Squib

The Role of Phonological Predictability in Sound Change: Privileged Reduction in Oceanic Reduplicated Substrings

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Phonetic reduction is more likely when a word is predictable or recoverable independent of acoustic information. Attributing higher rates of phonetic reduction to lexical predictability has implications for subword domains. A range of historical developments in Oceanic support this position. In reduplication, where the content of the reduplicated substring is wholly predictable and recoverable from the base, the reduplicant undergoes leniting sound changes more readily than the base, and more readily than other prosodically comparable domains. Synchronic consequences of these developments challenge models associating reduplication with the emergence of unmarked structures.

1. Predictability and reduction.[1] There is mounting evidence that in positions where a particular word has a high predictability of occurrence, phonetic reduction is more likely and more extreme than elsewhere (Lindblom 1983, 1990; Moon and Lindblom 1994; Sotillo 1997; Bard and Aylett 1999; Gregory et al. 1999; Aylett 2000; Bard et al. 2000; Bush 2001; Jurafsky et al. 2001; Bell et al. 2003). Lindblom's research program explores the hypothesis that hypoarticulation correlates with the degree to which speakers or listeners can supplement acoustic information with information from other sources (pragmatic, textual, etc.). The research program explored by Jurafsky and colleagues focuses more specifically on transitional probabilities drawn from large corpora, and evidence that knowledge of such probabilities plays a role in speech production and processing. When the results of these research programs are combined, a clear picture emerges: articulatory reduction of words is, in part, a function of contextual lexical predictability and recoverability. The more predictable or recoverable a word is independent of acoustic information, the more likely the word is to be produced in a phonetically reduced form.

While the role of predictability in speeding leniting sound change at the level of the word has received a great deal of attention in the past few decades, there has been less exploration of its role for smaller word-internal domains. Nevertheless, there are certain word-types where the phonological content of substrings is wholly predictable. A

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canonical case of this type is reduplicative morphology, where the phonological form of the base determines the phonological shape of a reduplicative substring (Wilbur 1973; Moravcsik 1978; Marantz 1982; McCarthy and Prince 1995; Inkelas and Zoll 2005).[2] If, quite generally, hypoarticulation correlates with the degree to which speakers or listeners are able to supplement acoustic information with information from other sources, then a strong prediction is made for reduplicated forms: all else being equal, phonetic reduction should occur more often in reduplicants than elsewhere in words, because the phonological information present in the reduplicated substring is predictable from the base. In models of sound change where frequencies of phonetic variants play a role in the trajectory of sound change through the lexicon (Bybee 2001, Pierrehumbert 2001, Blevins 2004), the expectation is that certain sound changes will progress faster in reduplicative substrings, or even be restricted to reduplicative domains.

In this squib, historical reduction processes in reduplicative substrings in Oceanic are shown to support this prediction. Four types of leniting sound change are highlighted, each occurring preferentially in reduplicants. As each of these historical trajectories gives rise to synchronic sound patterns under reduplication that are problematic for modern conceptions of markedness, the data also lend additional support to the evolutionary framework of Blevins (2004), where universal markedness constraints are eliminated from synchronic grammars.

2. Unstressed final vowel loss. Hoava, a language of the Western Solomons, like many other Oceanic languages, has a productive reduplication process where the first two syllables of a base are reduplicated (Davis 2003). The basic syllable structure in Hoava is (C)V, but under CVCV- reduplication, as illustrated in (1), "the second vowel is always deleted in connected speech" though, "when a word is said slowly, in isolation, the vowel is not elided" (Davis 2003:26). In (1), periods represent syllable boundaries. The voiced series /b d g/ are prenasalized intervocalically, oral word-initially, and nasal in derived codas like the connected speech forms in (1b,d).

(1) Hoava CVCV- reduplication (Davis 2003:26)

	BASE	REDUPLICATION		
		SLOW/CAREFUL	CONNECTED SPEECH	
a.	ɣa.sa	ɣa.sa.ɣa.sa	ɣas.ɣa.sa	'to jump/jumping'
b.	ka.bɔ	ka.bɔ.ka.bɔ	kam.ka.bɔ	'to cry/crying'
c.	hi.ɣa.la	hi.ɣa.hi.ɣa.la	hiɣ.hi.ɣa.la	'to garden/gardening'
d.	ha.ga.la	ha.ga.ha.ga.la	haŋ.ha.ga.la	'to run/running'
e.	ha.βɔ.rɔ	ha.βɔ.ha.βɔ.rɔ	haβ.ha.βɔ.rɔ	'flower/wearing flowers'

Though word-final vowel elision is common "in rapid speech, especially for frequent combinations of words" (Davis 2003:27), rapid speech and high frequency are not conditions for the morpheme-final vowel loss shown in (1). Rather, the connected speech forms in (1) demonstrate that the sound change shown in (2) is progressing faster in redu-

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2. I use the term "substring" rather than "affix" or "prefix" because the morphological and prosodic status of reduplicated material may differ from one Oceanic language to the next. In some languages, disyllabic reduplicated prefixes may have prosodic word status, being comparable to initial elements of compounds, while in others, monosyllabic reduplicants are comparable to other CV- prefixes. The term "reduplicated substring" or "reduplicant" allows reference to the reduplicated subpart of the word without taking a stand on its precise morphological or prosodic status.

plicated forms than elsewhere in the language. This supports the hypothesis that word-internal phonological predictability plays a facilitative role in leniting sound change.

(2) Unstressed final vowel-loss in Hoava (in progress)

$V > \emptyset / \underline{\quad} \,]$

APPLIES:
   (i) regularly to reduplicated prefix
   (ii) in rapid speech, especially between high frequency word pairs

A similar sound pattern is reported for the related Northwest Solomonic language Roviana (Corston-Oliver 2002:470). In Roviana, reduplication patterns like those in (1) are also found. In addition, a nonnasal syllable-final consonant resulting from vowel deletion may be optionally deleted. Compare Roviana slow careful *heɣe-heɣere*, common *heɣ-heɣere,* and optional *he-heɣere* 'RED-laugh'.

   Note that regular V-loss in reduplicative substrings in Hoava and Roviana cannot be attributed to prosodic factors alone: reduplicated words have the same stress patterns as compounds and words formed with the reciprocal prefix /vari-/. In these word types, rule (2) appears to be more variable, and sensitive to frequency and rate of speech. The regularity of unstressed vowel loss in reduplicative substrings then supports the hypothesis that word-internal phonological predictability can play a facilitative role in leniting sound change.

3. Intervocalic C-loss. A number of Oceanic languages have undergone historical consonant loss processes that appear restricted to reduplicated substrings. In Bugotu, a Southeast Solomonic language (Ivens 1933, 1940: Blevins 2003), synchronic reduplication of CVCV stems is CVV-, with the medial consonant absent (3a-d), while that for VCV stems is VC-, with the medial consonant intact (3e-h).

(3) Bugotu reduplication (Ivens 1933, 1940; Blevins 2003)

BASE	REDUPLICATION	GLOSS OF REDUPLICATED FORM
a. ka.lu	kau.ka.lu	'to stir, knead'
b. li.ko	li.o.li.ko	'to be crooked'
c. ke.mu	keu.ke.mu	'to distribute'
d. lo.po	loo.lo.po	'to fold'
e. i.li	i.lii.li	'to be drunken'
f. a.θo	a.θo.a.θo	'to beckon, signal'
g. o.lu	o.lu.o.lu	'to be greedy, gluttonous'
h. i.fu	i.fu.i.fu	'to blow'

Comparative data from Blust (n.d.) supports reconstruction of pre-Bugotu *CVCV-reduplication, with historical medial consonant loss limited to the medial C of the reduplicated CVCV- string. Some examples of Proto-Oceanic (POc) *CVCV- reduplication with CVV- Bugotu reflexes are given in (4), and the pre-Bugotu sound change limited to reduplicated substrings is shown in (5).

(4) CVV- reflexes of *CVCV- in Bugotu

PROTO-OCEANIC	BUGOTU
*poli-poli 'buy, sell, trade'	voi-voli

*puraq-puraq 'foam, bubbles; bubble up'   bua-burara
*piri-piri 'to twine round and round'   fii-firi 'to twine'
*mpuku-mpuku 'node, joint; knuckle'   puu-puku 'swelling, lump,
                                                              knot, tumor'

(5) Intervocalic C-loss in Bugotu
     a. C > Ø / CV_V.] $_{RED}$ b. C > Ø / V_V.] $_{RED}$

Retention of medial consonants in reduplicants of VCV stems could reflect inhibi-
tory effects of the following vowel sequence, particularly in forms like (3e), where
resyllabification takes place, and the potentially leniting consonant is no longer in a
light syllable. Prosodic effects of this sort would allow one to rewrite (5a) as the
more natural (5b), where a consonant lenites to zero intervocalically.

However, the primary interest of the sound change in (5) is its restriction to the redu-
plicative substring within the word. Whether stated as in (5a) or (5b), medial C-loss
must be restricted to apply only in intervocalic position when the target C is within a
reduplicated domain. Within nonreduplicant [CVCV] stems, medial consonants show
no evidence of historical lenition, as illustrated by the bases in (6), though such lenition
is evident stem-internally in other Oceanic languages, as comparanda illustrate.

(6) Retention of stem-medial C in Bugotu
     a. POc *mpoŋi 'night'; Bugotu *boŋi;* Monu-Alu *boi;* Motu (*hanua)-boi*
     b. POc *potak 'split, cleave, divide'; Bugotu *fota;* Sa'a *hoa;* Arosi *hoa*
     c. POc *poli 'value, price'; Bugotu *voli;* Motu *hoi* 'buy, sell'

Furthermore, as shown in (7), though medial C-loss applies regularly in reduplicated
substrings, there is no evidence of medial C-loss in stems that are the first members of
Bugotu stem-stem compounds.

(7) Retention of stem-medial C in Bugotu compounds (Ivens 1940)

STEM	REDUPLICATION	COMPOUND
dika 'to be bad'	dia-dika-la 'to harm'	dika-hehe 'to grieve'
doro 'to look at'	doo-doro 'to gaze'	doro-kovili 'a lizard'
gatha 'to burn'	gaa-gatha	gatha-paku 'to endure'
halu 'to go'	hau-halu	halu-dotha 'to disappear; twilight'

As in Hoava and Roviana, the differences between reduplication and compounding
cannot be attributed to prosodic factors, because both word types appear to have the
same prosodic structure. Like vowel loss in (2), then, Bugotu historical intervocalic C-
loss in (5) appears to be facilitated by the fact that segmental content in reduplicated
substrings is phonologically predictable. In this case, a phonetically natural leniting
sound change of intervocalic C-loss is limited to a subpart of the word, occurring only
within the reduplicated prefix.

4. CR cluster reduction. Historical consonant cluster reduction of onset CR > C,
where R is a sonorant, is not a common instance of regular sound change.[3] Within the
history of English, for example, where certain CR clusters have been lost, only certain
phonetically conditioned instances of *sw > *s* show sonorant loss, while *kn,*gn > *n*
and *hR > *R* show loss of the initial consonant instead (Schreier, to appear).

It is somewhat surprising, then, that historical shift of *CRV > CV is widespread in reduplicants. In unrelated languages, including Kokota of the Solomons (Palmer 1999), Klamath-Modoc, an isolate of south-central Oregon (Gatschet 1890; Barker 1963, 1964), and a range of Indo-European languages (e.g., Old Irish, Gothic, Attic Greek, and Sanskrit, as detailed in Fleischhacker 2002), synchronic patterns of reduplication show stem-initial CRV- reduplicated as CV-. In all of these languages, comparative evidence or internal reconstruction argues for the cluster-reducing sound change, *CRV > CV, which, like (5), is limited to reduplicated substrings.

In Kokota, a Northwest Solomonic language spoken on Santa Isabel, and described by Palmer (1999, 2002), there is evidence of the sound change in (8).

(8) CR reduction with R-loss in Kokota

$R > \emptyset / [C\_V\ldots]_{RED}$

Kokota has basic syllable types V, VV, CV, CVV, CRV, and CRVV, where syllable-initial consonant clusters are composed of obstruents followed by sonorants /l/, /r/, or /n/ (abbreviated "R"). In the synchronic pattern of partial reduplication (Palmer 1999:33–36), the initial syllable of the word is copied (9a–d), with surface reduction of initial CRV to CV, as illustrated in (9e–h). The same reduction of CRV to CV is evident in historical reduplications for which synchronic bases are now absent (9i–j).

(9) Synchronic partial reduplication in Kokota (Palmer 1999)

	BASE	REDUPLICATION	
a.	siko	si-siko	'steal/thief'
b.	vahe	va-vahe	'carve/operate surgically'
c.	seha	se-seha	'climb/climb all about'
d.	ipi	i-ipi	'wear/be wearing (clothes)'
e.	protu	po-protu	'distant object/small lump on body'
f.	prosa	po-prosa	'slap self w/flipper/wash clothes'
g.	krisu	ki-krisu	'scoop liquid/be scooping liquid'
h.	knusu	ku-knusu	'break (INTR)/a broken piece'
i.	*blata	bablata	(<*bla-blata) 'bat species'
j.	*preku	pepreku	(<*pre-preku) 'lip'

It appears, based on Palmer's description, that the sound change in (8) is not yet entirely complete. Though all speakers produce reduplicative prefixes lacking initial consonant clusters in both casual and careful speech (Palmer 1999:35), things are different for older speakers in tasks involving syllable-by-syllable speech (Palmer 1999, pers. comm. 2005). Palmer trained speakers by delivering forms with only CV syllables in unnaturally slow, syllable-by-syllable speech, with each syllable of approximately equal duration and intensity, and with momentary pauses between syllables. When reduplicated words like

those in (9e-h) were presented, elder speakers produced slow speech forms with initial CR clusters intact: *pro//pro//tu, pro//pro//sa,* etc. And when the experimenter presented deliberate forms of this kind as *po//pro//tu, po//pro//sa,* etc., they were corrected to forms with initial CRV syllables. Palmer's (1999) conclusion is that speakers are unaware of and do not "hear" the surface deletion of R in CRV- reduplicative prefixes. Indeed, this appears to be a classic instance of "ghost" or "phantom" segments: those that are present in the minds of speakers, but absent in the acoustic record. Given the predictable phonological form of reduplicated substrings, this is an expected effect: missing segments can be reincarnated on the basis of the reduplicative base.

As with the languages discussed earlier, it is not possible to attribute selective C-loss in reduplicated substrings to prosodic factors alone. Stress in Kokota can occur on the reduplicative prefix when new lexemes are formed, or on the base (Palmer 1999, chap. 3). When these reduplicative prefixes are stressed, they are no different from other stressed CRV- syllables that resist R-loss. Historically, a case might be made that the context for (8) is pretonic unstressed CRV syllables. However, there are particles like *bla* 'LIMITER' that have not undergone R-loss, nor is there any evidence that (8) has applied to compounds or other words where CRV syllables are unstressed and pretonic: *fogra'dou* 'be very sick' (cf. *fogra* 'be very sick', *dou* 'be big'); *togla'zuta* 'k.o. snake that comes to lights at night' (cf. *togla* 'hunt', *zuta* 'lamp'); *fabli'nori* 'make pure, cleanse' (cf. *fa-* 'causative', *blino-* 'be pure, clean') (Palmer 2005).

5. Vowel loss between identical consonants. A final instance of sound change that appears to occur faster in reduplicated substrings than elsewhere is vowel loss between identical consonants. The recurrent nature of this sound change in Austronesian is discussed in Blust (1990), Blevins (2004:172), and, most recently and comprehensively, by Blust (forthcoming). Data from Tuvaluan, a Polynesian outlier, in (10) illustrates the historical sound change in (11).

(10) Historical vowel-loss in Tuvaluan CV- reduplication (Besnier 2000:618)

	BASE	REDUPLICATION	
a.	*vae	vvae (<*va-vae)	'divide'
b.	*mao	mmao (<*ma-mao)	'far'
c.	*tolo	ttolo (<*to-tolo)	'crawl'

(11) V-loss between identical consonants

a. $V > \emptyset\ /\ [C\_]_{RED}$ b. $V > \emptyset\ /\ C_i \_ C_i$

In (11a), the sound change is stated without reference to flanking identical consonants: an unstressed vowel is lost in the reduplicative prefix. In (11b), the sound change is stated with reference to flanking identical consonants.

While seven of ten independent sound changes discussed by Blust (forthcoming) occur both across morpheme boundaries as well as morpheme-internally, there is no Austronesian language in which vowel loss between identical consonants *does not apply* to the V of a CV- reduplicative prefix. That is, there is no language that has the sound change in (11b), but does not show the change in (11a). Furthermore, in languages where one can observe this sound change in progress, for example, in Kokota as described by Palmer (1999, chap. 3), the change is restricted to the unstressed vowel

of the CV- reduplicate prefix. I conclude that this sound change, like those discussed above, occurs faster in the reduplicated substring, due to the phonological predictability of vowel quality in this morphological context.

6. Theoretical implications. The four sound changes discussed above apply preferentially or uniquely to reduplicative substrings. Within Evolutionary Phonology (Blevins 2004), this preference is straightforwardly modeled. In each case, variation along the hyper-to-hypoarticulation continuum gives rise to instances of CHOICE, where a more frequent phonetic variant replaces a less frequent one as best "exemplar," resulting in phonological reanalysis. The higher frequency of lenition in reduplicative substrings, as opposed to bases or other subword domains, is a consequence of the general finding that articulatory reduction is, in part, a function of contextual predictability and recoverability.

In contrast, synchronic models like Optimality Theory (Prince and Smolensky 1993; McCarthy and Prince 1994, 1995; Kager 1999) that employ universal markedness constraints to predict language-specific sound patterns have some difficulty with synchronic sound patterns arising from each of these four types of sound change. Recall that the loss of unstressed final vowels in (2) gives rise to CVC syllables in Hoava in reduplicative prefixes, though elsewhere Hoava does not have clear evidence of underlying closed syllables. The facts then present direct counter-evidence to emergence-of-the-unmarked effects in reduplication (McCarthy and Prince 1994; Kager 1999:206–7, 215–16). In reduplicated substrings, unmarked structures are predicted to emerge, because canonical faithfulness constraints are inactive. Within Optimality Theory, closed syllables are cross-linguistically marked, violating the NO-CODA constraint. In Hoava, NO-CODA must be highly ranked, because open syllables are the norm. The prediction, then, is that under reduplication, open syllables should emerge in Hoava. However, as we have seen, this is the only context where closed syllables are consistently found.

Similar problems are raised by the Bugotu data in (3) (Blevins 2003). In reduplicated substrings, marked onsetless syllables emerge, again providing potential counter-evidence to models predicting emergent unmarkedness. As shown above, there is little problem with accounting for the synchronic pattern as a consequence of expected diachronic sound change. In Bugotu, intervocalic consonant lenition and loss proceed faster in reduplicative prefixes than elsewhere, due to the fact that consonant quality in these contexts is predictable and recoverable.

The reduplication-specific reduction of CRV > CV in Kokota and other languages provides perhaps the strongest evidence for contextual predictability and recoverability as catalysts for regular sound change. In these instances, the sound change resulting in cluster reduction is limited to the reduplicative substring. Synchronic universalist constraint-based analyses of these types of reduplicative patterns assume a general phonotactic pressure against onset consonant clusters, and a reduplication-specific constraint that requires correspondent strings to be "perceptually similar within acceptable levels" (Fleischhacker 2002). However, the same account also requires elimination of CONTIGUITY, a constraint needed elsewhere to ensure that segments are not generally skipped under reduplication. Under the present account, articulatory reduction under phonological recoverability is the primary factor in sound change; perceptual similarity allows listeners to maintain phonological repre-

sentations with CRV- prefixes, as in Kokota, even when evidence in the acoustic signal is lacking. The two approaches make different predictions with respect to common and rare reduplicative transforms. Under the evolutionary account, nonleniting sound change (e.g., fortition, segment insertion, etc.) should not be more common in reduplicative substrings than elsewhere, because these types of sound changes are not associated with articulatory reduction. Under the perceptual similarity account, reduplication of CV as CRV is just as likely as reduplication of CRV as CV, given that CONTIGUITY and constraints enforcing base-reduplicant identity are clearly violable.

Finally, there is the case of unstressed vowel loss between identical consonants. This sound change, and the synchronic sound patterns associated with it, pose serious empirical problems for universalist markedness accounts of "antigemination" like that originally proposed by McCarthy (1986). Under McCarthy's account, antigemination—the failure of a vowel to delete between identical consonants—is a consequence of the Obligatory Contour Principle, a synchronic universal constraint that prohibits adjacent identical segments. However, as detailed in subsequent work, this account is simultaneously too weak and too strong (Odden 1988), it fails to capture relationships between antigemination and antihomophony (Blevins 2005), and it fails to properly predict the widespread occurrence of antiantigemination in Austronesian languages (Blust forthcoming).

A further problem for universal markedness accounts is raised by unstressed vowel loss between identical consonants in languages like Tuvaluan and many other cases detailed in Blust (forthcoming). Recall that within Optimality approaches, unmarked structures are predicted to emerge in reduplicate structures. Word-initial geminates are universally marked structures, instantiated by highly ranked universal markedness constraints in many languages. Yet, it is under reduplication, where unmarked structures are predicted to emerge, that initial geminates arise. In contrast, the evolutionary account predicts loss of unstressed vowels in a wide range of contexts, due to articulatory, perceptual, and structural factors (Blevins 2004, 2005; Blust forthcoming). If we add to this the observation supported in this squib that leniting sound change may advance faster in reduplicative substrings than elsewhere, vowel loss patterns like those in (10–11) are expected.

In sum, there is evidence from a range of different types of sound change in Oceanic languages that factors of language use play an important role in sound patterns and sound change. While frequency effects (Bybee 2001), real world and discourse knowledge (Lindblom 1983, 1990), and knowledge of transitional probabilities between words (Jurafsky et al. 2001) have already been shown to play a facilitative role in phonetic reduction, the implications of this general finding for word-internal domains has received little attention. The facts summarized here suggest that word-internal domains with high indices of phonological predictability may also be positively correlated with higher rates of phonetic reduction and leniting sound change. The same facts highlight inadequacies of universal markedness approaches to reduplicative sound patterns, in contrast to evolutionary approaches, where the same sound patterns are grounded in articulatory and perceptual transforms of speech as modulated by patterns of language use.

REFERENCES

Aylett, Matthew Peter. 2000. Stochastic suprasegmentals: Relationships between redundancy, prosodic structure and care of articulation in spontaneous speech. PhD diss., University of Edinburgh.

Bard, E. G., A. H. Anderson, C. Sotillo, M. P. Aylett, G. Doherty-Sneddon, and A. Newlands. 2000. Controlling the intelligibility of referring expressions in dialogue. *Journal of Memory and Language* 42:1–22.

Bard, E. G., and M. P. Aylett. 1999. The dissociation of deaccenting, givenness, and syntactic role in spontaneous speech. In *Proceedings of the 14th International Congress of Phonetic Sciences,* ed. by J. J. Ohala, Y. Hasegawa, M. Ohala, D. Granville, and A. C. Bailey, 1753–56. Berkeley: University of California, Berkeley.

Barker, M. A. R. 1963. *Klamath dictionary.* Publications in Linguistics 31. Berkeley: University of California Press.

———. 1964. *Klamath grammar.* University of California Publications in Linguistics 32. Berkeley and Los Angeles: University of California Press.

Bell, Alan, Daniel Jurafsky, Eric Folser-Lussier, Cynthia Girand, Michelle Gregory, and Daniel Gildea. 2003. Effect of disfluencies, predictability, and utterance position on word form variation in English conversation. *Journal of the Acoustic Society of America* 113:1001–24.

Besnier, Niko. 2000. *Tuvaluan: A Polynesian language of the Central Pacific.* London: Routledge.

Blevins, Juliette. 2003. A note on reduplication in Bugotu and Cheke Holo. *Oceanic Linguistics* 42:499–505.

———. 2004. *Evolutionary Phonology: The emergence of sound patterns.* Cambridge: Cambridge University Press.

———. 2005. Understanding antigemination. In *Papers from the International Symposium on Linguistic Diversity,* ed. by Zygmunt Frajzyngier, 203–34. Amsterdam: John Benjamins.

Blust, Robert. 1990. Three recurrent changes in Oceanic languages. In *Pacific island languages: Essays in honour of G. B. Milner,* ed. by J. H. C. S. Davidson, 7–28. London: University of London, School of Oriental and African Studies.

———. n.d. Austronesian comparative dictionary. Unpublished manuscript. (ms. in progress quoted with author's permission)

———. Forthcoming. Antiantigemination: An Austronesian preference.

Bush, Nathan. 2001. Frequency effects and word-boundary palatalization in English. In *Frequency and the emergence of linguistic structure,* ed. by Joan L. Bybee and Paul Hopper, 255–80. Amsterdam: John Benjamins.

Bybee, Joan L. 2001. *Phonology and language use.* Cambridge: Cambridge University Press.

Corston-Oliver, Simon. 2002. Roviana. In *The Oceanic Languages,* ed. by John Lynch, Malcolm Ross, and Terry Crowley, 467–97. Richmond, Surrey: Curzon.

Davis, Karen. 2003. *A grammar of the Hoava language, Western Solomons.* No. 535. Canberra: Pacific Linguistics.

Fleischhacker, Heidi. 2002. Onset transfer in reduplication. Ms. Dept. of Linguistics, University of California, Los Angeles.

Gatschet, Albert Samuel. 1890. *The Klamath Indians of Southwestern Oregon.* Washington: Government Printing Office.

Gregory, M. L., W. D. Raymond, A. Bell, E. Fosler-Lussier, and D. Jurafsky. 1999. Effects of collocational strength and contextual predictability in lexical production. *Proceedings of the Chicago Linguistic Society* 35:151–66.

Inkelas, Sharon, and Cheryl Zoll. 2005. *Reduplication: Doubling in morphology.* Cambridge: Cambridge University Press.

Ivens, W. G. 1933. A grammar of the language of Bugotu, Ysabel Island, Solomon Islands. *Bulletin of the School of Oriental and African Studies* 7:141–77.
———. 1940. *A dictionary of the language of Bugotu (Santa Isabel Island, Solomon Islands)*. London: Royal Asiatic Society.
Iwasaki, Shoichi, and Preeya Ingkaphirom. 2005. *A reference grammar of Thai*. Cambridge: Cambridge University Press.
Jurafsky, D., A. Bell, M. Gregory, and W. D. Raymond. 2001. Probabilistic relations between words: Evidence from reduction in lexical production. In *Frequency and the emergence of linguistic structure*, ed. by Joan L. Bybee and Paul Hopper, 229–54. Amsterdam: John Benjamins.
Kager, Rene. 1999. *Optimality theory*. Cambridge: Cambridge University Press.
Lindblom, Björn. 1983. Economy of speech gestures. In *The production of speech*, ed. by P. F. MacNeilage, 217–45. Heidelberg: Springer-Verlag.
———. 1990. Explaining phonetic variation: A sketch of the H&H theory. In *Speech Production and Speech Modelling*, ed. by W. J. Hardcastle and A. Marchal, 403–39. Dordrecht: Kluwer Academic Publishers.
Marantz, Alec. 1982. Re Reduplication. *Linguistic Inquiry* 13:483–545.
Matisoff, James A. 2003. *Handbook of Proto-Tibeto-Burman: System and philosophy of Sino-Tibetan reconstruction*. Berkeley: University of California Press.
McCarthy, John J. 1986. OCP effects: Gemination and antigemination. *Linguistic Inquiry* 17:207–63.
McCarthy, John J., and Alan Prince. 1994. The emergence of the unmarked: Optimality in prosodic morphology. In *Proceedings of the North East Linguistic Society 24*, ed. by Merce Gonzalez, 333–79. Amherst, Mass.: Graduate Linguistic Student Association.
———. 1995. Faithfulness and reduplicative identity. In *Papers in optimality theory*, ed. by J. Beckman, L. Walsh Dickey, and S. Urbanczyk, 249–384. University of Massachusetts Occasional Papers in Linguistics 18. Amherst, Mass.: Graduate Linguistic Student Association.
Moon, Seung-Jae, and Björn Lindblom. 1994. Interaction between duration, context, and speaking style in English stressed vowels. *The Journal of the Acoustical Society of America* 96:40–55.
Moravcsik, Edith. 1978. Reduplicative constructions. In *Universals of human language*, vol. 3, *Word structure*, ed. by Joseph Greenberg, 297–334. Stanford: Stanford University Press.
Odden, David. 1988. Anti Antigemination and the OCP. *Linguistic Inquiry* 19:451–75.
Palmer, Bill. 1999. *A grammar of the Kokota language, Santa Isabel, Solomon Islands*. PhD diss., The University of Sydney.
———. 2002. Kokota. In *The Oceanic Languages*, ed. by John Lynch, Malcolm Ross, and Terry Crowley, 498–524. Richmond, Surrey: Curzon.
———. 2005. Kokota on-line dictionary. Computer file. University of Surrey.
Pierrehumbert, Janet. 2001. Exemplar dynamics: Word frequency, lenition, and contrast. In *Frequency and the emergence of linguistic structure*, ed. by Joan L. Bybee and Paul Hopper, 137–57. Amsterdam: John Benjamins.
Prince, Alan, and Paul Smolensky. 1993. Optimality theory: Constraint interaction in generative grammar. Ms., Rutgers University, New Brunswick, N.J., and University of Colorado, Boulder. [Published as Technical report no.2, Rutgers University Center for Cognitive Science, and by Blackwell, Oxford, 2004.]
Schreier, Daniel. To appear. *Consonant change in English worldwide: Synchrony meets diachrony*. Basingstoke: Palgrave Macmillan.
Sotillo, Catherine F. 1997. Phonological reduction and intelligibility in task-oriented dialogue. PhD diss., University of Edinburgh.
Wilbur, Ronnie. 1973. *The phonology of reduplication*. Bloomington: Indiana University Linguistics Club.

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