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The Tense-Lax Distinction in English Vowels and the Role of Parochial and Analogical Constraints

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1. Introduction and theoretical background

The vast majority of the work that has been done in Optimality Theory (McCarthy & Prince 1993, Prince & Smolensky 1993) has focused, sometimes directly, sometimes indirectly, on the interaction between markedness (or well-formedness) constraints and faithfulness constraints. The question of lexical exceptions to patterns of phonotactic well-formedness has been somewhat less often explored (but see, for example, Tranel 1996, Inkelas et al. 1997, Inkelas 1999), but in this paper I intend to investigate not only lexical exceptions, but cases where phonotactic well-formedness is regularly violated by certain vowel + consonant sequences in most words (including the most common ones), while it is obeyed only in a handful of rare (mostly foreign) words.

As will be discussed in §2, the dichotomy between tense and lax vowels is blurred in the low back region in Eastern General American English (henceforth EGA): While there are certain environments in which tense vowels are prohibited, and other environments in which lax vowels are prohibited, the low back vowels in EGA [ɔ] and [ɑ] show an ambiguous distribution. While [ɔ] generally patterns as a tense vowel, it is allowed before [ŋ] and tautomorphemic [ft], which are otherwise lax-only environments. And while [ɑ] generally patterns as a lax vowel, it may stand in tense-only environments in recent loanwords. More surprisingly, lax [ɑ] may stand before [ŋ] and tautomorphemic [ft] **only** in recent loanwords, even though other lax vowels stand freely in these positions. There are also some varieties of EGA that have the diphthong [ɛə] which patterns as a tense vowel; this can stand before [mp ft sk sp], although usually only lax vowels may stand there. I will argue that these exceptions to well-formedness are attributable to the influence of a network of connections between lexical items, concretely represented in the theory as a web of conjoined output-output (OO) correspondence constraints known as **analogical constraints** (Myers 1999). More isolated lexical exceptions are attributed to the influence of morpheme-specific **parochial constraints**.[1] This theory will be developed further in Green (in prep.); below I give a brief sketch of the basic idea.

The role that analogical constraints and parochial constraints play in this analysis demonstrates an important consequence for Optimality Theory: There is more to phonology than just the interaction between markedness and faithfulness constraints, since constraints can also encourage the proliferation of a phonologically marked pattern, and

[1] Since many of the constraints discussed here refer specifically to English lexical items, they can hardly be said to be universal. Although the proposal that all constraints are universal belongs to the founding tenets of Optimality Theory, some recent work (e.g. Boersma 2000, Ellison 2000) has argued against it. My personal belief is that while constraints on phonological markedness are universal, constraints referring to lexical and/or morphological properties are language-specific. See Green (in prep.) for more on this issue.

can also require specific lexical items to have a certain phonological shape.

The organization of the paper is as follows. In §2.1 the distribution of tense and lax vowels in EGA is described and in §2.2 is given an OT-based analysis. In §2.3 lexical exceptions to the usual pattern are discussed and analyzed. In §3 the exceptional behavior of the two low back vowels, lax [ɑ] and tense [ɔ] is described and analyzed. In §4 the analysis is extended to the tense vowel [ɛə] present in some varieties of EGA. §5 summarizes and concludes the paper.

2. Distribution of tense and lax vowels in English

2.1 Description

English is generally described as having a distinction between tense and lax vowels. Minimal pairs such as *hit-heat*, *bet-bait*, *soot-suit*, *butt-boat* illustrate this contrast. In each pair, the lax vowel has a short, monophthongal pronunciation rather centralized with respect to the corresponding cardinal vowel: [hɪt], [bɛt], [sʊt], [bʌt]. The tense vowel in each case is long, has a quality more nearly that of the cardinal vowel, and may tend to diphthongization, this tendency being greater in some dialects than in others: [hit ~ hɪit], [bet ~ beɪt], [sut ~ sʊut], [bot ~ boʊt ~ bəʊt]. Tenseness and length usually cooccur in English: Lax vowels are short, while tense vowels are long (in stressed syllables).

I shall not be concerned here with the articulatory or acoustic differences between tense and lax vowels; for a review of the debate the reader is referred to Halle (1977), and for arguments against the existence of the feature [tense] in English to chapter 1 of Lass (1976). Instead, I use purely distributional criteria to classify vowels into the groups “tense” and “lax”. An arbitrary labeling could have also been used, such as that of Wells (1982): His “part-system A” corresponds to the vowels usually called lax: [ɪ], [ɛ], [æ], [ʊ], [ʌ], [ɑ] (= British [ɒ]); his “part-system B” corresponds to those “tense” vowels and diphthongs that end in the high front region: [i], [e(ɪ)], [aɪ], [ɔɪ]; “part-system C” corresponds to those “tense” vowels and diphthongs that end in the high back region: [u], [o(ʊ)], [aʊ]; and “part-system D” corresponds to those “tense” vowels and diphthongs that have relatively open qualities: [ɔ], British [ɜː], British [ɑː], and the British centering diphthongs [ɪə], [ɛə], [ʊə]. For EGA I would consider that “part-system D” includes [ɔ], [ɛə] (in the dialects that have it; see §4 for discussion), and the rhotacized diphthongs [ɪr], [ɛr], [ɝ], [ʊr], [ɔr], [ɑr]. (See Green 2001 for arguments that these “r-colored vowels” have the status of diphthongs in American English.)

Using distributional rather than phonetic criteria for this vowel classification allows us to avoid the problem that some vowels and diphthongs behave like tense vowels but are phonetically more similar to lax vowels. Thus, there is phonetically nothing “tense” about the members of Wells’s part-system D,[2] but they have the same

[2] Including, of course, [ɔ]. The symbol [ɔ] is used to represent a mid lax vowel in many languages (e.g. German, French), but in English [ɔ] really does pattern as a tense vowel, namely the tense counterpart to British [ɒ]/American [ɑ]. For this reason, I consider [ɔ] to be a low tense vowel. Wells (1982: 145) points out that American [ɔ] is quite open, falling between cardinal [ɒ] and cardinal [ɔ], and in Wells (1990) he even uses the symbol [ɒː] to stand for the EGA pronunciation of the vowel in words like *thought*.

distribution as the members of part-systems B and C, not the same as part-system A. Since I am not concerned here with the differences between part-systems B, C, and D, I will continue to use the traditional labels "lax" and "tense" in this paper.

The distribution of tense and lax vowels in English has been discussed by a variety of authors, including Chomsky & Halle (1968), Kahn (1976), Lass (1976), Halle (1977), Halle & Mohanan (1985), Borowsky (1986, 1989), Hammond (1999). Tense vowels may stand in stressed final open syllables and lax vowels may not, but otherwise the distribution seems to have little to do with syllable structure (as was argued for German by Féry 1997 and for French by Féry 2001). Another environment where tense but not lax vowels may stand is in stressed final syllables closed by [ð] or [ʒ]. Examples of (usually) tense-only environments are shown in (1).[3] For the moment, I abstract away from the low back vowels [ɑ, ɔ].

(1) Distribution of vowels in stressed final open syllables and before final [ð, ʒ]
[i] *see, tree, be, wreathe, liege*
[e] *day, play, way, bathe, beige*
[u] *too, do, who, soothe, rouge*
[o] *sew, know, toe, loathe, loge*
Note: The lax vowels [ɪ], [ɛ], [ʊ], [ʌ], [æ] are generally prohibited in these environments, but cf. [ɛð] (name of the letter "ð"), *with* [wɪð] (for some; many people pronounce this [wɪθ]) and the French loanword cortège which may be pronounced with final [ɛʒ] or [eʒ].

Note that the (nearly absolute) prohibition of lax vowels before [ð] and [ʒ] applies only when these consonants are in word-final position. Word internally, lax vowels may stand before them, as in *gather*, *azure*; *feather*, *measure*; *wither*, *vision*; *mother*.

Conversely, lax vowels may stand before [ŋ] and before certain consonant clusters containing one noncoronal consonant (henceforth referred to as a "noncoronal cluster"); tense vowels may not stand in these environments. The clusters in question are those of stop + fricative, fricative + stop, and sonorant + obstruent.[4] (Most obstruent + sonorant clusters can be preceded by both types of vowel.) The velar nasal [ŋ] has traditionally been assumed to be the surface representation of underlying /ng/, so it might be considered just another instance of a noncoronal cluster; but in my opinion this

[3] My sources for the words illustrating the distribution of vowels, not counting my own introspection, are Wood (1936), Wells (1982), Hammond (1999), and Muthmann (1999). EGA, the dialect I focus on here, has the following properties: It is rhotic (i.e. [r] may be present outside syllable onsets); it has merged the [ɑ:] and [ɒ] of British English into [ɑ], so that *balm* and *bomb* are homophonous as [bɑm], and *father* and *bother* rhyme as [fɑðɚ, bɑðɚ]. Unlike many other dialects of North American English, EGA as examined here has **not** merged the [ɔ:] and [ɒ] of British English, so that *caught* [kɔt] and *cot* [kɑt] are distinct. Many varieties of EGA have an additional tense vowel [ɛə], which I discuss below in §4.

[4] Included among the noncoronal clusters considered here are [ps ks pt kt]; it must be pointed out that tense vowels are prohibited only before **tautomorphemic** clusters. Tense vowels freely appear here when the [s] or [t] in such clusters forms an inflectional ending (*peeps, peaks, peeped, peaked*). I do not have space here to develop an analysis of this fact, but presumably an output-output constraint requiring *peeps* etc. to have the same vowel as *peep* etc. outranks the constraint against tense vowels before noncoronal clusters.

view is untenable because of pairs like *anger* [æŋgɚ] vs. *hangar* [hæŋɚ], *lingam* [lɪŋgəm] vs. *gingham* [gɪŋəm], *dingo* [dɪŋgo] vs. *dinghy* [dɪŋi][5] , so I shall consider [ŋ] an independent phoneme. The restriction to lax vowels before noncoronal clusters and [ŋ] holds both when the consonants are word-final and when they are intervocalic.

(2) Distribution of vowels before noncoronal clusters and [ŋ]
[ɪ] *lisp, whisper; eclipse, gypsy; script, triptych; lift, nifty; risk, whisker; mix, pixie; strict, victim; filbert; sylph, pilfer; silver; film; milk; pilgrim; limp, simple; limber; link, trinket; linger; sing, gingham*
[ɛ] *vesper; biceps, epilepsy; accept, Neptune; left; desk, rescue; sex, exit; sect, nectar; help; Melba; shelf, belfry; twelve, velvet; elm, helmet; elk, welcome; hemp, tempest; ember; ginseng*
[ʊ] *pulpit; wolf*
[ʌ] *cusp; abrupt; tuft, mufti; tusk, musket; crux, buxom; duct; pulp, culprit; bulb; gulf, sulfur; culminate; bulk; vulgar; pump, trumpet; number; hunk, bunkum; hunger; tongue*
[æ] *hasp, jasper; draft, after; lapse; rapt, captain; mask, basket; ax, taxi; act, practice; scalp; album; Ralph; valve; talc, falcon; amalgam; camp, pamper; amber; sank, Yankee; anger; fang, hangar*
Note: [i], [e], [o], [u] are usually prohibited in such words, but cf. *chamber, cambric, Cambridge, traipse* with [e], *coax, hoax* with [o] and (for some speakers only) *rumba* with [u] (normally [rʌmbə] or [rʊmbə]).

The diphthongs [aɪ], [ɔɪ], [aʊ] pattern with the tense vowels, as shown in (3).

(3) Distribution of diphthongs: tense environments
[aɪ] *die, try, buy, lithe* (no examples before [ʒ])
[ɔɪ] *boy, joy, annoy* (no examples before [ð] and [ʒ])
[aʊ] *cow, allow, bough, mouth* (vb.) (no examples before [ʒ])
Note: These are usually prohibited before [ŋ] and noncoronal clusters, but cf. *deixis/deictic* with [aɪ].

The rhotacized diphthongs [ɪr ɛr ɝ ɑr ɔr ʊr] do not occur before [ŋ] or, usually, noncoronal clusters (some exceptions listed below); neither do usually they occur before word-final [ð], [ʒ]. But they can stand at the end of stressed final syllables, implying that they have the distribution of tense vowels.

(4) Distribution of rhotacized diphthongs: tense environments
[ɪr] *peer, tear* (n.), *beer*
[ɛr] *pear, tear* (v.), *bear; concierge* [ˌkɑnsiˈɛrʒ]
[ɝ] *spur, fir, myrrh*
[ɑr] *par, tar, bar*

[5] This is the pronunciation I use; it is listed first (followed by [dɪŋki] and [dɪŋgi]) in *Webster's Third New International Dictionary* and is recommended by Wells (1990) as a model for learners of English. Kenyon & Knott (1944), however, list only [dɪŋgi].

[ɔr] *pour, tore, boar*
[ʊr] *poor, tour, boor*
Exceptions: *(ant)arctic, coarctation, harpsichord, infarct, Marx* with [ɑr]; *excerpt, Xerxes* with [ɝ] *corpse, (ab-, ad)sorption/-sorptive* with [ɔr].

To sum up, although tense and lax vowels can contrast in stressed syllables that are closed by a single consonant (other than [ð, ʒ, ŋ]) or by a consonant cluster in which all members are coronal, in other environments the two sets are in complementary distribution. In word-final stressed syllables that are either open or closed by [ð] or [ʒ], only tense vowels may occur. Before noncoronal clusters or [ŋ], only lax vowels may occur (with some exceptions, as noted above).

2.2 The basic constraint interaction

These facts can be submitted to an OT analysis by means of several interacting constraints. First of all, Foot Binarity (**FTBIN**) requires that feet be at least bimoraic. Second, **TNS↔μμ** says that vowels are tense if and only if they are bimoraic.[6] The constraint ***3μ** bans trimoraic syllables. The constraint ***ð,ʒ/μ** prohibits these two voiced coronal fricatives from being moraic; as we see below, this has the result of banning short lax vowels before syllable-final [ð, ʒ]. The constraint ***TNSCLUS** prohibits tense vowels before noncoronal clusters.[7] Finally, the constraint **ŋ/μ** requires [ŋ] to be moraic, a constraint which could also play a role in the cross-linguistic tendency to disfavor [ŋ] in onset position. In the data we have seen so far (abstracting away from the handful of exceptions like *traipse*, which will be discussed below), all of these constraints are unviolated, and assuming that all outrank **IDENT(tense)**, requiring output vowels to have the same specification for [tense] as their corresponding inputs, it does not matter whether underlying vowels are marked as [+tense] or [–tense] in the environments where there is no contrast.[8]

So, in stressed open syllables, FTBIN and TNS↔μμ conspire to permit only tense vowels to surface, as shown for see in (5).[9] Since [ɪ] and [i] cannot contrast in this environment, it does not matter which of them is in the input, as only the tense [i] can surface in the output.

(5)

(α) /sɪ/ (β) /si/	FTBIN	TNS↔μμ	IDENT(tense)
sɪ	* !		(α)
			(β) *
sɪː		* !	(α)
			(β) *
si	* !	*	(α) *
			(β)
☞ siː			(α) *
			(β)

Adding *ð,ʒ/μ to the high-ranking constraints ensures that only tense vowels appear before these two consonants. The tableau in (6) illustrates this for *beige*, and it would be the same for *bathe*.

(6)

(α) /bɛʒ/ (β) /beʒ/	FTBIN	*ð,ʒ/μ	TNS↔μμ	IDENT(tense)
bɛ$_{\mu}$ʒ$_{\mu}$		* !		(α)
				(β) *
bɛ$_{\mu}$ʒ	* !			(α)
				(β) *
bɛː$_{\mu\mu}$ʒ			* !	(α)
				(β) *
be$_{\mu}$ʒ$_{\mu}$		* !	*	(α) *
				(β)
be$_{\mu}$ʒ	* !		*	(α) *
				(β)
☞ beː$_{\mu\mu}$ʒ				(α) *
				(β)

In the environments where only lax vowels are permitted, TNS↔μμ conspires with *3μ, *TNSCLUS, ŋ/μ to prohibit tense vowels from the relevant contexts. The tableau in (7) illustrates this for *tongue* and the tableau in (8) for *cusp*.

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[6] This constraint is regularly violated when tense vowels are unstressed: pretty [ˈprɪ i̲], yellow [ˈjɛlo̲], virtue [ˈvɝtʃu̲], etc. I will not be further concerned with unstressed tense vowels here.

[7] I stipulate the constraints *ð,ʒ/μ and *TNSCLUS in order to skirt the issue of precisely why tense and lax vowels have the distribution they do in these contexts. Hammond (1999) bases his analysis of these facts on syllable structure, but I find unconvincing his proposal that [ŋ] and [ʒ] contribute two moras to the syllable, and in the case of [ʒ] the first of these two moras must be shared with the preceding vowel. I further disagree with many of his intuitions regarding syllabification (e.g. ambisyllabic [t] in *active*, ambisyllabic [k] in *alcove*, *bulky* syllabified [bʌlk.i], etc.), upon which his analysis crucially depends. See Hall (2001) and van Oostendorp (2001) for full reviews of Hammond (1999).

[8] There is a large literature on English syllable structure. Some representative examples of this work are: Kahn (1976), Selkirk (1982), Clements & Keyser (1983), Borowsky (1986), and Lamontagne (1993).

[9] Tracy Hall (p.c.) points out that full lax vowels are prohibited from word-final position in unstressed syllables as well in EGA, e.g. *happy* [hæpi], *[hæpɪ], and suggests that it is a constraint banning full lax vowels from word-final position rather than FTBIN that excludes *[sɪ] in 0. This seems unlikely to me, however, as there are many dialects of English (e.g. RP, Southern US English) where [hæpɪ] is well-formed, but there is no dialect of English that allows *[sɪ]. So I maintain that FTBIN is responsible for *[sɪ], and some other constraint rules out *[hæpɪ] in EGA – perhaps a constraint against full lax vowels in unstressed open syllables.

(7)

(α) /tʌŋ/ (β) /toŋ/	*3μ	TNS↔μμ	ŋ/μ	IDENT(tense)
☞ $t\text{ʌ}_{\mu}\text{ŋ}_{\mu}$				(α) (β) *
$to_{\mu}\text{ŋ}_{\mu}$		* !		(α) * (β)
$to{:}_{\mu\mu}\text{ŋ}$			* !	(α) * (β)
$to{:}_{\mu\mu}\text{ŋ}_{\mu}$	* !			(α) * (β)

(8)

(α) /kʌsp/ (β) /kosp/	*3μ	TNS↔μμ	*TNSCLUS	IDENT(tense)
☞ $k\text{ʌ}_{\mu}sp_{\mu}$				(α) (β) *
$ko_{\mu}sp_{\mu}$		* !	*	(α) * (β)
$ko{:}_{\mu\mu}sp_{\mu}$	* !		*	(α) * (β)
$ko{:}_{\mu\mu}sp$			* !	(α) * (β)

In environments where tense and lax vowels contrast, namely in syllables closed by a single consonant other than [ð, ʒ, ŋ] and in position before coronal clusters, the inputs must not be as rich as they are in (5)–(8), because IDENT(tense) will be crucial in determining the optimal form. This need not be problematic, though: If we assume *pest* has only the input /pɛst/ and *paste* has only the input /pest/, the desired surface forms will be judged optimal in each case. The remaining question is how to deal with lexical exceptions to the prohibition of tense vowels before noncoronal clusters, like *chamber* and *coax*.

2.3 Lexical exceptions

According to Inkelas (1995, 1996) and Inkelas et al. (1997), lexical exceptions to otherwise robust well-formedness principles within a language are best treated by allowing a three-way underlying contrast between [+F], [–F], and [0F] and ordering the relevant faithfulness constraint above the relevant markedness constraint. This enables the fully specified forms always to surface faithfully, while the underspecified form, which cannot surface faithfully (all features being fully specified as either + or – on the surface), is subject to the markedness constraint. So, for example, most Turkish words are subject to coda devoicing, as shown by the contrast between (9)a and (9)b, but some words are exempt from coda devoicing, as shown in (9)c.[10] The tableaux illustrating the analysis of Inkelas et al. are given in (10). (/D/ represents a stop underspecified for voice.)

[10] See Artstein (1998) for further discussion of this example.

(9) Turkish coda devoicing

a.	kɑnɑt	‘wing’
	kɑnɑtlɑr	(plural)
	kɑnɑdɯ	(accusative)
b.	devlet	‘state’
	devletler	(plural)
	devleti	(accusative)
c.	etyd	‘study’
	etydler	(plural)
	etydy	(accusative)

(10) The analysis of Inkelas et al.

a.

/kanaD/	FAITH	CODA DEVOICING
☞ kanat	*	
kanad	*	* !

b.

/devlet/	FAITH	CODA DEVOICING
☞ devlet		
devled	* !	*

c.

/etyd/	FAITH	CODA DEVOICING
etyt	* !	
☞ etyd		*

Inkelas et al. argue that this analysis is superior to a rule-based one that requires cophonologies, but it comes at the cost of allowing a three-way underlying contrast among [+voice], [–voice], and [0voice]. This is in violation not only of the Contrastive Underspecification hypothesis (Calabrese 1988), according to which features that contrast (e.g. [voice] in Turkish) cannot be left unspecified underlyingly, but also of the convention of (both contrastive and radical) underspecification theory, going back to Stanley (1967), that assumes “strict binarity of feature specifications in underlying lexical representations. In each environment, we can have at most [0F] and [αF], where [–αF] is the value assigned by the most specific rule (language-particular or universal) which is applicable in that environment” (Kiparsky 1993: 285).

That alone is worrying enough, but when we consider the arguments that have been presented against input underspecification within OT in general, the analysis becomes even weaker. For example, Smolensky (1993) argues that in an OT approach to markedness, unmarked features are phonologically inert not because they are absent the input (in fact, they are present there), but because they are literally unmarked, i.e. engender no violation marks under harmony evaluation (cf. also Golston 1996). Smolensky’s approach would then not predict any difference between [–voice] and [0voice] in obstruents. Itô et al. (1995), examining redundant feature specifications (in particular [voice] in nasals), show that there is no requirement of underlying feature minimization, implying that underlying [0voice] – whether on sonorants or on obstruents – is an unnecessary and therefore undesirable tool.

The nonderivational approach to morphology and phonology outlined in Green (in prep.), however, allows an analysis of lexical exceptions that relies neither on cophonologies nor on underspecification. Instead, parochial constraints requiring particular morphemes to surface with particular features outrank the relevant markedness constraint, which in turn outranks the general faithfulness constraint.

In (1)–(4) I listed words showing that, for the most part, only lax vowels are permitted before tautomorphemic noncoronal clusters, but there were some exceptions to this tendency. I repeat some of those exceptions here for convenience.

(11) Exceptions to the prohibition of tense vowels before tautomorphemic noncoronal clusters

a.	*with*	wɪð
b.	*cortège*	kɔrˈtɛʒ
c.	*chamber*	tʃembɚ
d.	*coax*	koks
e.	*deixis/deictic*	daɪksɪs/daɪktɪk
f.	*excerpt*	ɛksɝpt
g.	*rumba* (for some)	rumbə
h.	*traipse*	treps
i.	*corpse*	kɔrps

In a–b, *ð,ʒ/μ is apparently violated; in c–i, *TnsClus is. As far as I am aware, there are no exceptional words that violate ŋ/μ (except words with [ɔŋ] discussed below). I therefore propose that the words in (11) have parochial constraints requiring them to have the vowel with which they surface. For example, the constraint ***traipse*[e]** requires the lexical item *traipse* to surface with the vowel [e]. This constraint, and the ones holding for the other words in (11), outrank *ð,ʒ/μ or *TnsClus, but there are apparently no parochial constraints outranking ŋ/μ.

(12)

/treps/	ŋ/μ	*traipse*[e]	*ð,ʒ/μ	*TnsClus	Ident(tense)
☞ treps				*	
trɛps		* !			*

The majority of words, however, either have no such parochial constraint, or else it is so low ranking that it plays no role.[11] In this case, *TnsClus determines that the optimal candidate must have a lax vowel before a noncoronal cluster, as we saw above in (8).

We have now analyzed the distribution of most tense and lax vowels in EGA, including the lexical exceptions. In the next section we move to low back vowels [ɑ] and [ɔ], which we have ignored up to now, and whose distribution blurs the distinction between tense and lax vowels.

[11] Alcántara (1998) argues that only high-ranking parochial constraints ("specific" constraints in his terminology) are present in the grammar.

3. Ambiguity in low back vowels

3.1 The distribution of [ɑ] and [ɔ]

EGA has two low back vowels, [ɑ] and [ɔ]. Since [ɔ] is often longer than [ɑ], and because [ɑ] but not [ɔ] may appear before most noncoronal clusters (as will be discussed presently), it is attractive to consider these vowels a lax/tense pair like the ones discussed in §2.1. As shown in (13), [ɑ] and [ɔ] contrast in environments where both tense and lax vowels are permitted.

(13) Minimal pairs illustrating lax [ɑ] vs. tense [ɔ]

collar	kɑlɚ	*caller*	kɔlɚ
cot	kɑt	*caught*	kɔt
stock	stɑk	*stalk*	stɔk
don	dɑn	*dawn*	dɔn
knotty	nɑt̬i[12]	*naughty*	nɔt̬i

However, unlike the pairs seen above, [ɑ] and [ɔ] may contrast also in stressed open final syllables and before [ŋ]. (In stressed open final syllables, [ɑ] is pronounced long.).

(14) Contrast of [ɑ] and [ɔ] in stressed open final syllables and before [ŋ]

Shah	ʃɑ	*Shaw*	ʃɔ
la	lɑ	*law*	lɔ
pa	pɑ	*paw*	pɔ
ma	mɑ	*maw*	mɔ
Hong Kong	hɑŋ kɑŋ	*long*	lɔŋ
dugong	dugɑŋ	*gong*	gɔŋ

Thus we see that both [ɑ] and [ɔ] can occur in environments where only tense vowels are allowed, as well as in environments where only lax vowels are allowed. The distribution of [ɑ] and [ɔ] is illustrated in (15)–(16). Note that [ɑ] is pronounced long in environments where lax vowels are prohibited, otherwise it is pronounced short; [ɔ] is pronounced long everywhere.

(15) Distribution of [ɑ]

Tense environments:	*bra, spa, Shah, mirage* (with long [ɑː])
Lax environments:	*wasp, copse, mosque, ox, opt, concoct, pomp, somber, conquer, conger, Hong Kong* (with short [ɑ])
Other environments:	*father, bother, balm, bomb, Mali, Molly* (with short [ɑ])

[12] I use [t̬] to symbolize the American English "flap" often transcribed [D] or [ɾ].

(16) Distribution of [ɔ]

Tense environments:	*jaw, law, saw*
Lax environments:	*soft, long, bauxite, auction, auxiliary, auspice, auscultation, palfrey, Balkan,* (for some) *donkey*, (for some) *falcon*
Other environments:	*thought, hawk, daub, cloth, cross, off*

In the next two subsections we will look at this ambiguous distribution in more detail and begin to form an analysis.

3.2 Lax [ɑ] in tense-only environments

Let's begin with the distribution of [ɑ], which we are assuming to be [–tense]. In words like *bra, spa, Shah, mirage*, the constraint against long lax vowels appears to be violated. Take for example the word *spa*. Given the constraint hierarchy shown above in (5), even the input /spɑ/ should give the output *[spɔ].

(17) Constraint hierarchy falsely predicts *spa* to be *[spɔ]

/spɑ/	FtBin	Tns↔μμ	Ident(tense)
spɑ	* !		
spɑː		* !	
👎 spɔː			*

But following the analysis of lexical exceptions outlined in §2.3, we may propose a high-ranking parochial constraint specific to the lexical items *spa* and *mirage* requiring them to have lax vowel: $_{spa}$([–tense]) and $_{mirage}$([–tense]). The tableaux illustrating this analysis, given in (18), also show that FtBin outranks Tns↔μμ, which was not provable before.

(18) Parochial constraints force lax [ɑ] to show up in tense contexts

a.

/spɑ/	FtBin	$_{spa}$([–tense])	Tns↔μμ	Ident(tense)
spɑ	* !			
☞ spɑː			*	
spɔː		* !		*

b.

/mɪrɑʒ/	FtBin	$_{mirage}$([–tense])	*ð,ʒ/μ	Tns↔μμ	Ident (tense)
mɪ(ˈrɑ$_{μ}$ʒ$_{μ}$)			* !		
mɪ(ˈrɑ$_{μ}$ʒ)	* !				
☞ mɪ(ˈrɑː$_{μμ}$ʒ)				*	
mɪ(ˈrɔː$_{μμ}$ʒ)		* !			*

It is especially interesting that all words in which [ɑ] appears in contexts otherwise restricted to tense vowels are either recent loanwords like *spa* and *mirage* or hypocoristics

like *ma* and *pa*. Ordinary native words like *law*, on the other hand, need no parochial constraint and surface with a tense vowel because of ordinary constraint interaction, regardless of whether the input provides /ɑ/ or /ɔ/.

(19)

(α) /lɑ/ (β) /lɔ/	FtBin	Tns↔μμ	Ident(tense)
lɑ	* !		(α)
			(β) *
lɑː		* !	(α)
			(β) *
☞ lɔː			(α) *
			(β)

3.3 Tense [ɔ] in lax-only environments

We can now move on to the [ɔ] cases. Notice in (16) that [ɔ] is not permitted in **all** lax environments: It occurs before [ŋ] and [ft], in a few words before [ŋk, ŋg], and in a few isolated words like *bauxite* and *auction* but otherwise not before noncoronal clusters. Also, if we compare words that have [ɔ] before [ŋ] with those that have [ɑ] before [ŋ] we see that most words have [ɔ], but some foreign words can vary between [ɑ] and [ɔ] (i.e. some speakers use [ɑ] and others use [ɔ]). Before [ŋk] and [ŋg], however, [ɑ] is more common than [ɔ].

(20) Distribution of [ɔ] and [ɑ] before [ŋ]

a. [ɔ] before [ŋ] in most words
along, belong, ding-dong, (di-, mono-, tri-)phthong, dong, furlong, gong, long, mah-jongg, Mekong, oblong, oolong, prolong, prong, sarong, scuppernong, song, strong, thong, throng, tongs, wrong

b. Variability between [ɑ] and [ɔ] before [ŋ] in foreign words
bong, dugong, Hong Kong, Ping-Pong, Vietcong

c. [ɑ] fairly consistently before [ŋk] and [ŋg]
bongo (also [bɔŋgo]), *bonkers, bronchial, bronco, Bronx, conch, concubine, conga, conger, Concord, Congo, congress, congruence, conquer, donkey* (also [dɔŋki, dʌŋki]), *honk* (also [hɔŋk]), *honky-tonk* (also [hɔŋkitɔŋk]), *humongous* (also [hjuˈmʌŋgəs]), *jongleur, jonquil, Mongol, mongoose* (also [mʌŋgus, mɑngus]), *mongrel* (also [mʌŋgrəl, mɑngrəl]), *Rancho Cucamonga* (also [-mʌŋgə]), *Songhai* (also [sɔŋgaɪ]), *Tonga, Yonkers, zonked* (also [zɔŋkt])

We begin our analysis with common native words like *long*, pronounced [lɔŋ] in EGA. Given the constraint hierarchy given above in (7), even the input /lɔŋ/ should give the output *[lɑŋ].

(21) Constraint hierarchy falsely predicts *long* to be *[lɑŋ]

/lɔŋ/	*3μ	Tns↔μμ	ŋ/μ	Ident(tense)
lɔː$_{\mu\mu}$ŋ			* !	
lɔː$_{\mu\mu}$ŋ$_{\mu}$	* !			
lɔ$_{\mu}$ŋ$_{\mu}$		* !		
☟ lɑ$_{\mu}$ŋ$_{\mu}$				*

One conceivable solution (which we will later reject) would be to follow the same route we took for *spa* and *mirage* and propose parochial constraints requiring words like *long* to have tense vowels.

(22) Parochial constraint forces *long* to be [lɔŋ]

/lɔŋ/	$_{long}$([+tense])	*3μ	Tns↔μμ	ŋ/μ	Ident(tense)
☞ lɔː$_{\mu\mu}$ŋ				*	
lɔː$_{\mu\mu}$ŋ$_{\mu}$		* !			
lɔ$_{\mu}$ŋ$_{\mu}$			* !		
lɑ$_{\mu}$ŋ$_{\mu}$	* !				*

Under this analysis, the other words listed in (20)a would also have parochial constraints requiring that they have a tense vowel, and these parochial constraints would be ranked above ŋ/μ. Other words, such as those in (20)c, those in (20)b for speakers who use the variant [ɑ] rather than [ɔ], and all words with any vowel besides a low back vowel before [ŋ], would not have any parochial constraint requiring them to have a certain kind of vowel, but would be taken care of solely by the usual phonotactic and faithfulness constraints, as shown in (23) for *dugong* with the pronunciation [dugɑŋ]. (For simplicity's sake I exclude candidates that violate *3μ and Tns↔μμ.)

(23)

(α) /dugɑŋ/ (β) /dugɔŋ/	ŋ/μ	Ident(tense)
☞ dugɑ$_{\mu}$ŋ$_{\mu}$		(α) (β) *
dugɔː$_{\mu\mu}$ŋ	* !	(α) * (β)

The idea, therefore, would be that the words in (20)a, i.e. the native words, form a class of lexical exceptions to the generalization that tense vowels are prohibited before [ŋ], and that these lexical exceptions are accounted for by high-ranking parochial constraints. Newer words, such as those in (20)b, follow the phonotactically expected pattern and thus are not subject to this kind of parochial constraint.

One problem with this analysis is it doesn't explain why only [ɔ] behaves this way; the prohibition against all other tense vowels before [ŋ] is absolute. Why is [ɔ] different? Furthermore, this analysis flies in the face of the usual treatment of exceptional loanword phonology, according to which native words conform to phonotactically expected patterns, while loanwords can violate markedness constraints that native words are subject to (Itô & Mester 1995, 1999, Davidson & Noyer 1996, Fukazawa et al. 1998, Féry to appear).

The problem then is to find a way to capture the intuition that the native words in (20)a are less marked than the foreign words in (20)b. To do this, I turn to the principle of lexical relatedness webs as outlined in Green (in prep.), which makes use of the analogical constraints proposed by Myers (1999).

The first point to make is that the forms in (20)a include the most commonly occurring (and probably earliest acquired) words of all that contain a low back vowel followed by [ŋ]: *along, belong, ding-dong, long, song, strong, wrong*. These words establish a correlation between [ɔ] and [ŋ] that overrides ŋ/μ; this correlation can be stated as the set of conjoined output-output (OO) constraints relating the [ŋ] in these words to the preceding [ɔ]. Assuming just these seven words, there are 7 × 6 ÷ 2 = 21 OO constraints requiring that both members of any pair have the vowel [ɔ] (as exemplified in (24)), 15 OO constraints requiring that both members of any pair have the consonant [ŋ] (as exemplified in (25)), and 21^2 = 441 constraint conjunctions requiring pairs to have both [ɔ] and [ŋ] (as exemplified in (26)).[13]

(24) Ident-OO(*long, song*; ɔ), Ident-OO(*long, strong*; ɔ), etc.

(25) Ident-OO(*long, song*; ŋ), Ident-OO(*long, strong*; ŋ), etc.

(26) OO(*long, song*; ɔ) & OO(*long, song*; ŋ),
OO(*long, strong*; ɔ) & OO(*long, strong*; ŋ), etc.

The constraint conjunctions in (26), acting together, are strong enough to attract the rest of the words in (20)a and, for many speakers, some or all of the words in (20)b into it.[14] Following Myers (1999) we may refer to this influence as synchronic analogy. A representative tableau for *diphthong* [dɪfθɔŋ] is given in (27). In practice, there would not be just a single OO conjunction, but at least seven, one pairing *diphthong* with each of the most common [ɔŋ] words. In the upper left hand corner, /Ɔ/ stands for "either /ɑ/ or /ɔ/".

(27) *diphthong* [dɪfθɔŋ] influenced by analogy with *long* etc.

/dɪfθƆŋ/	OO(*long*, *diphthong*; ɔ) & OO(*long*, *diphthong*; ŋ)	ŋ/μ
dɪfθɑ$_{\mu}$ŋ$_{\mu}$	* !	
☞ dɪfθɔː$_{\mu\mu}$ŋ		*

[13] An issue I do not have space to go into here is how this pattern got started. Briefly, I suspect that only a historical explanation is possible: At some point in the history of the dialect(s) in question there was a sound change tensing [ɒ] (the ancestor sound of EGA [ɑ] in lax environments) to [ɔ] before [ŋ] (also before voiceless fricatives, as in cloth [klɔθ], cross [krɔs], soft [sɔft]). The phonetic or phonological rationale for such a sound change is unclear to me, and it may not have originally applied to all words simultaneously. Instead, it may have begun in just a few forms and then spread by lexical diffusion. I plan to examine lexical diffusion in future research.

[14] The remaining words in (20)b and those in (20)c do not have such a strong connection with those in (20)a, either because of their low frequency (see Bybee 1995 on the importance of frequency in establishing lexical connections), their status as recent loanwords, or the presence of [k] or [g] after [ŋ].

Words like those listed in (20)b, which vary between [ɑ] and [ɔ] before [ŋ], have parochial constraints requiring them to have lax vowels, but these constraints are not consistently ranked above the analogical constraints. There are a number of different approaches to variation within OT, any one of which could successfully be applied here, e.g. Anttila (1997), Nagy & Reynolds (1997), Boersma (1998). Variation in the pronunciation of *Vietcong* [viɛtkɑŋ ~ viɛtkɔŋ] is illustrated in (28), where a wavy line indicates variable ranking between two constraints.

(28) Variability in *Vietcong*

/viɛtkƆŋ/	$_{\textit{Vietcong}}$([–tense])	OO(*long*, *Vietcong*; ɔ) & OO(*long*, *Vietcong*; ŋ)	ŋ/μ
☞ viɛtkɑ$_{\mu}$ŋ$_{\mu}$		*	
☞ viɛtkɔː$_{\mu\mu}$ŋ	*		*

This analysis now lets us mark foreign words like *Congo* and *Vietcong* as special and unusual, while native words like *long, song, strong*, and *wrong* obey the basic constraint ranking of the language. Note, however, that the basic constraint ranking of the language is not simply a matter of conflicting markedness and faithfulness constraints. Rather, analogical constraints play a role as well, establishing strong patterns that violate otherwise robust phonotactic tendencies. This approach allows us to treat the difference between foreign words and native words in a much more intuitively satisfying way.

Now we can return to the words in (20)c, showing [ɑ] before [ŋk] and [ŋg]. I suggest that these words show that [ŋk] and [ŋg], unlike [ŋ] alone, are ordinary noncoronal cluster and thus the relevant markedness constraint for these words is not ŋ/μ but rather *TNSCLUS. Thus *conger* [kɑŋgɚ] has a lax vowel for precisely the same reason *cusp* in (8) does: high-ranking *TNSCLUS. For speakers who pronounce *honk* as [hɔŋk] or *bongo* as [bɔŋgo], the parochial constraints $_{\textit{honk}}$([+tense]) and $_{\textit{bongo}}$([+tense]) outranks *TNSCLUS, just as $_{\textit{traipse}}$([+tense]) does in (12).

The sequence [ɔŋg] is otherwise found only in the derived forms[15] *longer, longest, stronger, strongest, diphthongal*. The analysis as described so far falsely predicts [ɑ] rather than [ɔ] in these words, because [ŋg] patterns as a noncoronal cluster that is irrelevant for the constraint ŋ/μ. As shown in the tableaux in (29)–(30), the theory predicts the same vowel in *longer* as in *congress*.

(29)

/lƆŋgɚ/	ŋ/μ	*TNSCLUS
👎 lɑŋgɚ		
lɔŋgɚ		* !

(30)

/kƆŋgrəs/	ŋ/μ	*TNSCLUS
☞ kɑŋgrəs		
kɔŋgrəs		* !

[15] I use the term “derived form” for expository convenience; within the word-based morphology I assume there is of course no actual process of derivation.

Appealing to a high-ranking parochial constraint requiring *longer* etc. to contain a tense vowel is unsatisfying, for the same reasons that the similar constraint for *long* given in (22) was unsatisfying: These forms do not seem to be lexical exceptions in any way, and should be able to be accounted for directly. To do this, we need an OO constraint requiring that vowels in the positive and comparative forms of an adjective agree for the feature [tense]: IDENT-OO(A_{pos}, A_{cmp}; [tense]). This does not require that the comparative be derived from the positive, merely that the comparative and positive can be identified as forms of the same word, presumably through their semantic properties. Ranking this constraint above *TNSCLUS achieves the desired result, as shown in the tableau in (31). As discussed above, the [ɔ] of *long* is an effect of analogical constraints among the various words ending in *-ong*.

(31)

pos:/lƆŋ/ cmp:/lƆŋgɚ/	OO(*long, song*; ɔ) & OO(*long, song*; ŋ)	IDENT-OO (A_{pos}, A_{cmp}; [tense])	ŋ/μ	*TNSCLUS
pos:[lɔŋ] cmp:[lɑŋgɚ]		* !	*	
☞ pos:[lɔŋ] cmp:[lɔŋgɚ]			*	*
pos:[lɑŋ] cmp:[lɑŋgɚ]	* !			

The relationship between the vowels in *diphth*[ɔ]*ng* and *diphth*[ɔ]*ngal* can presumably be analyzed in a similar way, although this is obviously not a positive-comparative adjective pair.

As mentioned briefly above, [ɔ] occurs regularly not only before [ŋ] but also before the noncoronal cluster [ft] in native words and names of English origin: *aloft, Ashcroft, Bancroft, loft, oft, often* (when pronounced with [t]), *soft*. Here again, analogical constraints connecting tense [ɔ] with the cluster [ft] outrank *TNSCLUS, as shown in the tableau in (32). (As above, one analogical constraint is shown in the tableau, but this must be understood as standing for a whole host of them, one for each pair of words with [ɔft].)

(32)

/lƆft/	OO(*loft, soft*; ɔ) & OO(*loft, soft*; ft)	*TNSCLUS
lɑft	* !	
☞ lɔft		*

There is even a lexical exception to the pattern of having [ɔ] rather than [ɑ] before [ft]: the Yiddish loanword *zaftig*, which is usually pronounced [zɑftɪk]. For this word, there is presumably a high-ranking parochial constraint requiring a lax vowel that outranks the analogical constraints establishing the [ɔft] pattern, as illustrated in (33).

(33)

/zɔftɪk/	zaftig([–tense])	OO(*zaftig, soft*; ɔ) & OO(*zaftig, soft*; ft)	*TnsClus
☞ zɑftɪk		*	
zɔftɪk	* !		*

So there are a number of instances where the usual distributional restrictions on tense vowels are suspended for [ɔ], such that [ɔ] occurs nearly to the exclusion of [ɑ] before [ŋ] (but not usually before [ŋk] and [ŋg]) and before [ft], but there are foreign words like *dugong* and *zaftig* that are exceptions to this exceptional behavior.

4. The low front tense vowel [ɛə]

In many varieties of EGA there is a tense partner to lax [æ]; its exact phonetic realization varies from region to region, but in general it is either a vowel slightly higher and somewhat longer than [æ] (in IPA, [æ̝ˑ]) or else a diphthong beginning with a front vowel and ending with [ə], so somewhere along the spectrum [æə - ɛə - eə - ɪə]. For some speakers this vowel may also be spontaneously nasalized (i.e. even when not preceding a nasal consonant). I will choose [ɛə] to indicate any variety of this "tense æ"; in the previous literature the most common symbol is [E]. Unlike the other tense vowels of English, [ɛə] does not occur in stressed open final syllables. This is because it is derived from lax [æ], which could not stand there; therefore there are no words in which [ɛə] has the opportunity to stand in a stressed open final syllable.[16] Discussions of this vowel and its patterning can be found in Trager (1930, 1934, 1940, 1941), Labov (1966, 1972, 1981), Ferguson (1972), Kahn (1976), Wells (1982: 477–9 and 510–2), Benua (1995), and Morén (1997) (who analyzes the vowel in question as lax).[17]

In most dialects that have [ɛə], it occurs in stressed final syllables before nasals (except [ŋ]) and voiceless fricatives (not all dialects allow it before [ʃ]); some varieties allow it before voiced obstruents as well.[18] Interestingly, noncoronal clusters beginning with one of the permitted segments are **not** excluded. Some examples of words with [ɛə] are shown in (34).

(34) Words with [ɛə]

a.	*ram*	rɛəm
b.	*ran*	rɛən
c.	*laugh*	lɛəf
d.	*path*	pɛəθ
e.	*pass*	pɛəs

[16] The only exception I know of is *yeah*, pronounced [jɛə]. In nonrhotic accents, [ɛə] is also found in words like *pair* [pɛə], tear (verb) [tɛə], care [kɛə]. For some speakers, then, *scarce* [skɛəs] rhymes with *pass* [pɛəs].

[17] Many thanks to my informants: Nate Brown (Schenectady, NY), Ellen DeSoto (Poughkeepsie, NY), Jeff Kaplan (Philadelphia), Cindy Schneider (Watchung, New Jersey), and Alan Stevens (New York City).

[18] And within voiced obstruents, there is also variation. For example, some people have [ɛə] before voiced fricatives and [d] but [æ] before [b, g]. Other people have [ɛə] before voiced fricatives and [d, b], but [æ] before [g].

f.	*camp*	kɛəmp
g.	*shaft*	ʃɛəft
h.	*task*	tɛəsk
i.	*grasp*	grɛəsp

There are some words that unexpectedly have [æ] in these environments, resulting in minimal pairs between [ɛə] and [æ], such as *can* 'tin container' [kɛən] vs. *can* 'be able' [kæn], or *halve* [hɛəv] vs. *have* [hæv] and (for some people) *bad* [bɛəd] vs. *bade* [bæd] in the varieties that allow [ɛə] before voiced obstruents. [ɛə] does not occur in nonfinal syllables for all speakers, e.g. *manage* [mænɪdʒ], *tassel* [tæsl̩], with the proviso that while Class I suffixes cause [ɛə]~[æ] alternations (*class* [klɛəs] ~ *classic* [klæsɪk]), Class II suffixes do not (*classy* [klɛəsi]).[19] Also, monosyllables that are truncations of longer words maintain the vowel of the original, resulting in pairs like *caf* [kæf] (truncation of 'cafeteria') vs. *calf* [kɛəf], *path* [pæθ] (truncation of 'pathology') vs. *path* [pɛəθ] (as in 'footpath'), or *Mass* [mæs] (truncation of 'Massachusetts') vs. *mass* [mɛəs] (Benua 1995). In some varieties, [ɛə] can also occur (even in nonfinal syllables) before [r], as in *Mary* [mɛəri], which is then distinct from both *merry* [mɛri] and *marry* [mæri]; in other varieties, *Mary* and *merry* (and sometimes *marry* as well) are homophonous as [mɛri].[20]

Like most tense vowels, [ɛə] is prohibited before [ŋ] and before most noncoronal clusters (except [mp ft sk sp]), as shown in (35).

(35) Only [æ], not [ɛə]

a.	lapse	læps	*lɛəps
b.	rapt	ræpt	*rɛəpt
c.	ax	æks	*ɛəks
d.	act	ækt	*ɛəkt
e.	scalp	skælp	*skɛəlp
f.	Ralph	rælf	*rɛəlf
g.	valve	vælv	*vɛəlv
h.	talc	tælk	*tɛəlk
i.	fang	fæŋ	*fɛəŋ
j.	sank	sænk	*sɛəŋk

The prohibition of [ɛə] in the environments in (35) can be analyzed in the same way as the prohibition of other tense vowels in these environments was analyzed in §2.2. Tab

[19] Again, I am using the labels "Class I Suffix" and "Class II Suffix" for descriptive convenience; such constructs play no role in a word-based morphology.

[20] For some people, the distribution of [æ] and [ɛə] is apparently in lexical diffusion (cf. Labov 1994). One of my informants has, for example, [æ] in *graph, half*, and *staff* but [ɛə] in *laugh* and *riff-raff*; before a noncoronal cluster she has [æ] in *Basque, cask, casket, flask, paschal, rascal* but [ɛə] in *ask, bask, basket, mask, task*. As often seems to be the case with lexical diffusion, there is great variation: One informant has [æ] in *clasp, grasp, hasp, rasp* and [ɛə] in *asp, gasp*; another informant has [æ] in *asp, gasp, hasp* and [ɛə] in *clasp, grasp, rasp*; a third has [æ] in *asp, clasp, grasp, hasp* and *rasp* and [ɛə] in *gasp*; a fourth has [æ] in *asp* and *hasp* and [ɛə] in *clasp, gasp, grasp, rasp*. So all four have [æ] in *hasp*, but otherwise there is no agreement. A fifth informant has [ɛə] in all these words.

leaux for *fang* and *lapse* are shown in (36)–(37). The symbol Æ stands for "either /ɛə/ or /æ/."

(36)

/fÆŋ/	*3μ	TNS↔μμ	ŋ/μ
☞ fæ$_{\mu}$ŋ$_{\mu}$			
fɛə$_{\mu}$ŋ$_{\mu}$		* !	
fɛə$_{\mu\mu}$ŋ			* !
fɛə$_{\mu\mu}$ŋ$_{\mu}$	* !		

(37)

/lÆps/	*3μ	TNS↔μμ	*TNSCLUS
☞ læ$_{\mu}$ps$_{\mu}$			
lɛə$_{\mu}$ps$_{\mu}$		* !	*
lɛə$_{\mu\mu}$ps$_{\mu}$	* !		*
lɛə$_{\mu\mu}$ps			* !

As for (34)f–i, the analysis is basically the same as it was for words like *long* and *soft*: high-ranking analogical constraints force the members of these classes to rhyme with each other. For example, each pair of words in the set {*ask, bask, cask, flask, mask, task*} establishes a correlation between the cluster [sk] and the preceding vowel [ɛə]. In the tableau in (38), just one of these analogical constraints is illustrated, but it stands for all of them.

(38)

/tÆsk/	OO(*task, ask*; ɛə) & OO(*task, ask*; sk)	*TNSCLUS
☞ tɛəsk		*
tæsk	* !	

There are lexical exceptions to this pattern as well. For example, one of my informants reports that he generally has [ɛə] before [sk] in stressed penults: *basket, casket, rascal* all have [ɛə]. But *paschal*, which is a rather rare word, is exceptional in having [æ]. Once again, a parochial constraint, this time requiring *paschal* to have a lax vowel, can take care of this, as shown in (39).

(39)

/pÆskl̩/	*paschal*([–tense])	OO(*paschal, rascal*; ɛə) & OO(*paschal, rascal*; sk)	*TNSCLUS
pɛəskl̩	* !		*
☞ pæskl̩		*	

So, just as we saw with [ɔ] in §3, there are circumstances under which the tense vowel [ɛə] occurs in environments where normally only lax vowels are allowed. The facts can be analyzed in a theory that assumes analogical constraints relating rhyming words, which outrank phonotactic constraints like *TNSCLUS.

5. Conclusions

In this paper, I have discussed data from Eastern General American English that show

regular exceptions to the distribution of lax and tense vowels. Namely, while it is usually the case that lax vowels cannot stand in stressed final syllables that are either open or closed by [ð] or [ʒ], there are lexical exceptions like *with* [wɪð] and a fair number of exceptions involving [ɑ] in foreign words: *spa, bra, mirage*, etc. Furthermore, while tense vowels (and diphthongs) usually cannot stand before [ŋ] or noncoronal clusters, there are a number of lexical exceptions such as *traipse* and *coax*. The tense vowel [ɔ] is remarkable in that it usually stands before [ŋ] and [ft], and (in the varieties of EGA that have this sound) the diphthong [ɛə] is remarkable in that it usually stands before [sk, sp, ft, mp]. But each of these unexpected generalizations has lexical exceptions too, mostly involving rare or foreign words: *dugong* with [ɑ] rather than [ɔ] before [ŋ], *zaftig* with [ɑ] rather than [ɔ] before [ft], and *paschal* with [æ] rather than [ɛə] before [sk].

I have argued that lexical exceptions are best analyzed as resulting from parochial constraints requiring specific lexical items to contain specific phonological information (such as the feature [–tense]) which can outrank general phonotactic well-formedness constraints; the majority of lexical items will not have parochial constraints and will thus be subject to phonotactic markedness. In cases like [ɔŋ], [ɔft], [ɛəsk], etc., the fact that more words violate markedness than obey it, and the fact that the words that **do** obey it tend to be rare or foreign words, make it unlikely that this is a simple case of parochial constraints outranking markedness. Rather, the members of the set of words containing sequences like [ɔŋ], [ɔft], [ɛəsk], etc., reinforce each other by means of analogical constraints. These analogical constraints then outrank markedness, and can be themselves outranked by parochial constraints governing rare and foreign words like *dugong, zaftig, paschal*.

These conclusions contribute to phonological theory by showing that constraint interaction is not always a matter of conflict between faithfulness constraints and markedness constraints; analogical constraints reinforcing exceptional patterns as well as parochial constraints governing specific lexical items have roles to play as well.

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