Contradictory Markedness Preferences across Morphological Domains

Jesse Zymet

1. Introduction

Investigators have uncovered evidence for LEARNING BIASES: biases inherent in learners that favor certain language phonologies over others (Wilson 2006, Moreton & Pater 2011, Hayes & White 2013, White 2014, McMullin & Hansson 2014, *a.o.*). How strong are these biases? In particular, to what extent can a learning bias be defied in language? These questions bear directly on the theory of phonological learning, as they address the limits of learner capability. Two cases of bias defiance come to mind: though learners tend to prefer phonological processes that are phonetically natural (Hayes & White 2013), unnatural constraints can be weakly apprehended (Hayes, Zuraw, Siptar & Londe 2009, Hayes & White 2013); and though learners prefer alternations that are perceptually minimal, saltations — where one sound "leaps" over a phonetically intermediate, nonalternating sound — occasionally arise through diachronic change and can persist across generations (Hayes & White 2015).

A family of findings now suggests the working of another bias here dubbed DOMAIN GENERALIZATION BIAS, or learner tendency to favor phonological constraints that hold across morphological domains. This bias has been implicated in a number of corpus studies: Martin (2007, 2011) observed cases of grammatical "leaking", in which strong phonotactic constraints manifest weakly across boundaries. Chong (2016), moreover, found that some famous derived environment effects (*cf.* Lewis 1967, Kiparsky 1973) are actually unstable or merely apparent. Domain generalization bias effects were borne out in artificial language learning experiments: Myers & Padgett (2014) found that participants generalize a phrase-final devoicing pattern to the word-final domain without exposure to unambiguous evidence; Chong (2017) found that participants more readily learned a harmony alternation when they were exposed to higher rates of root harmony, corroborating proposals that phonotactic generalizations assist in the acquisition of alternations (Tesar & Prince 2003, Hayes 2004, Jarosz 2006, *a.o.*).

This paper argues, despite previous findings, that **domain generalization bias can be defied**, and that the matching of phonological drives across morphological domains is not a necessary condition for learning. Evidence for the claim comes from a corpus study of Malagasy, which displays contradictory markedness preferences across domains: backness dissimilation applies regularly to the passive imperative suffix, but stems in the lexicon show an overall opposing preference for backness harmony. Though learners might prefer for morphological domains to match, the Malagasy system suggests they are capable of overriding this bias when they have access to natural constraints with opposing drives. Contradictory markedness preferences are even found to regulate morphemes in the same domain, in Yucatec Maya: as discussed previously in Krämer (2001), two suffixes in the language harmonize for backness and height, but one suffix dissimilates for backness, and yet another for backness and height. I present these systems below, focusing primarily on Malagasy, and discuss the problems they pose for a theory in which the learner prefers morphologically general constraints.

2. Empirical background

2.1. Suffixal backness dissimilation in Malagasy

This paper focuses primarily on cooccurrence restrictions on front and back vowels in Malagasy. The inventory is composed of [i e a u] (Parker 1883, de la Beaujardière 2004). The data and counts below were extracted from the Malagasy Dictionary and Encyclopedia of Madagascar (de la

---

* Jesse Zymet, UCLA, jzymet@ucla.edu. I wish to thank Kie Zuraw, Bruce Hayes, Michael Lefkowitz, and audiences at BLS43 and WCCFL35 for excellent input on this project. All shortcomings are my own.

 Proceedings of the 35th West Coast Conference on Formal Linguistics, ed. Wm. G. Bennett et al., 479-488. Somerville, MA: Cascadilla Proceedings Project.

Beaujardière 2004; available at malagasyword.org), an online corpus containing around 90,000 Malagasy words.

Backness cooccurrence avoidance can be observed in the suffixal domain. The passive imperative suffix conditionally undergoes backness dissimilation (Parker 1883, Zymet 2015): underlying *–u* (1a-b) surfaces as *–i* after stems containing *u* (2a-d) unless a front vowel intervenes (3a-b). The alternation conforms to patterns driven by the Obligatory Contour Principle (Leben 1973, Goldsmith 1976, *et seq*).

	-u is underlying		
(1a)	/bata+u/	[bata-u]	'lift'
(1b)	/fana+u/	[fana-u]	'heat'
	Items undergoing local and nonlocal backness dissimilation		
(2a)	/bab**u**+**u**/	[bab**u**-**i**]	'plunder'
(2b)	/t**u**v+**u**/	[t**u**v-**i**]	'fulfill'
(2c)	/t**u**da+**u**/	[t**u**da-**i**]	'prevent'
(2d)	/**u**^{n}dan+**u**/	[**u**^{n}dan-**i**]	'bolster'
	Front vowels block		
(3a)	/t**uri**+**u**/	[t**uri**-**u**]	'preach'
(3b)	/f**ule**s+**u**/	[f**ule**s-**u**]	'thread'

One cannot tell whether the process applies to all suffixes or to *–u* in particular, as there are no other suffixes containing *u* in the language to distinguish the two possibilities. Note, however, that a passive suffix surfaces as *–ina* following *a* and *u* ([babu-ina] = plunder-PASS, [buda-ina] = soft-PASS), but as *–na* following *e* or *i* (e.g., [bede-na] = tattle-PASS, [enge-na] = praise-PASS, [burusi-na] = brush-PASS) (Richardson 1885), which could be due to a broader OCP effect within the suffix domain.

A variety of evidence suggests backness dissimilation applies productively to the passive imperative. The alternation is lawfully triggered by stem-internal *u*, applies nearly categorically when the trigger and target are local and semi-regularly across *a*, and is nearly categorically blocked by front vowels, as the table below illustrates (see also Zymet 2015).

	–u	***–i***	**Dissim. rate**	**Example**
No trigger	1877	7	0.0%	bata-u
Local	4	989	99.6%	bab**u**-**i**
Nonlocal	196	201	50.9%	t**u**da-**i**
Intervening front vowel	399	2	0.4%	t**uri**-**u**

Table 1: *Counts for Malagasy backness dissimilation*

The alternation is observed across multiple generations: it was reported as early as Parker (1883), and evidence of it appears in a variety of dictionaries since then (e.g., Abinal 1888, Rajemisa 1985, de la Beaujardière 2004). Backness dissimilation also applies after loaned stems. The stems below are given in the World Loanword Database (wold.clld.org; data from Adelaar 2009), except /matsu/, which is marked as having been loaned in the Malagasy Dictionary and Encyclopedia of Madagascar.

(4a)	*Dissimilation*	/matsu+u/	[matsu-i]	'march'	English loan
		/kiraru+u/	[kiraru-i]	'shoe'	Bantu loan
		/kuhukuhu+u/	[kuhukuhu-i]	'cluck'	Bantu loan
(4b)	*Blocking*	/burusi+u/	[burusi-u]	'brush'	French loan

In the forms above we observe dissimilation after stem-internal *u*, and blocking by *i*, even when the triggers and blockers are within loaned stems.

2.2. Phonotactic backness harmony in Malagasy

Though backness dissimilation applies to the passive imperative suffix, roots display a moderate tendency toward backness harmony. A brief glance at the corpus reveals numerous harmonic roots:

(5)	k**i**r**i**	'small hole'	sar**u**tr**u**	'cape'
	l**u**f**u**	'persistence'	t**e**v**i**ka	'spasm'
	uz**u**na	'curse'	ts**i**ndr**i**	'compression'
	rir**i**n**i**na	'winter'	v**e**l**i**	'blow'

Counts of tier-adjacent vowel pairs reveal no preference for disharmonic sequences in roots. On the contrary, they display the opposite preference, for *harmonic sequences*, as can be observed in the table below. Note that the majority of roots in the corpus are classified as nouns (2,737), adjectives (729), or adverbs (733), as the table below reflects; verbs are derived through affixation. Some words displaying reduplication (*cf.* Lin 2005) were classified as roots in the corpus; in these cases, only the root involved in reduplication contributed to the counts, rather than the reduplicated stem as a whole.[1]

	# harmonic **V**C_0**V** *seq.s*	*# disharmonic* **V**C_0**V** *seq.s*	*# harmonic* **V**C_0aC_0**V** *seq.s*	*# disharmonic* **V**C_0aC_0**V** *seq.s*
Within noun roots	786	602	35	44
Within adj. roots	185	183	27	11
Within adv. roots	312	188	109	49
Within interj., conj., prep. roots	96	41	24	14
TOTAL	**1379**	**1014**	**205**	**118**

Table 2: *Raw counts of (dis/)harmonic sequences in roots*

There are around 350 more local harmonic sequences than there are local disharmonic sequences, and around 100 more nonlocal harmonic sequences than there are nonlocal disharmonic sequences. This makes backness dissimilation in Malagasy a DERIVED ENVIRONMENT EFFECT (Kiparsky, 1973, 1993; Iverson & Wheeler 1988; Burzio, 1997; Lubowicz 1999; *a.o.*) in the sense that it lacks a counterpart generalization in the lexicon. In fact, as the paper will argue below, the counts above suggest that Malagasy is characterized by a preference for backness harmony in roots. The Malagasy case therefore suggests the existence of something more extreme: that *contradictory* markedness preferences — harmony and disharmony — can distribute across morphological domains.

Could the harmony counts have arisen by chance, rather than being the result of an opposing restriction? The observed rates of local and nonlocal harmony are 1379/(1379 + 1014) = 57.3% and 205/(205+ 108) = 63.5%, respectively. We can calculate the expected rate of local harmony given the frequencies of non-low vowels by isolating V_1V_2 sequences in which each vowel belongs to [i e u], and calculating $p(V_1 = u) \times p(V_2 = u) + p(V_1 = i \text{ or } e) \times p(V_2 = i \text{ or } e)$, where $p(V_1 = u)$, for example, is the number of instances of *u* in the list of stems divided by the number of instances of *i*, *e*, and *u*. The expected rate of nonlocal harmony is computed analogously over V_1aV_2 sequences. Doing this, we

[1] A conference reviewer points out that there could exist productive pseudoreduplication, with the first syllable being a copy of the second, potentially inflating the harmony rate. After words displaying other reduplicative patterns in the language (*cf.* Lin 2005) were factored out, the corpus revealed that only 115 of the remaining 4,519 roots have matching first and second syllables, with only 64 beginning with a front or back vowel. It is not obvious that the language possesses pseudoreduplication, considering how low the count is here.

obtain 51.6% and 57.7% as expected rates of local and nonlocal harmony. Comparing observed and expected rates, we find that observed rates are higher than expected. But is this difference substantial? To determine whether harmonic sequences occur significantly more than chance would predict, we can run a Monte Carlo simulation (Kessler 2001). To run a simulation for local vowel sequences, for example, we gather pairs of tier-adjacent vowels belonging to [i e u], shuffle the second vowels of each pair and randomly concatenate each of them to a first vowel, calculate the new harmony rate, and then repeat 10,000 times. The simulation for V_1aV_2 sequences is computed analogously. The figures below are histograms of local and nonlocal harmony rate frequencies after 10,000 Monte Carlo trials.

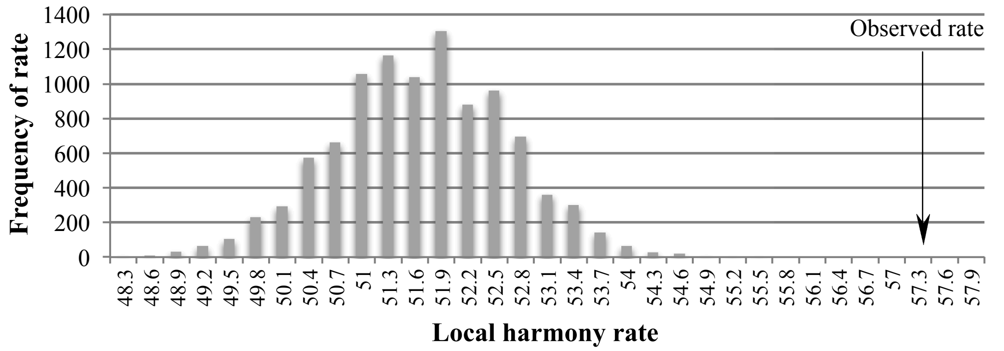

Figure 1a: *distribution of local harmony rates yielded by Monte Carlo trials, plus observed rates*

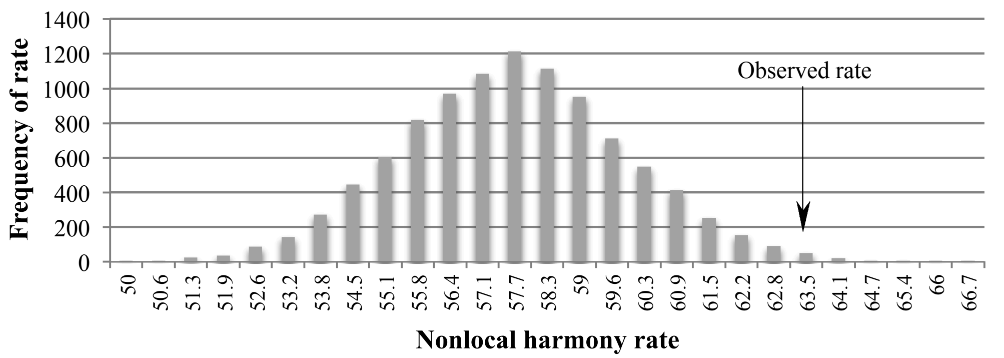

Figure 1b: *distribution of nonlocal harmony rates yielded by Monte Carlo trials, plus observed rates*

The observed rate of 57.3% is greater than *any proportion* yielded by 10,000 Monte Carlo trials. In other words, the observed proportion is significantly greater than chance would predict (est. $p < 0.0001$). For nonlocal harmony, the observed proportion of 63.5% is greater than rates yielded by 9,834 of the 10,000 Monte Carlo trials, and so we can conclude that the observed rate of nonlocal harmony is significantly above chance as well (est. $p = 0.008$). The results suggest overrepresentation is not coincidental, but rather reflects a backness harmony preference in the lexicon.

Despite these results, it could be that learners do not actually pick up the harmony tendency from the lexicon (*cf.* Becker, Nevins & Ketrez 2011, Becker, Nevins & Levine 2012). But if this were to be the case, then we might expect the tendency to fade over the years (*cf.* Martin 2007). Roots in the online corpus are classified for the Malagasy dictionaries they appear in, which span from the late 1800s to the late 1900s. The counts below show that the harmony tendency persists across multiple generations without substantial signs of fading out:

Dictionaries	*# harm.* VC_0V *seq.s*	*# disharm.* VC_0V *seq.s*	*Local harm. rate*	*# harm.* VC_0aC_0V *seq.s*	*# disharmonic* VC_0aC_0V *seq.s*	*Nonlocal harm rate*
Richardson (1885)	223	165	**57.5%**	38	12	**76.0%**
Abinal & Victorin (1888)	215	137	**61.1%**	43	8	**84.3%**
Rakotosaona (1972)	322	209	**60.6%**	79	42	**65.3%**
Hallanger (1974)	229	179	**57.5%**	25	7	**78.1%**
Rajemisa (1985)	925	723	**56.1%**	217	44	**83.1%**

Table 3: *Backness harmony across generations*

The dictionaries show similar harmony rates, giving roughly a 57.5% rate for local harmony and a 75% rate for nonlocal harmony. And as previously discussed, dissimilation of *–u* has been active in the language throughout this time interval as well, and does not display any obvious signs of fading. If unproductive generalizations fade out over the years, then the data above suggest that contradictory markedness restrictions across domains are part of the Malagasy grammar.

To summarize these findings, Malagasy productively applies backness dissimilation to the passive imperative suffix, which alternates at drastic rates. Roots, on the other hand, reveal a preference for backness harmony. We now turn to Yucatec Maya, which displays contradictory markedness preferences within the same domain, regulating two groups of suffixes.

2.3. Contradictory markedness preferences governing Yucatec Maya suffixes

Yucatec Maya shows opposite restrictions governing suffix vowels. Certain suffixes harmonize with stem vowels for height and backness, while others dissimilate. The harmony data, further described in Krämer (2001), are provided below. Glosses in (6-8) are adopted from Krämer (2001).

Suffixal harmony

(6a) Intransitive imperfective

ʔ**a**h-**a**l	wake.up-IMPF
ʔ**o**k-**o**l	enter-IMPF
l**u**b'-**u**l	fall-IMPF
w**e**n-**e**l	sleep-IMPF
k**i**ːm-**i**l	die-IMPF

(6b) Intransitive perfective

ʔ**a**h-**a**k	wake.up-SUBJ
ʔ**o**k-**o**k	enter-SUB
l**u**b'-**u**k	fall-SUBJ
w**e**n-**e**k	sleep-SUBJ
k**i**ːm-**i**k	die-SUBJ

Blocking by coda consonant

(6c) Intransitive imperfective

t'otʃ-b'-al	harden-PASS-IMPF

(6d) Intransitive perfective

tuːkul-n-ak	think-N-SUBJ
heːk'-n-ak	break-N-SUBJ
ts'iːb'-n-ak	write-N-SUBJ

The intransitive suffixes take the backness and height of the stem-final vowel (6a, b) unless the stem ends in a coda consonant, in which case the suffix vowel defaults to [a] (6c, d).[2]

[2] As mentioned in Krämer (2001), if the patterns in (6a-b) were due to reduplication instead of assimilation, then we might expect the vowels to match for length and tone (the latter suppressed from above), but they do not — e.g., [kiːm-il] above (see Kitto & de Lacy 1999, Stanton & Zukoff 2016 for related discussion). This gives some evidence that an assimilatory process is at work here.

On the other hand, two derivational suffixes dissimilate from the stem-final vowel: *–kiːn*/*–kuːn*, used in the formation of deadjectival and denominal forms (glossed D below, following Krämer 2001), and *–en*/*–un*, a participle formed from positional verbs used in reduplication. The data are given below:

Dissimilation driving –kiːn vs. –kuːn

(7a)	**u**ts-k**i**ːn-t-ik	good-D-TR-IMPF
(7b)	h**a**w-k**u**ːn-t-ah	lie.down.face.up-D-TR-PERF
(7c)	saːs**i**l-k**u**ːn-s	light.up-D-CAUS-DET

Dissimilation driving –en vs. –un

(8a)	h**a**ːy-**u**n-haːy	stretch-PART-RED = 'stretch here and there'
(8b)	k**e**ːb-**u**n-keːb	lean-PART-RED = 'lean here and there'
(8c)	ʃ**o**ːl-**e**n-ʃoːl	kneel-PART-RED = 'kneel here and there'
(8d)	k**u**ːl-**e**n-kuːl	seat-PART-RED = 'seat here and there'
(8e)	tʃ**i**ːl-**e**n-tʃiːl	lie-PART-RED = 'lie here and there'

In both (7a-c), the suffix form chosen is the one that differs from the preceding vowel in the value of [back], providing evidence for the working of backness dissimilation in the grammar. In (8a-e), the story is somewhat more complicated: it seems *–en* is the default allomorph for the participial morpheme, but if the preceding vowel differs from it in both backness and height, then a different allomorph, *–un*, is selected (see Krämer 2001 for an analysis based on underspecification). Hence in Yucatec Maya, two suffixes harmonize with the preceding vowel for backness and height, while another suffix dissimilates for backness, and yet another for both backness and height.[3] Contradictory markedness preferences can thus regulate allomorphy of different morphemes in the same domain.

3. MaxEnt grammar for Malagasy cooccurrence restrictions

This section provides an analysis of contradictory markedness restrictions across domains, in particular the data from Malagasy. Backness restriction in the language is in large part gradient, and so I treat it within Maximum Entropy Harmonic Grammar (MaxEnt; Hayes & Wilson 2008). In MaxEnt, constraints are assigned a numerical "strength", or weight, instead of being ranked. Rather than being partitioned into winners and losers, output forms are assigned probabilities ($\mathcal{P}$ in the tableaux below), determined as a function of the weighted sum of the constraint violations, called the harmony ($\mathcal{H}$). The MaxEnt Grammar Tool (Wilson 2006; linguistics.ucla.edu/people/hayes/MaxentGrammarTool/) was used here, which takes in UR-SR pairs, their frequencies, the constraints and violation profiles and returns weights for the constraints which best match attested frequencies.

To capture suffixal backness dissimilation, we posit local and nonlocal varieties of OCP, *applying only across the suffix boundary*: OCP-L/across+ (*$\begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix} C_0 + \begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix}$) and OCP-NL/across+ (*$\begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix} C_0 a C_0 + \begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix}$). We also posit low-weighted IDENT, violated by alternating forms. As for the harmony preference in roots, we posit local and nonlocal varieties of AGREE (Lombardi 1999, Bakovic 2000), *applying only within roots*: AGREE-L/within.roots: (*$\begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix} C_0 \begin{bmatrix}\text{-}\alpha\text{back}\\ \text{-low}\end{bmatrix}$) and AGREE-NL/within.roots (*$\begin{bmatrix}\alpha\text{back}\\ \text{-low}\end{bmatrix} C_0 a C_0 \begin{bmatrix}\text{-}\alpha\text{back}\\ \text{-low}\end{bmatrix}$).

The input tableaux for the MaxEnt Grammar Tool and the weights it returned are given below. I follow Hayes & Wilson (2008), Hayes, Zuraw et al (2009), *a.o.* in giving type frequencies for the input, they having closely mirrored the intuitions given by native speakers during wug tests in prior

[3] Note that not all suffixes harmonize or dissimilate: the perfective and transitive imperfective *–ah* and *–ik* always surface with these forms, and do not depend on the final stem vowel.

studies of variable phonological phenomena (e.g., Hayes, Zuraw *et al.* 2009). The within-root inputs in Table 4 are sequences of tier-adjacent vowels, with V_1, V_2 drawn from [i e u] (i.e., V_1, V_2 are [-low]).

Within root			*Across suffix boundary*		
Input	Candidate	Freq.	Input	Candidate	Freq.
V_1V_2	uu, ii, ei, etc.	1379	u+u	u+u	4
	ui, eu, iu, etc.	1014		u+i	989
V_1aV_2	uau, iai, etc.	205	ua+u	ua+u	196
	uai, iau, etc.	118		ua+i	201
			ui+u	ui+u	399
				ui+i	2
			no.trigger+u	…+u	1877
				…+i	7

Table 4: *input tableaux for the MaxEnt learner*

(9)

AGREE-L-rt	0.31
AGREE-NL-rt	0.55
OCP-L-+	10.45
OCP-NL-+	5.38
IDENT	5.34

Cross-boundary OCP constraints receive high weight, matching high rates of suffixal dissimilation, while root-internal AGREE constraints receive lower weight, matching lukewarm harmony rates within roots. With these constraints MaxEnt acquires the opposite restrictions system, predicting essentially perfectly the observed frequencies.

I give below the tableaux for local suffixal dissimilation and root harmony:

(e.g., /babu+u/) /…$\mathbf{u}C_0+\mathbf{u}$/	$\mathcal{P}$	$\mathcal{H}$	OCP-L/across+ $w = 10.45$	IDENT $w = 5.34$
$\mathbf{u}C_0+\mathbf{u}$	0.01	-10.45	-1 ∗ 10.45	
$\mathbf{u}C_0+\mathbf{i}$	0.99	-5.34		-1 ∗ 5.34

Table 5a: *Tableau for local backness dissimilation*

/V_1V_2/	$\mathcal{P}$	$\mathcal{H}$	AGREE-L/roots $w = 0.31$
uu, ii, ei, etc.	0.58	0	
ui, eu, iu, etc.	0.42	-0.31	-1 ∗ 0.31

Table 5b: *Tableau for front vowel blocking*

The grammar accurately predicts drastic suffixal dissimilation across 99% of the relevant forms, and weaker harmony within roots. Nonlocal cooccurrence restrictions are captured analogously with the nonlocal variety of constraints. Blocking by front vowels, not shown above, is also modeled accurately: violation of higher weighted OCP-L/across+ and IDENT are traded for a violation of lower weighted OCP-NL/across+.

Alternative approaches might account for these data (e.g., Agreement by Correspondence; Hansson 2001, Rose & Walker 2004, Bennett 2013, *a.o.*), but do not appear to speak meaningfully to domain generalization bias defiance in a way that the above analysis does not. The analysis above is meant to illustrate what a grammar for an opposite restrictions system might look like, and is not intended to privilege above all other possibilities a particular account of harmony and dissimilation.

4. Discussion

How might opposite restrictions systems have arisen in these languages? Here the picture is unclear, but we can speculate: one could imagine that the passive imperative was adopted late in the language's development, with dissimilation subsequently arising to distinguish the suffix boundary — a drive for recoverability that directly conflicts with and overrides domain generalization bias. Or perhaps dissimilation began as a constraint banning *u+u* sequences, mirroring a ban on *uu* sequences in phonotactics, but was somehow generalized to a ban on $u(C_0a)C_0$+*u* sequences. How and why these systems arise in defiance of domain generalization bias is something I leave to future research.

On a broader level, attested opposite restrictions systems provide evidence that the learner is capable of acquiring morphologically granular phonologies, counteracting domain generalization bias. This finding patterns with other instances of learning bias defiance, in which structures or systems shown to be disfavored by learners occasionally arise in the world's languages and persist across generations, suggesting they can be apprehended to some extent.

On a deeper level, opposite restrictions systems complicate our understanding of domain generalization. Martin (2011) observes that strong phonotactic constraints can "leak" into the cross-boundary domain: in Navajo sibilant harmony and English geminate avoidance, a categorical phonotactic generalization is mirrored by a statistical tendency across compound boundaries. Martin introduces a Gaussian smoothing term into the MaxEnt learning system (see his paper for specifics) such that when the learner weighs highly a phonotactic constraint, it also gives weak positive weight to a domain-general constraint, thereby deriving tendencies in compounds. For Malagasy, we could invoke a suffixal OCP constraint together with a general OCP constraint, and the smoothing term would result in the learner weighing general OCP positively, so that the dissimilatory drive would leak into the stem-internal domain, creating a statistical tendency in stem phonotactics. But the learner is free to counteract the tendency simply by adjusting the weight of stem-internal AGREE to the point of counteracting general OCP. This is revealed in the MaxEnt outputs below. The inputs frequencies in Table 6a and Table 6b represent simplified but illustrative scenarios that the learner might encounter: 6a shows categorical suffixal dissimilation with a harmony tendency in roots, while 6b shows categorical suffixal dissimilation with no tendency toward harmony or disharmony in roots.

(10a)

AGREE-L-rt	9.83
OCP-L	9.57
OCP-L-+	19.39
IDENT	14.21

Within root			*Across suffix boundary*		
Input	Cand.	Freq.	Input	Cand.	Freq.
V_1V_2	uu, ii, etc.	1300	u+u	u+u	0
	ui, eu, etc.	1000		u+i	1000
			no.trig+u	…+u	1000
				…+i	0

Table 6a: *Input with harmony tendency in roots*

(10b)

AGREE-L-rt	9.66
OCP-L	9.66
OCP-L-+	19.32
IDENT	14.21

Within root			*Across suffix boundary*		
Input	Cand.	Freq.	Input	Cand.	Freq.
V_1V_2	uu, ii, etc.	1000	u+u	u+u	0
	ui, eu, etc.	1000		u+i	1000
			no.trig+u	…+u	1000
				…+i	0

Table 6b: *Input with no tendency in roots*

The OCP drive is leaked into the root domain, and yet the overall result in (10a) is one in which opposing constraints result in *tendency reversal*, and in (10b) is one in which opposing constraints result in *tendency cancellation*, for better or for worse. The returned grammars given above match the input frequencies essentially perfectly. Thus the current representation of domain generalization bias in MaxEnt does not prevent derived environment effects most generally, because the learner can simply weigh positively a counterconstraint to cancel out or reverse a generalization leaked into a domain.

The availability of a natural counterconstraint to the learner might be what distinguishes Martin's cases from mine: learners may fail to entertain constraints favoring disharmonic sibilants or geminates, they being unnatural and typologically unmotivated; but backness harmony *and* dissimilation are observed crosslinguistically (Clements & Sezer 1982, Itô 1984, Harrison 1999), and so it is reasonable to think the learner could entertain them in hypotheses about morphological domains. Hence, provided learners do spread the effect of a strong constraint across domains, the Malagasy system suggests they are capable of counteracting this effect provided they have access to natural constraints driving contradictory markedness preferences. It very well could be that derived environment effects arise and persist only in cases where there exists independent crosslinguistic evidence for the working of two opposing constraints, and derived environment effects in which there does not exist a natural opposing constraint are relatively prone to breaking down, as in Chong (2016), or being generalized, as in Martin (2011).

5. Conclusion

A family of previous findings suggests the working of a learning bias here dubbed domain generalization bias, or learner tendency to favor phonological constraints that hold across morphological domains (Martin 2011; Myers & Padgett 2014; Chong 2016, 2017). This paper argues, despite these findings, that domain generalization bias can be defied, and that the matching of phonological drives across morphological domains is not a necessary condition for learning. Evidence for the claim comes from a corpus study of Malagasy, which displays contradictory markedness preferences across domains: backness dissimilation applies regularly to the passive imperative suffix, but stems in the lexicon show an overall opposing preference for backness harmony. Though learners might prefer for morphological domains to match, the Malagasy system suggests they are capable of overriding this bias when they have access to natural constraints with opposing drives. Contradictory markedness preferences are even found to regulate morphemes in the same domain, in Yucatec Maya: as discussed previously in Krämer (2001), two suffixes in the language harmonize for backness and height, but one suffix dissimilates for backness, and yet another for backness and height.

References

Abinal, Antoine & Malzac Victorin (1888). *Dictionnaire malgache-français*. Ambozoantany.

Alexander Adelaar (2009). Malagasy vocabulary. In: Haspelmath, Martin & Tadmor, Uri (eds.) *World Loanword Database*. Leipzig: Max Planck Institute for Evolutionary Anthropology.

Bakovic, Eric (2000). Harmony, dominance and control. Ph.D. Dissertation, Rutgers University.

Becker, Michael, Nihan Ketrez, and Andrew Nevins (2011). The surfeit of the stimulus: Analytic biases filter lexical statistics in Turkish laryngeal alternations. *Language* 87:1, 84–125.

Becker, Michael, Andrew Nevins, and Jonathan Levine (2012). Asymmetries in generalizing alternations to and from initial syllables. *Language* 88:2, 231–268.

Bennett, William (2013). *Dissimilation, consonant harmony, and surface correspondence*. Ph.D. Dissertation, Rutgers University.

Burzio, Luigi (1997). Cycles, non-derived-environment blocking, and correspondence. Ms., Johns Hopkins University.

Chong, Adam J. (2016). Gradient phonotactics and derived-environment effects: A comparison of Korean and Turkish. Presentation given at AMP2016.

Chong, Adam J. (2017). On the relation between phonotactic learning and alternation learning. Ph. D. Dissertation, University of California, Los Angeles.

Clements, George & Engin Sezer (1982). Vowel and consonant disharmony in Turkish. In Harry van der Hulst and Norval Smith (eds.), *Structure of phonological representations (Part II)*, 213-255. Dordrecht: Foris Publications.

de la Beaujardière, Jean Pierre. 2004. *Malagasy Dictionary and Encyclopedia of Madagascar.*

Goldsmith, John (1976). *Autosegmental phonology*. IULC and Garland Press, New York.

Hallanger, Frederik S. (1974). *Diksionera Malagasy-Frantsay*. Trano Printy Loterana.

Hansson, Gunnar (2001). *Theoretical and typological issues in consonant harmony*. Ph.D. Dissertation, University of California, Berkeley.

Harrison, K. David (1999). Vowel harmony and disharmony in Tuvan and Tofa. *Proceedings of the Nanzan GLOW*.

Hayes, Bruce (2004). Phonological acquisition in Optimality Theory: the early stages. In Kager, Rene, Joe Paterand Wim Zonneveld, (eds.), *Fixing Priorities: Constraints in Phonological Acquisition*. Cambridge University Press.

Hayes, Bruce, Kie Zuraw, Peter Siptar & Zsuzsa Londe (2009). Natural and unnatural constraints in Hungarian vowel harmony. *Language* 85: 822-863.

Hayes, Bruce & James White (2013). Phonological naturalness and phonotactic learning. *Linguistic Inquiry* 44:45-75.

Hayes, Bruce & James White (2015). Saltation and the P-map. *Phonology* 32:267-302.

Hayes, Bruce & Colin Wilson (2008). A maximum entropy model of phonotactics and phonotactic learning. *Linguistic Inquiry*, 39, 379–440.

Itô, Junko (1984). Melodic dissimilation in Ainu. *Linguistic Inquiry* 15, 505-13.

Iverson, Gregory K. & Deirdre W. Wheeler (1988). Blocking and the Elsewhere condition. In Michael Hammond & Michael Noonan (eds.), *Theoretical morphology: Approaches in modern linguistics*, 325 – 338. San Diego: Academic Press.

Jarosz, Gaja (2006). *Rich lexicons and restrictive grammars: Maximum likelihood learning in Optimality Theory*. Ph.D. Dissertation, Johns Hopkins University.

Kitto, Catherine & Paul de Lacy (1999). Correspondence and epenthetic quality. *Proceedings of AFLA 4*: 181-200.

Lubowicz, Ania (1998). Derived environment effects in Optimality Theory. In: Susan J. Blake, Eun-Sook Kim, and Emary Shahin (eds.), *Proceedings of the 17th West Coast Conference on Formal Linguistics*, Vancouver, British Columbia.

Kiparsky, Paul (1973). Phonological representations. In Osamu Fujimura (ed.), *Three dimensions of linguistic theory*, 1–135. Tokyo: TEC.

Kiparsky, Paul (1993). Blocking in nonderived environments. In Ellen Kaisse & Sharon Hargus (eds.), *Phonetics and Phonology 4: Studies in lexical phonology*, 277–313. San Diego: Academic Press.

Kessler, Brett (2001). *The significance of wordlists*. Cambridge, MA: MIT Press.

Krämer, Martin (2001). Yucatec Maya Vowel Alternations: Harmony as Syntagmatic Identity. *Zeitschrift für Sprachwissenschaft* 20: 175-217.

Leben, Will (1973). *Suprasegmental phonology*. Ph.D. dissertation, MIT. Published by Garland Press, New York.

Lewis, Geoffrey (1967). *Turkish grammar*. Oxford: Oxford University Press.

Lin, Ying (2005). Two perspectives on Malagasy reduplication: derivational and OT analyses. *UCLA Working Papers in Linguistics 12*.

Lombardi, Linda (1999). Positional Faithfulness and Voicing Assimilation in Optimality Theory. *Natural Language and Linguistic Theory* 17, 267-302.

Martin, Andrew (2007). The evolving lexicon. Ph.D. Dissertation, UCLA.

Martin, Andrew (2011). Grammars leak: Modeling how phonotactic generalizations interact with in the grammar. *Language* 87(4): 751–770.

McMullin, McMullin and Gunnar Ólafur Hansson (2014). Locality in long-distance phonotactics: evidence for modular learning. In *Proceedings of the 44th Meeting of the North East Linguistic Society*. GLSA Publications, UMass, Amherst.

Moreton, Elliott & Joe Pater (2012). Structure and Substance in Artificial-phonology Learning, Part I: Structure. *Language and Linguistics Compass*, 6(11), 686-701.

Myers, Scott & Jaye Padgett (2014). Domain generalization in artificial language learning. *Phonology* (31): 399 433.

Parker, George Williams (1883). *A concise grammar of the Malagasy language*. London, Trübner & Co.

Rajemisa-Raolison, Régis (1985). *Rakibolana Malagasy*. Ambozoantany.

Richardson, James (1885). *A New Malagasy-English Dictionary.* The London Missionary Society, Antananarivo.

Rose, Sharon, & Rachel Walker (2004). A typology of consonant agreement as correspondence. *Language* 80: 475–531.

Stanton, Juliet & Sam Zukoff (2016). Prosodic effects in segmental correspondence. *Proceedings of CLS 51.* Chicago Linguistics Society. 501-515.

Tesar, Bruce & Alan Prince (2003). Using phonotactics to learn phonological alternations. *Proceedings of the Thirty-Ninth Conference of the Chicago Linguistics Society, Vol. II: The Panels*.

Wilson, Colin (2006). Learning phonology with substantive bias: an experimental and computational study of velar palatalization. *Cognitive Science* 30.5:945-982.

White, James (2014). Evidence for a learning bias against saltatory phonological alternations. *Cognition*, 130(1): 96–115.

Zymet, J. (2015). Distance-based decay in long-distance phonological processes. In U. Steindl et al. (eds.), *Proceedings of the 32nd West Coast Conference on Formal Linguistics*, pp. 72 – 81. Somerville, MA: Cascadilla Press.

Proceedings of the 35th West Coast Conference on Formal Linguistics

edited by Wm. G. Bennett, Lindsay Hracs, and Dennis Ryan Storoshenko

Cascadilla Proceedings Project Somerville, MA 2018

Copyright information

ISBN 978-1-57473-472-0 library binding

Ordering information

Orders for the library binding edition are handled by Cascadilla Press.
To place an order, go to www.lingref.com or contact:

Cascadilla Press, P.O. Box 440355, Somerville, MA 02144, USA
phone: 1-617-776-2370, fax: 1-617-776-2271, sales@cascadilla.com

Web access and citation information

This entire proceedings can also be viewed on the web at www.lingref.com. Each paper has a unique document # which can be added to citations to facilitate access. The document # should not replace the full citation.

This paper can be cited as:

Zymet, Jesse. 2018. Contradictory Markedness Preferences across Morphological Domains. In *Proceedings of the 35th West Coast Conference on Formal Linguistics*, ed. Wm. G. Bennett et al., 479-488. Somerville, MA: Cascadilla Proceedings Project. www.lingref.com, document #3421.