

Vowel elision and the morphophonology of dominance in Aymara

Yuni Kim

University of Manchester
United Kingdom

ONOMÁZEIN 33 (junio de 2016): 367-384
DOI: 10.7764/onomazein.33.21



Yuni Kim: Lecturer in Phonetics and Phonology, Division of Linguistics and English Language, University of Manchester, United Kingdom. | Correo electrónico: Yuni.Kim@manchester.ac.uk

Fecha de recepción: abril de 2015
Fecha de aceptación: septiembre de 2015

Abstract

This paper examines morphologically conditioned vowel elision processes in Aymara, and proposes that they are due to a two-way division in Aymara suffixes between those which delete a mora from the preceding morpheme and those which do not. This “dominant/recessive” morpheme analysis builds on and simplifies previous accounts, which specified a preference for consonantal or vocalic environment on both sides of each suffix. I observe some phonological tendencies within suffix categories and propose a diachronic hypothesis as to how morphological vowel elision could have evolved from purely phonological vowel weakening processes that are still found in the language today.

Keywords: morphophonology; Aymara; affix ordering; diachronic morphology.

1. Introduction

Aymara, a Jaqi language of the Andes (Bolivia/Peru/Chile), exhibits morpheme-final vowel deletion that is triggered by a complex set of phonological, morphological, and syntactic factors (Hardman et al., 2001¹). In this paper I will look at a subset of these cases, namely morphologically-conditioned vowel elision, where a suffix is lexically specified to delete the final vowel of the root or suffix that immediately precedes it. Examples:

- (1) a. *apa* 'carry' + *nuku* (distancing suffix) > *apa.nuku.ña* 'abandon'
 b. *apa* + *naqa* (diffusive) > *ap.naqa.ña* 'manipulate'
 c. *sara* 'go' + *qa* (downward) + *ya* (caus.) > *sara.qa.ya.ña* 'help descend'
 d. *sara* + *qa* + *xa* (completive) > *sara.q.xa.ña* 'go down/away'

The behavior of individual suffixes appears idiosyncratic. However, some phonological conditioning can be detected, which suggests that phonology be incorporated somewhere in the analysis, despite exceptions. A level-ordering analysis is also tempting because there is some correlation of the phenomenon with ordering properties of suffixes (Beas, 1999), but the correlation is quite tenuous. I propose that contemporary Aymara is in a state of transition that illustrates the Emergence of Morphology principle (Anttila, 2002): morphophonology turns into morphology first and most quickly where phonological conditioning is the weakest. I develop the hypothesis that vowel elision was originally phonological, but has lexicalized and started to become uniform within grammatical suffix categories. For clues to the diachronic origins of morphologically conditioned vowel elision, I look to synchronic, phonologically conditioned processes of vowel devoicing and vowel deletion.

Synchronically, I analyze morphological vowel elision as a dominance effect. Dominant affixes have been defined in the morphological literature as affixes which delete phonological (often accentual) material in the base they attach to (Inkelas, 1998). They are

¹ Unless otherwise specified, page numbers refer to this work.

opposed to recessive affixes, which concatenate without deleting material from the base. In Aymara, suffixes are either dominant as in (1b,d), or recessive, as in (1a,c). In section 5 I outline a Construction Morphology approach to dominance in Aymara using cophonologies (Orgun, 1996; Inkelas, 1998), and discuss independent elements of Aymara phonology which constrain the possible variation among cophonologies. These generalizations could be used as the basis for constraints in a partially-ordered OT grammar (Anttila, 2002), but will be relevant to any account of this apparent development of morphological conditioning from phonological variation.

The synchronic part of my analysis represents a departure from Hardman et al. (2001), who refer to morphological vowel elision as being determined by the idiosyncratic phonotactic requirements of different suffixes. In their analysis, suffixes can specify both their left- and right-hand phonotactic environments. I suggest that the effects of right-hand specifications are largely an artifact of the affix ordering system, and propose an analysis that accounts for these effects without the need for diacritic phonotactic requirements.

2. Aymara vowel elision

2.1. Basic Aymara phonology

Aymara has three vowel phonemes, /i/, /u/, and /a/. The vowel /u/ is reported to be unrounded but may be rounded in the speech of bilinguals (p. 36). Only frontness and backness are contrastive; height is not. Therefore, allophones of /i/ include [i], [ɪ], [e], and [ɛ], while allophones of /u/ include [u], [ʊ], [o], and [ɔ]. The lower allophones are found before or after uvulars. In unstressed positions, /a/ can surface as a centralized [ʌ]. Vowel length can be considered contrastive, although long vowels seem to appear only in (historically or synchronically) derived contexts. Stress falls on the penultimate vowel, though in a word with underlying form /jupaxa/, the stress will go on the penultimate underlying vowel even if the last vowel is elided on the surface: [jupáx] (p. 43). There are probably further complexities and possible reanalyses, but these are the basics.

Most syllables are underlyingly CV, but word-medial consonant clusters occur in roots of the canonical shape CVCCV. No native words have initial consonant clusters. Underlying word-medial consonant clusters are subject to phonotactic restrictions; many consist of sonorant + obstruent. However, vowel elision gives rise to clusters of up to six consonants, with no apparent phonotactic restrictions, as seen here:

- (2) *aka* 'here' + *na* 'in' + *ka* (verbalizer) + *ka* (incompl.) + *ta* (person) + *ti* (interrog.)
> *aka.n.k.k.t.ti* ~'I am here?'

Aymara does not allow diphthongs. Sequences ending in /w/ or /y/, such as /aw/ or /ay/, surface in derived environments when sequences like /-awa/ lose their final vowel. Hardman et al. (2001: 41) claim that the glides are phonologically consonantal, although may be subject to dialectal variation: specifically, some of the Bolivian Aymara examples in Cerrón-Palomino (1993) seem to treat /-ay/ as a vowel with regard to dominance effects. The sequence /-aya-/ also frequently reduces to /-a:-/. Diphthong avoidance in derived environments is discussed in 2.3.

2.2. Recessive suffixes

Recessive suffixes are defined here as suffixes which add phonological material to the base in concatenative fashion, i.e. without deleting anything. Two classes fit under this definition: the normal recessive suffixes, and the vowel-lengthening suffixes.

Normal recessive suffixes (R1) concatenate without any obvious morphophonological processes:

- (3) *apa* 'carry' + *nta* 'into' > *apa.nta.ña* 'insert'
suti 'name' + *cha* (caus) + *ya* (caus) > *suti.cha.ya.ña* 'cause to nickname'

Vowel-lengthening suffixes (R2) lengthen the final vowel of the preceding morpheme. I classify them as recessive since they do not delete material from the base, but whether they differ fundamentally from other recessive suffixes is a topic for future investigation. R2 suffixes can be analyzed autosegmentally as vowel slots which receive their features by spreading from the previous segment. Obviously, they cannot delete the preceding vowel, because then there would be nothing to lengthen. Some R2 suffixes simply lengthen the vowel, while others lengthen it and add segments:

- (4) *wawa* 'baby' + /-:/ (verbalizer) + *ña* (infinitive) > *wawa:ña* 'to be a baby'
sara 'go' + /-:/ (1. future) > *sara:* '(I) will go'
sara 'go' + /-:ta-/ (2. future) > *sara:ta* '(you) will go'

With some suffixes, in particular orational suffixes which come last in the affix ordering, the final vowel of the preceding morpheme sometimes deletes and sometimes does not. The deletion appears to be conditioned lexically, rather than morphologically, given the minimal pairs below in (7). The natural question is, do these lexical factors ever apply before R1 or R2 suffixes? If not, why not? The issue is whether there is a principled three-way distinction between suffixes which always delete the vowel, suffixes which always retain the vowel, and suffixes which have no preference. Sections 2.4 and 4.1 touch on these questions, but the data I have seen so far are inconclusive.

2.3. Dominant suffixes

Normal dominant suffixes (D1) delete the final vowel of the immediately preceding morpheme:

- (5) *apa* 'carry' + *xata* (allative) > *ap.xata.ña* 'put sthg. on top'
sara 'go' + *naqa* (diffusive) > *sar.naqa.ña* 'wander'
apa + *ta* 'up' + *t'a* (temporary) + *ña* (infin.) > *ap.t.t'a.ña* 'raise momentarily'

There is a puzzling class of vowel-initial dominant suffixes (D2). Since Aymara does not allow diphthongs, a vowel-initial suffix must by definition delete the final vowel of the preceding morpheme, since if it always deleted its own vowel it would never surface with it, and hence not be vowel-initial. Most vowel-initial suffixes start with /i/, and a few start with /u/. However, if the final vowel of the preceding morpheme is /u/, then /u/ is retained at the expense of a suffix-initial /i/:

- (6) *qama* 'stay at home' + *iri* (agentive) > *qamiri* 'rich person'
katu 'grab' + *iri* (agentive) > *katuri* 'he who grabs'

The existence and origin of vowel-initial suffixes (in a diphthong-prohibiting language of vowel-final roots) are mysterious, although it is potentially illuminating that many suffixes that are /i/-initial in Aymara are /u/-initial in the closely related language Jaqaru (Cerrón-Palomino 1993). Cerrón-Palomino (1993) describes diachronic vowel-harmony-like processes that could have caused these alternations. It is possible that the origin of these suffixes is important to the origin of the morphological dominance phenomenon, even though I am unable to analyze them further here.

2.4. Lexically conditioned vowel elision

Hardman et al. (2001) do not analyze Aymara suffixes as dominant or recessive, but rather as having phonotactic requirements: a suffix wants to be preceded by either a consonant or vowel, and in some cases, is specified for wanting to either delete its own final vowel (= end in a consonant) or keep it. The following data illustrates the attested variations; note that the vowel elision is an essential part of the morphology, since it is crucial to distinguishing morphemes that are underlyingly identical otherwise:

(7) Various *-ta-* suffixes with root *q'ipi* 'to carry' and orational suffix *-wa-*

-_CX- : deletes preceding vowel

-X_{C-} : suffix-final vowel deletes when an unspecified suffix follows

-_VX- : no effect on preceding vowel

-X_{V-} : suffix-final vowel is preserved when an unspecified suffix follows

a. <i>-_Cta_{C-}</i> (1sg. pres. indic.)	q'ip.t.wa	'yo cargo'
b. <i>-_Cta_{V-}</i> (2sg. pres. indic.)	q'ip.ta.wa	'túargas'
c. <i>-_Vta_{V-}</i> (resultative)	q'ipi.ta.wa	'lo cargado'
d. <i>-_Vta_{C-}</i> (suffix meaning 'of')	q'ipi.t.wa	'del atado'

A dominance analysis builds on the left-hand specifications by making the generalization that, instead of wanting to follow a consonant, dominant suffixes delete the final *mora* of the base. In a sequence of Root + /-:/ (vowel-lengthening suffix, no additional segments) + Dominant Suffix, the derived long vowel is shortened by the dominant suffix □ not deleted (Hardman et al., 2001). It is unclear what happens when the suffix in question is vowel-initial.

The right-hand specifications do not appear to be strongly motivated. They are used to describe the arbitrary behavior of morpheme-final vowels before unspecified orational suffixes. Before specified suffixes, they do not behave any differently from suffixes which are listed as unspecified for right-hand environment; that is, *-_V* suffixes still lose their final vowel before a dominant suffix (p. 71; no example is given). The main generalization seems to be that suffixes with a right-hand specification are those that occur before orational suffixes, while suffixes without a right-hand specification are those that occur closer to the root and are (almost?) always followed by a non-orational suffix (i.e. one that is either dominant or recessive, so that it does not need to determine the status of its own final vowel).

In other words, the right-hand specifications can be seen as an artifact of affix ordering properties. This can be schematized as follows, where \emptyset means the class of suffixes is unspecified at a given end and X means that those suffixes have vowel deletion or preservation specifications:

(8) Verbal affix ordering

Root $_{\emptyset}$ + $_X$ Derivational $_{\emptyset}$ + $_X$ Independent $_{\emptyset}$ + $_X$ Inflectional $_X$ + $_{\emptyset}$ Orational

The fact that some suffixes drop their final vowel before orational affixes still needs to be accounted for, however. It is significant that all of the suffixes specified by Hardman et al. to drop their final vowel have the same final vowel, /a/, which is also the most frequent vowel in the language (p. 42). The vowel /-a-/ may be considered a default, given that it is also the vowel that is added to consonant-final loanwords from Spanish (p. 51). All the $__C$ suffixes have the ordering property that they are either word-final, or followed by an orational suffix². The vowel only surfaces when the suffix is word-final, so there is in fact not overwhelming evidence for its existence in the underlying representation, and it may be possible to consider it epenthetic. The underlying form of the suffix then would be C or CVC. This idea is modeled on Beas's (1999) idea that vowel elision is an illusory artifact of consonant-final representations plus vowel epenthesis rules. (Beas's analysis cannot work for other roots and suffixes however, because final vowels are not predictable.)

This section has reviewed the basic descriptive facts about morphologically conditioned vowel elision, and concluded that it can be analyzed as a case of segment-deleting dominance. Now I ask whether it is possible to predict the dominance or recessiveness of a suffix, given its phonological content and ordering properties.

3. Conditioning factors: tendencies and absolutes

3.1. Phonological conditioning

Although dominance effects are not phonologically conditioned, there is a tendency for suffixes to be recessive, the more sonorous their initial consonant is. Conversely, dominant suffixes tend to begin with less sonorous consonants. The list in (9) shows nearly all the consonant-initial suffixes discussed by Hardman et al., separated into dominant versus recessive (glosses have been omitted). We can make the following observations:

- Suffixes beginning with /w/, /r/, /y/ are always recessive (p. 113).
- Most nasal-initial suffixes are recessive. Only two are dominant.
- Since Aymara lacks voiced obstruents, consonant-initial dominant suffixes, except for the two nasal-initial ones, all begin with voiceless segments.
- Suffixes beginning with /x/ are dominant except in the possessive *-xa-*.

The generalization is that less sonorous segments (dominant) prefer to be preceded by less sonorous segments (consonants), and more sonorous segments (recessive) prefer to be preceded by more sonorous segments (vowels).

(9) Consonant-initial suffixes (pp. 74-76)

Dominant	Recessive
chi, ch'a, ch'uki, ja, ja, jama, jita, ka, ka, kata, kata, naqa, nuqa, pa, pacha, pura, sa, sma, sna, su, ta, ta, ta, tan, tam, t'a, thapi, xa, xa, xaru, xäsi, xata, xaya	cha, ki, kipa, m, ma, mpi, na, naka, ni, ni, ni, nuku, ña, ñani, pa, pta, puni, qata, ra, raki, rapi, raqa, rpaya, ru, sa, samäna, sana, sapa:na, si, si, sma, spa, ta, taki, tata, tayna, tpa, waya, wi, wisa, wja, xa, ya, yasma, yäta,

² There is one orational vowel-lengthening suffix /-:-/, which naturally requires the preceding morpheme to end in a vowel. It is not clear if or how this suffix interacts with the so-called _____C suffixes.

	yätam, yätan
--	--------------

3.2. Correlation with morphosyntactic categories

As Beas (1999) observes, the property of dominance/recessiveness tends toward uniformity within morphosyntactic suffix categories. Nevertheless, these are only tendencies, so they do not enable a level-ordering analysis where dominance would be a property of the affix ordering class rather than the individual morphemes. Lexical specification is still needed.

Verbalizing derivational suffixes (Class 1A). These are ordered directly after the verb, and can also verbalize nouns. It is rare for more than one of these to occur in a word, but from the limited cooccurrences that exist, their relative ordering can be discerned:

(10) D=dominant, R=recessive

R - cha (causative)	D - ja (verbalizer)	R - ra (pluractional) D - nuqa (action of placing sthg) D - thapi 'into' R - kipa 'bordering' R - nuku (action of distancing) R - tata 'away' R - nta 'into' D - kata 'forward'	D - t'a
------------------------	------------------------	--	---------

This is an example of a class of suffixes that does not show any particular preference with regard to dominance. There are more recessive suffixes than dominant, for instance in the third column, but it is hard to tell if this is principled, or just a coincidence.

Non-verbalizing derivational suffixes (Class 1B). The ordering of these suffixes is intertwined with Class 1A, but they are considered separately here and by Beas (1999)

because they can only attach to verb stems; they cannot verbalize nouns. They are shown in (11) in their relative order to each other:

(11)

D - su (completive)	D - ta (inceptive)	D - ch'uki (detentive)
D - xata (allative)	R - rpaya (pluractional)	
D - naqa (diffusive)		
D - qa 'downward'		
D - xaru (preparative)		
D - xa:si (sustained action)		
D - xaya (attentative)		

The pattern is more striking here; nearly all of the suffixes are dominant. The only recessive one is *-rpaya-*, whose first segment comes historically from the recessive Class 1A suffix *-ra-*. Again, without data we cannot know the significance of the fact that this class is suffixes is generally dominant, also since the many /x/-initial suffixes may come from similar historical sources.

Derivational suffixes (Class 2). These suffixes are ordered after the Class 1 suffixes. They focus more on the arguments of the verb (e.g. reflexive, benefactive), as opposed to Class 1 suffixes, which usually focus on the nature of the verbal action itself (e.g. direction of motion). Class 2 suffixes are all recessive, save for *-ka-* and *-xa-*, the incomplete and complete aspect morphemes, which also seem semantically different from the rest of the category (and similar to each other, making it logical for them to behave the same way).

(12)

R-ja (caus)	R-si (refl)	R-ni (proxim -ate)	R-waya (distanc- ing)	R - rapi (benef) R - raqa	R - si (continu- ative)	D - ka (incom- pletiv)	D - xa (compl -etive)	R - p (plural)
----------------	----------------	--------------------------	-----------------------------	---------------------------------	-------------------------------	------------------------------	-----------------------------	-------------------

				(victim)				
--	--	--	--	----------	--	--	--	--

Possessive suffixes. The four possessive suffixes, corresponding to the four person categories in Aymara, are all recessive:

- (13) 1p R - xa, R -ja
 2p R - ma
 3p R - pa
 4p R - sa

4. Synchronic clues to diachronic development

How did Aymara develop dominance effects in its morphological system? Synchronic phonology gives us some hints. Not only does Aymara have morphologically-conditioned vowel elision, it also has phonologically conditioned vowel deletion processes. Cerrón-Palomino (1993) reports that variable vowel deletion is reported in the earliest sources, which are from the 17th century, although no rules or conditioning factors are described. I hypothesize that the phonological processes have historically been similar to how they are today, and that the dominance effects are a grammaticalization of the variation brought about by those processes.

Aymara is described as devoicing vowels in two contexts: between voiceless consonants, most often word-finally; and utterance-finally following a voiceless consonant. However, devoicing seems to occur in a variety of contexts (and frequently), and it is unclear what actually conditions it. It is postlexical and applies across word boundaries. The following examples are taken from a text in Hardman et al. (2001: 57). (A translation of the text is provided, but morpheme-by-morpheme glosses are not given.)

- (14) Word-internally between voiceless consonants
 a. parintʃx

At word boundaries, adjacent to voiceless consonants

- b. apthapj khulanaka
- c. ukaxə tiwulaxa
- d. qotxə wañt'aya
- e. ukata ɬchaxa

Word- (but not phrase-) finally, adjacent only to voiced segments

- f. laqhətaynə uka

Phrase-finally

- f. kunats han wañt'ay akxə
- g. sarawayxataynə

It is possible that morphological vowel elision developed from listeners' failure to perceive a devoiced vowel between two voiceless consonants. A hypothetical example:

(15) q'ipi + ta > q'ipj.ta > q'ip.ta

(This idea presupposes that vowel devoicing used to take place more frequently word-internally. If vowels now occur most often in the environment of at least one voiced consonant, this would explain why word-internal vowel devoicing is infrequent.)

Vowels would be more likely to devoice (and hence delete) before a suffix beginning with a voiceless consonant, since that provides one-half of the supposed environment. But there would be variation (aside from the variation already noted in (14)), because the left-hand consonant might be voiced or voiceless, depending on the root.

Over time, language learners might reanalyze vowel devoicing/deletion as triggered by specific suffixes rather than a phonological environment, hence normalizing the variation. On this hypothesis, reanalysis would take place along the lines of morphosyntactic categories to give the distributions of dominant and recessive suffixes reviewed in section 3.2. It seems that the language has/had a strong constraint prohibiting

vowel deletion before /w/, /ɾ/, and /y/, so suffixes beginning with those segments could not be reanalyzed as dominant.

Another potential source of vowel elision, which still exists marginally as part of the synchronic phonology of Aymara, is metrically conditioned vowel deletion. There are a few suffixes which seem to be neither dominant nor recessive. If they attach to a two-syllable sequence, the sequence-final vowel is kept, but if the base is three syllables, the vowel is lost (p. 199):

- (16) Suffix *-layku-* 'because'
- | | |
|---------------------------------|-----------------------------|
| <i>kuna.layku.s jut.ta</i> | 'Why did you come?' |
| <i>manu.layku.w jut.ta</i> | 'I came because of a debt.' |
| BUT | |
| <i>yati.qa.ñ.layku.w jut.ta</i> | 'I came to learn.' |

According to Hardman et al., the suffix *-layku-* is quite lexicalized and not very productive. It is possible that metrically conditioned vowel deletion applied more widely at an earlier stage of the language, but that the variation in vowel preservation/dropping grammaticalized in different ways with different suffixes. Frequency effects could have been a factor, and differentiation of homophonous suffixes might also have been a driving force.

At this stage, the diachronic explanation proposed here is not supported by independent evidence. The best source of evidence would come from variation in Aymara dialects; a suffix that was dominant in one might be recessive in another. Some dialects or closely related languages (e.g. Jaqaru) might have patterns of vowel elision that are better analyzed as metrically conditioned, rather than as dominance effects (see Hardman, 2000).

Another possibility comes from internal reconstruction. Aymara has a large number of portmanteau morphemes, and it would be worthwhile to reconstruct their original constituent parts and what happened phonologically when those parts fused. Those

processes might also reflect what happened historically between morphemes that ended up not fusing.

5. Discussion

Aymara vowel elision can be modeled in a Construction Morphology approach (Orgun, 1996; Inkelas, 1998). The addition of a suffix can be seen as an input-output mapping that adds the suffix's segmental material and carries out the phonological processes associated with that specific morphological construction (vowel elision, in the case of dominant suffixes).

Cophonologies are the individual phonologies that can be associated with different constructions. They enable us to model languages like Aymara where suffixes can have differing, lexically specified morphophonological patterns. In Optimality Theory, for example, these can take the form of variable constraint rankings. The question then becomes: What keeps us from having wildly different phonologies for every single construction in a language, which is not generally thought plausible? Anttila (2002) addresses this issue, proposing partially-ordered OT grammars: a certain number of constraint rankings are fixed with respect to each other, but other constraints are not. The “free” constraints can be ranked in different permutations, giving rise to a restricted number of cophonologies that all have some basic constraint rankings in common.

For example, the Aymara constraint against diphthongs is always highly ranked, and so despite the attested variation in vowel elision and preservation, we never see a cophonology that derives diphthongs. Another area where there is no variability is the recessiveness of /w/-, /r/- and /y/-initial suffixes. Since these suffixes do not vary due to phonological constraints, they are not subject to grammaticalization as dominant or recessive, but suffixes whose behavior is not regulated by phonological constraints are free to vary and morphologize in potentially idiosyncratic ways. This is the Emergence of Morphology Principle (Anttila 2002: 14): “Extraphonological (morphological, lexical)

conditions emerge in environments where the phonological conditions are at their weakest.”

Presumably the language learner, in the course of acquiring a large number of constructions, starts to see that there is a limited number of cophonologies attested in his language. Constructions with the same cophonologies might be grouped together into natural classes such as dominant and recessive, and the learner would discover generalizations, such as “/w/-initial suffixes are always recessive.” The source of grammaticalization is when the speaker starts to make syntactically- or semantically-based generalizations (even erroneous ones) in addition to or instead of phonological ones.

The hypotheses and analysis advanced here remain to be tested against a wider range of data. It is hoped that this paper will raise questions for future research on Aymara morphophonology.

6. Orthography

Non-IPA symbols in Aymara orthography are:

<y> = [j]

<j> = [x]

<x> = [ʃ]

<ch> = [tʃ]

<ñ> = [ɲ]

(¨) = long vowel

(.) = morpheme boundary

7. References

ANTTILA, Arto, 2002: “Morphologically conditioned phonological alternations”, *NLLT* 20, 1-42.

- BEAS, Omar, 1999: “Morfofonémica y elisiones vocálicas en aimara sureño: un análisis no-linear”, ms. Available online at <http://www.aymara.org/biblio/obeas.pdf>.
- CERRÓN-PALOMINO, Rodolfo, 2000: *Lingüística aimara*, Lima: Centro de Estudios Regionales Andinos.
- HARDMAN, Martha J., 2000: *Jaqaru*, Munich: Lincom Europa.
- HARDMAN, M., J. VÁSQUEZ and J. D. YAPITA, with L. BRIGGS, N. ENGLAND and L. MARTIN, 2001: *Aymara: compendio de estructura fonológica y gramatical*, La Paz: Instituto de Lengua y Cultura Aymara. Available online at <http://www.ilcanet.com/aymara.htm>.
- INKELAS, Sharon, 1998: “The theoretical status of morphologically conditioned phonology: a case study of dominance effects”, *Yearbook of Morphology* 1997, 121-55.
- ORGUN, C. Orhan, 1996: *Sign-based Morphology and Phonology with special attention to Optimality Theory*. Ph.D. dissertation at UC Berkeley.
- WILLARD, E. Rainbow, 2003: *Dominance effects in a dialect of Mam Maya*. Ms., UC Berkeley.