũʔ^{11} 'fold' tsi:ʔ^{55} 'stone'

4.1 [l] or [n] as the unmarked onsets

In this section I justify the choice of Coronal, [+voice], [-cont] [l] as the unmarked onset. I will arrive at a small set of markedness constraints for onset consonants which must dominate ALLITERATE in order for onset change to take place.

The choice of the coronal [l] results from the familiar markedness hierarchy, *LABIAL, *DORSAL >> *CORONAL. The preference for a coronal over no onset at all shows that ONSET >> *CORONAL (cf Gafos (1998) on Temiar). Codas, by contrast, can delete (see below). ONSET also forces the addition of an onset to a vowel-initial syllable, as in [uãi nuãi tiau]; this is blocked in word-initial position by positional faithfulness constraints (Beckman 1996).

The [-cont] [l] is preferred to the [+cont] [s] because stops, even the flap-like [l], are the quintessential onsets, providing the sharpest start to the syllable. It is not clear whether stops, especially these flaps, are less sonorous than fricatives, see Clements (1988), Dell and Elmedlaoui (1985) and Prince and Smolensky (1993) for discussion. Certainly calling [l] less sonorous than [s] seems odd, so rather than stating the preference in sonority terms I shall content myself with assuming that for onsets *[+cont] >> *[-cont].

The choice of [l] over [t] suggests that *[-voice] is high-ranked, selecting the only voiced oral Coronal, /l/ in Chaoyang. Ranking *[-voice] >> *[+voice] is however cross-linguistically rather dubious, given that voiceless stops are usually preferred - indeed, many languages have no voiced stops at all, and if voice is privative as suggested by Lombardi (this vol) ranking voiceless as more marked than voice is in fact impossible. In most cases, the choice of voiced /l/ could be attributed to intersonorant voicing since the preceding syllable ends in a vocoid or a nasal (see below on Kunshan), suggesting the constraint InterSonorant Voicing: *[+son][-vce][+son].[3] [4] This leaves unexplained the cases where /l/ follows [ʔ, k]. Jie Zhang (p.c.) has suggested to me that [t] may be avoided in these contexts for a separate reason: it would be hard to detect after an unreleased, glottalized stop.

The following tableau shows how these constraints select [l]:

(12)

/p'oi/	*Labial, *Dorsal	Onset	*Coronal	INTER SON VOICE	*[+cont]
☞a. p'oi loi	*		*		
b. p'oi zoi	*		*		*!
c. p'oi toi	*		*	*!	
d. p'oi oi	*	*!			
e. p'oi koi	**!			*	

High-ranked *Labial, *Dorsal excludes candidate (e) at once, and Onset rules out the onset deletion candidate (d). The choice is now reduced to some sort of coronal onset, and the final two constraints select (a) which satisfies both INTERSONVOICE and *[+cont].

[n] is chosen in the presence of [nasal], in conformity with the general behavior of nasality in Chaoyang. Nasality is specified at the level of the morpheme, and voiced onsets harmonize in nasality with the following vowel in open syllables, so we find [la] and [nã] but not *[lã] or *[na]. Because nasality is morphemic, it is not automatically lost when an onset is lost (see Yip 1994, 1997 for more details, including discussion of the lack of nasal vowels in closed syllables).

4.2. [i] as the unmarked vowel:

I now turn to vowels. The basic analysis is identical to that for onset change, except that just as markedness dominated ALLITERATE in the case of onset change, it dominates RHYME in the case of rhyme change.

Recall that in onomatopoeia Chaoyang replaces all vocoids by [i], for example [tik tok]. This can be unified with the consonantal explanation if we follow Clements and Hume (1995) and assume that front vowels are Coronal. Then the ranking *LAB, *DORS >> *COR, established for onsets, will also cover the vowels. The choice of high [i] over mid [e] may be language-specific.

Spanish chooses [e] in epenthesis, and the Jin dialects use [ə].

Just as high-ranked ONSET blocks deletion as a way to reduce markedness, so HNUC, which requires every syllable to have a sufficiently harmonic (i.e. sonorant) nucleus, blocks deletion of the vowel. Non-nuclear vowels and codas may in fact delete: an input /kuai/ becomes [ki], although this would be hard to distinguish from [kiii]! The following tableau illustrates how these constraints interact; RHYME is low-ranked and not shown here. ALLITERATE is high-ranked, and blocks any onset changes.

(13) Tableau for vowel change: (counting only violations involving vowels)

/lom/	HNUC	*LAB, *DORS	*COR
☞li lom		*	*
lo lom		**!	
l̩ lom	*!	*	

4.3 Codas: Deletion, debuccalization, or velars

The facts about codas are more complex than they are for onsets or nuclei. First, remember that coda change accompanies nucleus change, not onset change. This is because onset change is the result of RHYME > > MARKEDNESS > > ALLITERATE, whereas any change in the rhyme, be it nucleus or coda, is the result of ALLITERATE > > MARKEDNESS > > RHYME. When markedness is reduced in the rhyme, nuclei cannot delete because of HNUC, but there is no such constraint on coda deletion: indeed, cross-linguistically codas are marked, and the constraint NOCODA captures this fact. We would thus expect codas to delete, eliminating both a marked syllable type, and the marked features of the coda segment, and this is indeed one option, as shown by forms like [hi hom]. However, codas do not all delete: they may survive as either a glottal stop, or a velar nasal or stop. I attribute this retention to pressure for what I will term "structural rhyme", in which the syllables match in syllable type, remaining both CVN [hiŋ-hom] or CVO [hiʔ-hop] where N=[nasal] and O stands for obstruent). The difference between CVN and CVO syllables is pervasive in Chinese, and CVO syllables can usually bear only a limited set of mostly level tones. Many dialects have lost them altogether, while preserving CVN syllables. Since this structural rhyme pressure results in retention of codas, it must outrank both featural markedness and NOCODA. I will discuss this in detail in the remainder of this section.

First, though, let me deal with the choice of glottal stop or velars for the retained codas. It is frequently observed that glottal stop is characterized by a lack of place features, thus eliminating markedness violations of *LAB, *COR, *DORS.[5] Final stops in Chaoyang are unreleased and glottalized, and bear the feature [constricted glottis]. If the pressure for structural rhyme requires the presence of a stop, debuccalization to [ʔ] will be the least marked option. For nasals in Chaoyang no such option exists. The language has no placeless nasal glide equivalent to the Japanese moraic nasal, and it can be shown that phonologically final nasals are simply characterized by Place features without the feature [constricted glottis] born by the stops (see Yip 1994, 1997 for details). Importantly, they do not bear the feature nasal, so their loss does not leave a nasal residue behind. The upshot of all this is that for final nasals if they are retained it must of necessity be as a nasal with some specified oral place of articulation.

In the case of onsets, the least marked place was Coronal, and yet codas survive as velar, not coronal. Chaoyang has only labial and velar codas, for both nasals and stops, so coronal codas are not an option, but why? Trigo (1988) argues that velars are the unmarked consonants in coda position), and one can perhaps understand this as resulting from a preference for moraic consonants to use the tongue body, making them more vowel-like in nature, so I formulate this as *μ_C=LAB, COR, crucially dominating *LAB,*DORS,*COR. The complete markedness ranking so far is given below:

HNUC, ONSET, $*\mu_C$=LAB, COR >> *LAB,*DORS >> *COR

4.4 Codas continued: Structural rhyme vs. featural rhyme:

In the last section I introduced the notion of structural rhyme to account for the retention of coda consonants. I will now flesh out this idea, using the syllables /hom/ and /hop/ as schematic examples for the real data. I will split RHYME into a pair of constraints, given below:

(14) STRUCTRHYME: Output must contain a pair of adjacent structurally identical syllables, where structurally identical means both CV, both CVN, or both CVO.

(15) FEATRHYME: Any structurally identical positions (i.e. nuclei, off-glides, codas) in the two rhymes must match in features.

Syllables may obey any mixture of these constraints, as conveyed in the chart below. (I give only outputs in which vowel change has taken place.) Moving from left to right across the table, as codas degrade or delete, rhyme deteriorates from perfect to non-existent, but markedness improves. The tension between these two gives rise to two options in the case of nasals: observe structural rhyme at the expense of markedness [hiŋ hom] or minimize markedness at the expense of rhyme [hi hom]. In the case of obstruents, however, [hiʔ hop] satisfies both, and is therefore always to be preferred.

(16) Perfect rhyme ➛ structurally good rhyme ➛ no rhyme

---➛

Most marked ➛ least marked

/hom/	*him-hom	**hiŋ-hom**		**hi-hom**
/hop/	*hip-hop	*hik-hop	**hiʔ-hop**	*hi-hop

One last empirical complication: although labial stop codas can't become velars, underlying velar codas may sometimes persist, as in [kik kiak liak kio]. Apparently velar codas are not very marked; the perceptual cues for the difference between [kik˺] and [kiʔ] are very subtle, since stop codas are unreleased and glottalized anyway.

I now give a more formal OT treatment of the account outlined above. Let me begin with the stop-final case. I give the tableau below, showing STRUCTRHYME high-ranked (above NOCODA), forcing coda retention. Here and in subsequent tableaux in this section I show only violations for the coda of the first syllable.

(17) Tableau for stop coda change: /hop/ > hiʔ hop (lop kio)

/hop/	STRUCTRHYME	*μ_C= LAB,COR	*LAB, *DORS	*COR
☞ hiʔ hop				
hik hop			*!	
hip hop		*!	*	
hi hop	*!			

Note crucially that [hiʔ hop] will win under any ranking of these constraints, since it is perfect.

When we turn our attention to nasal codas, we have to account for two possible outputs, [hi hom] or [hiŋ hom]. In OT optionality is usually captured by proposing that constraints are freely ranked with respect to each other (see Clements 1997, among others) and that is the position I shall take here. [hiŋ hom] is the result of low-ranked markedness and high-ranked STRUCTRHYME (as above), and [hi hom] is the result of high ranked markedness and low-ranked STRUCTRHYME. Stated in this way, the optionality involves the free ranking of STRUCTRHYME with respect to the adjacent block of related markedness constraints, an unsurprising extension of the usual assumption that optionality freely ranks adjacent singleton constraints only.

The following two tableaux tell the tale; I repeat that under either ranking, /hop/ will still become [hiʔ hop].

(18) Option one for nasal codas: Tableau for nasal coda change: /lom/ > liŋ lom (kio)

/lom/	STRUCTRHYME	*μ_C= LAB,COR	*LAB, DORS	*COR
☞liŋ lom			*	
lim lom		*!	*	
li lom	*!			

(19) Option two for nasal codas: Tableau for nasal loss: /lom/ > li lom (kio)

/lom/	*μ_C= LAB,COR	*LAB, DORS	*COR	STRUCTRHYME
☞li lom				*
liŋ lom		*!		
lim lom	*!	*		

Note that under this ranking, /hop/ will still become [hiʔ hop], as observed above.

The distinction between STRUCTRHYME and FEATRHYME is not only useful in Chaoyang, where STRUCTRHYME is the more high-ranked of the two, but in other dialects where the reverse ranking can be seen. Consider Fuzhou forms like /kuŋ/ > [ku luŋ], where the first syllable keeps its nucleus so that the nuclei of the two syllables remain identical satisfying FEATRHYME, but loses its coda, showing that NOCODA >> STRUCTRHYME. For completeness, let me also observe that Fuzhou rhymes show a reduction in segmental markedness of one further type: diphthongs are lost. We can conclude that in addition to NOCODA, NODIPHTHONG also outranks STRUCTRHYME.

The various rankings of STRUCTRHYME and FEATRHYME with respect to MARKEDNESS produce a factorial typology shown in the next table. For rhyme changes to take place at all, markedness must dominate at least one of the RHYME constraints, as shown by the first three rows in the typology; the fourth row shows the case of no rhyme change (although the onset can of course change independently if ALLITERATE is low-ranked).

(20) A typology of Rhyme/Markedness rankings:

(MARKEDNESS here includes *PLACE, NOCODA, NODIPHTH)

Dialect	Typical data	Constraint Ranking
Chaoyang	kiŋ kom	StructRhyme >> Markedness >> FeatRhyme
Chaoyang	ki kom	Markedness >> StructRhyme, FeatRhyme
Fuzhou	ko lom	FeatRhyme >> Markedness >> StructRhyme
Chaoyang	kom lom	FeatRhyme, StructRhyme >> Markedness

This completes the basic analysis, which in its essentials will extend to the data in the following sections also. I have shown that Chaoyang and Fuzhou offer instances of Alderete et al's first type of fixed segmentism, but with the twist that onsets and rhymes behave differently, motivating a richer typology . Below I compare their schema with that argued for here:

(21) *The Emergence of the Unmarked (TETU) : (Alderete et al 19xx)*

Max-IO >> Markedness >> Max-BR

For convenience, I repeat here the TETU typology that emerges under an Alliterate/Rhyme account. One nice result is that Pattern 5, historically related to Patterns 1-4, can be seen to arise out of a simple re-ranking of the same constraint set. Thus what appears on the surface to be a drastic change -

infixation instead of reduplication - is grammatically just a small ranking shift.

/hop/		Rankings
Pattern 1	hop hop	ALLITERATE, RHYME >> MARKEDNESS
Pattern 2	hop lop (+ suffix)	RHYME >> MARKEDNESS >> ALLITERATE
Pattern 3	hiʔ hop (kio)	ALLITERATE >> MARKEDNESS >> RHYME
Pattern 4	hiʔ hop lop (kio)	ALLITERATE, RHYME >> MARKEDNESS
Pattern 5	həʔ lop	MARKEDNESS >> ALLITERATE, RHYME

The major difference between these two proposals is that only the ALLITERATE/RHYME account directly distinguishes between the *different* treatment of the *same* segment in a single language depending on (i) whether that segment is in onset or rhyme, as in /ŋaŋ/ → [ŋaŋ naŋ], and (ii) which type of reduplication it is found in, as in /siap/ → [siap liap], with /p/ unchanged, but /hop/ → [hiʔ hop], with /p/ → [ʔ]. In an Alderete-et-al-style account, to achieve the change of /ŋ/ → [n] in the onset, we must have *DORSAL >> FAITH-BR, but then it should change in the coda too. To distinguish the different treatments of a segment in two types of reduplication, we will have to have two sets of FAITH-BR constraints, one specific to "suffixing reduplication" as in [siap liap], and standing above *LABIAL, and one specific to "prefixing reduplication" as in [hiʔ hop] and standing below. Various fix-ups are of course possible, but only the ALLITERATE/RHYME account directly captures the observed typology.

5. Markedness increases:

Although markedness is the main determiner of fixed segmentism in this type of reduplication, it can be over-ruled by higher-ranked constraints. To see this, I now turn to secret languages. I shall argue that the defining characteristic of secret languages is that no output syllable/morpheme may be fully identical to the input syllable/morpheme. This obfuscation is functionally motivated, of course: if it fails, then secrecy is not achieved! In secret languages, the role of markedness is limited to determining the solution: it does not cause the loss. The loss is instead caused by the essential property of these speech games: their secrecy, which I will instantiate as a constraint requiring that no output syllable is completely identical to the input syllable, or O ≠ I.

5.1 Changzhou

Changzhou has a secret language labeled by Chao (1931) as [məŋ-la], after the output from the input /ma/. Data can be found in Chao's paper, and analysis in Yip 1982, Bao 1990, among others. The syllable is reduplicated, the second onset is replaced by [l], and the first rhyme by [əŋ]. I only discuss the onset change here. As in Chaoyang and Fuzhou, the change can be seen as a response to markedness pressures, but there is a crucial difference. Recall that in Chaoyang and Fuzhou, unmarked *inputs* undergo no further change. But in the language game that is not the case: even an unmarked input changes, despite the fact that any change is in the direction of *increasing* markedness. /laɣ/ becomes [ləŋ taɣ], not *[ləŋ laɣ]. The reason is clear: if the onset did not change, the second syllable of the output would be entirely identical to the input syllable, sacrificing the very secrecy these games are designed to achieve. The change is minimal: the next least marked onset, /t/, is chosen instead, so the role of markedness is still clear. The following tableau shows two different inputs to the grammar, /ma/ and /laɤ/, and the role of O ≠ I in forcing an *increase* in markedness.

(22)

/ma/	O ≠ I	*LABIAL	*CORONAL	*[-voice]
☞ a. məŋ la		*	*	
b. məŋ ta		*	*	*!
c. məŋ ma	*!	**		
/laɣ/				
☞ a. ləŋ taɣ			**	*
b. ləŋ laɣ	*!		**	
c. ləŋ paɣ		*!	*	*

This situation in which one default segment is replaced by another slightly more marked one if and only if the output would otherwise contain the input intact is pervasive in secret languages.

6. Conflicting markedness constraints: markedness obscured

Markedness is a cover-term for a collection of constraints, and they can conflict. For example, we know that voiced consonants are more marked cross-linguistically than voiceless ones, so *[+voice] >> *[-voice], assuming binary features. Intervocalically, on the other hand, voiceless consonants may be more marked, so *V[-voice]V. If this outranks *[+voice], then we get intervocalic voicing. A sufficiently rich interaction of such constraints can obscure the role of markedness in the final output, but it is there nonetheless, as we shall now see.

A particularly interesting secret language is found in Kunshan, a Wu dialect of Kiangsu. It is called the Mo-pa language by Chao. Data are given below; I shall discuss only the onset changes here.

(23) Kunshan Mo pa secret language:

/təw/	to ləw	/vã/	vo pã
/k'ɛ/	k'o ɦɛ	/sya/	so tsya
/d'oŋ/	d'o loŋ	/nəw/	no təw
/tsa/	tso za	/ñən/	ño tɕən

The generalizations are as follows. In the second syllable, stops become voiced continuants, nasals and continuants become voiceless unaspirated stops, and place features are always unchanged. At first glance, this hardly looks like a markedness effect, since the new onset can have either value of the features [voice, cont]. Indeed, Yip (1982) analyzed it as dissimilation. I shall show that despite appearances this is also the result of markedness pressures, but here they are not just absolute but also contextual (Steriade 1995), a set of paradigmatic and syntagmatic markedness constraints. In combination with O ≠ I, they produce the desired results. An outline of the solution is given below; it is the various constraints on voicing and continuancy that select the preferred output. The general idea is that O ≠ I forces some change, but high-ranked IDENT-IO-PLACE blocks change in Place, leaving Manner as the only possible locus of change. The particular changes in manner are selected by the markedness constraints in conjunction with O ≠ I. Throughout, I focus on the second syllable, whose rhyme is identical to the input rhyme.

(24) The solution: an outline

Constraints	Effect
O ≠ I	Forces onset change
ONSET	Blocks onset deletion
IDENT-IO PLACE >> *PLACE	Blocks Place change
*MANNER >>IDENT-IO MANNER	Permits Manner change. *Manner is a cover-term for the following three constraint.
*[+vce, -cont]	Voiced stops are marked (Maddieson 1984)
*[+cont]	Stops preferred to fricatives (Maddieson 1984)
INTERSONVOICE: *[+son] [-voice] [+son]	Intervocalic voicing. Onset of second syllable always intervocalic. Stated in terms of [+son] as in Chaoyang.

The resistance of Place features to change is demonstrated in the tableau below.

Throughout this section I mark only violations for the onset of the second syllable.

(25)

/vã/	O ≠ I	IDENT-PLACE	*LABIAL
☞ a. vo pã			*
b. vo vã	*!		*
c. vo lã		*!	

The next two tableaux show how the grammar selects among various candidates in which Place has been held constant:[6]

(26) Voiced fricative changes to voiceless stop:

/vã/	O ≠ I	*MANNER			IDENT-MANNER
		*[+vce, -cont]	INTERSON VOICE	*[+cont]	
☞ a. vo pã			*		*
b. vo vã	*!			*	
c. vo bã		*!			*
d. vo fã			*	*!	

(27) Voiceless stop/affricate changes to voiced fricative

/tsa/	O ≠ I	*MANNER			IDENT-MANNER
		*[+vce, -cont]	INTERSON VOICE	*[+cont]	
☞ a. tso za				*	*
b. tso tsa	*!		*		
c. tso dza		*!			
d. tso sa			*!	*	*

Conclusion

The segmental changes that accompany reduplication have been argued to be a response to markedness pressures. Their various manifestations in different syllabic positions and in different types of word formation have been argued to be the result of both morphological pressures, such as O≠I, and conflicting markedness constraints. Finally, reduplication of the Chinese type has been argued to be self-compounding, and the result of RHYME and ALLITERATE constraints which trigger repetition. Yip (in press) extends these proposals to other languages. She points out that the reduplicant is nearly always adjacent to its base, so we get *pa-pati* or *pati-ti*, but not *pati-pa*. In Correspondence Theory this requires not only FAITH-BR, but also an anchoring constraint. In contrast, the ALLITERATE/RHYME approach builds adjacency into the constraints from the start. The matching portions may be larger than a syllable, by taking ALLITERATE and RHYME to be a family of constraints requiring rhyming feet as well as syllables. Undercopying can be achieved by ranking syllable structure markedness such as *COMPLEXONSET, or NOCODA, above ALLITERATE and RHYME. VC reduplication, a problem for many past theories, falls out simply as the case where the rhyming portion precedes the alliterating portion, instead of the more usual order. Some problems remain, principally overcopying of the kind that results in a heavy syllable prefix, as in Ilokano *puspusa*, but the basic approach offers sufficient advantages beyond those laid out in this paper that it is worth further research.

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Endnotes

1. In some languages ALLITERATE and RHYME refer to adjacent feet or words, rather than syllables.

2. Other types of fixed segmentism, including the familiar *table-schmable* formation, are probably affixal. See Alderete et al for discussion.

3.Of course, if voice is privative this constraint cannot be stated in this form - a problem I leave for future research!

4.In Taiwanese, a related Min dialect for which phonetic information is available, syllable final stops voice intervocalically, but syllable-initial ones do not (Hsu (1996)).

5. But see Lombardi (this vol) for another proposal.

6.Nothing yet blocks deletion of the second onset, plus epenthesis of an unmarked /l/: MAX-IO will only ensure one surviving correspondent, and here we need two. ALLITERATE must be highly ranked, and assessed gradiently (one * for each feature that differs), so that it can eliminate even non-correspondent unmarked segments that do not alliterate in Place:

(1)

$v_1ã$	ALLITERATE	IDENT-PLACE	*LABIAL
☞ a. $v_1o\ p_1ã$	**		**
b. $v_1o\ t_1ã$	***!	*	*
c. v_1o tã	***!		*

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