

Emergence of the unmarked in Scottish Gaelic copy epenthesis

Juliet Stanton, NYU (stanton@nyu.edu)

Sam Zukoff, USC (zukoff@usc.edu)

Epenthesis and Beyond · Stony Brook · September 17–19, 2021

★ In this talk, we document an *emergence of the unmarked effect* in Scottish Gaelic copy epenthesis, and explore its consequences for models of correspondence.

1 Introduction

- Scottish Gaelic epenthetic copy vowels (underlined) normally fully match the featural content of their host vowel (bolded), as in (1)a,b.
- However, as shown by Clements (1986), copy vowels obligatorily agree in $[\pm\text{front}]$ with a *preceding consonant*.¹
 - This can lead to mismatches in segmental quality between a copy vowel and its host, as in (1)c.

- (1) Copy epenthesis in Scottish Gaelic (from Borgstrøm 1937:127, 1940:212, Clements 1986:328)
- a. marav ‘dead’ (*marɛv)
 - b. kɛN’ɛp ‘hemp’ (*kɛN’ap)
 - c. ʃɛrav ‘bitter’ (*ʃɛrɛv)

- While $[\pm\text{front}]$ agreement is all but categorical for copy vowels, an analysis of the lexicon shows that other vowels display this effect only gradually.
 - i.e., the majority of lexical vowels agree in $[\pm\text{front}]$ with the preceding consonant, but there are many cases of disagreement.
- We conclude that $[\pm\text{front}]$ -agreement in Scottish Gaelic is an *emergence of the unmarked effect* (McCarthy & Prince 1995), whereby lexical vowels are actively faithful to the input but copy vowels can freely change to reduce markedness.
 - We demonstrate that this requires a model of (copy) epenthesis with asymmetric faithfulness:
 - Lexical host vowels have the capacity for greater faithfulness to the input than copy vowels do.

¹Clements characterizes the disagreement as one of $[\pm\text{back}]$, but we use $[\pm\text{front}]$ here as it is the more appropriate feature to separate the front vowels (e.g. [i]) from the rest of the vowels (e.g. [u u]). See Section 1.2 on the inventory.

- Other languages display similar contextual alternations/restrictions on copying (e.g. Fijian, Kenstowicz 2007, Kumagai 2016; Huave, Kim 2008; Japanese, Kawahara 2007).
 - However, in all cases known to us, the alternation is between full copy and a (context-specific) default segment (normally interpreted as blocking of copying).
- Scottish Gaelic’s partial copying pattern, with its consistent single-feature alternation, represents a distinct type, and as such serves as a distinct argument.

1.1 Roadmap

§1.2 Background information on the Scottish Gaelic vowel and consonant systems

- §2 Details of the Scottish Gaelic copy epenthesis pattern, focusing on the distinction between full copy and partial copy
- §3 Correspondence-theoretic analysis of Scottish Gaelic copy epenthesis
- §4 Statistical analysis of the lexicon demonstrating that lexical vowels differ from copy vowels in their propensity for [\pm front] agreement, confirming TETU in copy epenthesis
- §5 Discussion of the correspondence architecture necessary to capture TETU in copy epenthesis
- §6 Brief conclusion and discussion

1.2 The Scottish Gaelic inventory

- Some information about Scottish Gaelic’s inventory (following Borgstrøm 1940, Clements 1986), as well as the distinctive features we assume, will be helpful for what follows.
- Scottish Gaelic has nine short vowels that can appear in stressed syllables (2).²
 - The only featural distinction important here is that between the [+front] vowels (bolded) and the [-front] vowels (unbolded).
 - Different vowel heights are differentiated by the combination of [\pm high] and [\pm low].
 - We take same-height [-front] vowels to be differentiated by [\pm round]. (If they are central, then they would also differ in [\pm back], redundantly.)
- The inventory of vowels that can occur in stressless syllables is smaller (3).

(2) Scottish Gaelic *stressed* short vowels

i	ɪ	u
e	ə	o
ɛ	a	ɔ

(3) Scottish Gaelic *unstressed* short vowels

i		u
	ə	
ɛ	a	ɔ

²Long vowels and diphthongs also exist in Scottish Gaelic, but this talk will focus on the behavior of short vowels. In this talk we follow the vowel transcription conventions from Bosch & de Jong (1997). Examples from Clements (1986) have been modified according to the following rules: [λ] → [$\mathfrak{ɪ}$], [\emptyset] → [ə], and [$\mathfrak{æ}$] → [ɛ].

- Parallel to the distinction between [+front] and [-front] vowels, Scottish Gaelic also has a distinction between [+front] and [-front] consonants.
 - Among the obstruents (4), [\pm front] is contrastive for coronal and dorsal stops and fricatives.
 - * [+front] (i.e. palatalized) consonants are written with a following apostrophe.

(4) Scottish Gaelic obstruents

		Labial	Coronal	Dorsal	Glottal
Stops	[-front]	p b	t d	k g	
	[+front]		t' d'	k' g'	
Fricatives	[-front]	f v	s	x y	h
	[+front]		ʃ	ç j	

- Among the coronal sonorants (5), [\pm front] is contrastive for nasals, rhotics, and laterals.
- * Coronal sonorants also distinguished by a fortis (written with capital) vs. lenis (written with lowercase) contrast. (This plays no role in what follows.)

(5) Scottish Gaelic coronal sonorants; also /m/ (lenis, [-front])

		Nasals	Rhotics	Laterals
Lenis	[-front]	n	r	
	[+front]		r'	l'
Fortis	[-front]	N	R	L
	[+front]	N'		L'

- We assume that labial consonants (/p,b,f,v,m/) and /h/, which don't participate in a [\pm front] opposition, are unspecified for [\pm front].

★ The interaction between [\pm front] in vowels and [\pm front] in consonants is the focus of this talk.

2 Copy epenthesis

2.1 The overall picture

- In Scottish Gaelic, a vowel is inserted between a sonorant and a non-homorganic consonant.

- (6) a. Examples of morphemes that will exhibit epenthesis (clusters boxed):
 /mu \boxed{rx} əy, i \boxed{mr} ay, fε \boxed{nv} ar/
- b. Hypothetical morphemes that won't exhibit epenthesis:
 /mu \boxed{rd} əy, i \boxed{mb} ay, fε \boxed{nd} ar/

- The inserted vowel resembles the previous vowel: it is identical for [±high] and [±low], as in (7).

(7) Copy epenthesis in Scottish Gaelic (from Clements 1986:328)

- a. muruxəɣ ‘Murdoch’
- b. aLapə ‘Scotland’
- c. marav ‘dead’
- d. borəɣ ‘Borg’ [place name]
- e. ʃerəv ‘bitter’
- f. bul’ik’ ‘bellows’ (gen. sg.)
- g. skər’ev ‘cormorants’
- h. duu’içə ‘darker’

- The epenthetic vowel has been claimed to have some peculiar prosodic properties:
 - Bosch & de Jong (1997) claim that epenthetic vowels are stressed.
 - Epenthetic vowels are longer than their non-epenthetic counterparts.
 - Epenthetic vowels select from the vowel inventory available to stressed syllables.
 - Hammond et al. (2014) claim that epenthetic vowels are phonologically visible, though not to the same degree as underlying vowels.
 - Speakers’ judgments of syllable count are affected by epenthetic vowels, but epenthetic vowels don’t count as a full syllable.
 - Syllabification of an intervocalic consonant differs according to whether it precedes an epenthetic vowel or an underlying vowel.
- In this talk, however, we will focus on only the segmental aspects of vowel insertion.

2.2 Types of copy

- As noted above, Scottish Gaelic has two types of copy epenthesis: *full* and *partial* (Borgstrøm 1937, Clements 1986, Ní Chiosáin 1994, Halle 1995, Morrison 2019, *a.o.*).
- The type of copy is determined by the [±front] value of the host and the following sonorant.
 - Reminder: vowels and coronal sonorants are divided into two classes, [+front] and [-front].

(8) Frontness of vowels and coronal sonorants

[+front]		[-front]	
Vowels	Consonants	Vowels	Consonants
/i e ε/	/r’ l’ N’ L’/	/u u ə o a ə/	/n r N L R/

- The [±front] value of a copy vowel must match the [±front] value of the preceding sonorant.
- This requirement can lead to mismatches in [±front] between host and copy!

2.2.1 Full copy

- When the [±front] value of the host vowel matches the [±front] value of the following sonorant, full copy occurs. As a result, the copy agrees with the preceding sonorant for [±front].

(9) Full copy in Scottish Gaelic (from Clements 1986:328)

a.	<u>m</u> ur <u>u</u> xəy	‘Murdoch’	b.	bər <u>ɔ</u> y	‘Borg’ [place name]
	ur <u>u</u> pəL	‘tail’		ɔr <u>ɔ</u> m	‘on me’
	duN <u>u</u> xəy	‘Duncan’		tɔr <u>ɔ</u> mət	‘Norman’
c.	mar <u>a</u> v	‘dead’	d.	kɛN’ <u>ɛ</u> p	‘hemp’ (Borgstrøm 1937:127, 1940:212)
	skar <u>a</u> v	‘cormorant’		ɛN’ <u>ɛ</u> m	‘name’ (ibid.)
	f <u>a</u> R <u>a</u> k’ə	‘rough sea’	e.	ɛm <u>ɛ</u> f <u>i</u> r’	‘time’
	<u>a</u> L <u>a</u> pə	‘Scotland’		t’im <u>i</u> ç <u>a</u> L	‘round about’
	d’ <u>a</u> L <u>a</u> v	‘picture’			
	f <u>a</u> L <u>a</u> k	‘hunting’			

- Walking through a couple of these examples:
 - For (a): /u/ is [-front] and [r,N] are both [-front]; /u/ copies fully across /r,N/.
 - For (d): /ɛ/ is [+front] and /N’/ is [+front]; /ɛ/ copies fully across /N’/.
 - For (e): /ɛ,i/ are both [+front] and /m/ is unspecified for [±front]; /ɛ,i/ copies fully across /m/.

2.2.2 Partial copy

- When the [±front] values of the host and the following sonorant **do not match**, partial copy occurs. As a result, the copy agrees with the preceding sonorant for [±front], not the host vowel.

(10) Partial copy in Scottish Gaelic (from Clements 1986:328)

a.	f <u>ɛ</u> r <u>a</u> v	‘bitter’
b.	sk <u>ə</u> r’ <u>ɛ</u> v	‘cormorants’
c.	bu <u>l</u> ’ <u>i</u> k’	‘bellows’ (gen. sg.)
d.	du <u>r</u> ’ <u>i</u> çə	‘darker’

- Walking through a couple of these examples:
 - For (a): /ɛ/ is [+front] and /r/ is [-front]; /ɛ/ copies partially across /r/, yielding [a].
 - For (c): /u/ is [-front] and /l’/ is [+front]; /u/ copies partially across /l’/, yielding [i].

- In cases of partial copy, the result is usually that the copy agrees with the host for all features except [\pm front] (as characterized by Clements 1986:329 and others cited above).
 - Of the 23 cases of partial copy across a coronal sonorant, the following correspondences exist between copy and host.³ (R' = [+front] consonant, R = [-front] consonant.)

(11) Host-copy correspondences

	Correspondence	No. of examples	Example (from Clements 1986:328)
a.	εR _a	9	ʃɛnaxəs 'conversation'
b.	əR'e	6	mər'ev 'the dead'
c.	ɯR'i	4	dɯr'ičə 'wooing'
d.	uR'i	2	bul'ik' 'bellows' (gen. sg.)
e.	iRə	1	inəxiN'ə 'brain'
f.	eR'i	1	fer'ik 'anger' (gen. sg.)

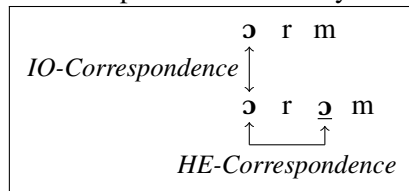
- In 21/23 cases (a-d), the corresponding vowels differ in only [\pm front]
 - Low front /ε/ partially copies as low back [a] (a).
 - Mid back /ə/ partially copies as mid front [e] (b).
 - High back /ɯ u/ partially copy as high front [i] (c,d).
- In two cases (e-f), the corresponding vowels do not follow from anything we have said.
 - The back version of /i/ should be [ɯ] (or [u]), not [ə] (e).
 - There is no reason for /e/ to copy as [i] across /r'/ (f); [e] and [r'] are both [+front].
- The counterexample in (e) aside, there is a generalization: in cases of partial copy, copies resemble their hosts for all features except [\pm front].

→ We attribute partial copy to a need for vowels to match a preceding consonant for [\pm front].

3 Analysis of copy epenthesis

- Kitto & de Lacy (1999) and Stanton & Zukoff (2018) argue that identity between copy and host is enforced over a correspondence relationship (McCarthy & Prince 1995).
 - For spreading-based approaches to copy epenthesis, see, e.g. Hall (2003), Kawahara (2007).
 - For a non-correspondence-based analysis of Scottish Gaelic epenthesis, see Morrison (2019).
- The architecture of correspondence we adopt (12) is one in which copy vowels are not faithful to an input segment but lexical vowels are (as in Stanton & Zukoff 2018). See §5.2 for alternatives.

(12) IO-correspondence with only lexical output vowels



³We are excluding three cases of copy across a labial sonorant here, because these display a distinct subpattern: /i/ partially copies as /ə/, as in /imray/ → [iməray] (see Clements 1986:328 for discussion).

3.1 Full copy

- For present purposes, we assume that epenthesis is motivated by *NK (13).

(13) ***NK**: assign one * for each sonorant that is followed by a heterorganic consonant.⁴

- Since epenthesis is observed (15), *NK dominates the constraint violated by epenthesis, which we assume is DEP-IO (14).

(14) **DEP-IO**: assign one * for each output segment that lacks an input correspondent.

(15) Motivating epenthesis (for /marv/ → [marav] ‘dead’)

/marv/	*NK	DEP-IO
a. [marv]	*!	
☞ b. [ma _x ra _x v]		*

- A correspondence relationship (automatically) holds between the epenthetic vowel and its host.
 - Identity between a copy vowel and its host is enforced by faithfulness constraints along the *host-epenthetic* (HE) dimension, such as:

(16) a. **IDENT-HE[±front]**: assign one * if a copy vowel and its host disagree for [±front].
 b. **IDENT-HE[±high]**: assign one * if a copy vowel and its host disagree for [±high].
 c. **IDENT-HE[±low]**: assign one * if a copy vowel and its host disagree for [±low].
 d. **IDENT-HE[±round]**: assign one * if a copy vowel and its host disagree for [±round].

- HE-correspondence is denoted in our tableaux with subscripts.

- To derive full copy epenthesis [**the c. candidates in (18)–(20)**] over default epenthesis [**the b. candidates in (18)–(20)**], these IDENT-HE constraints must outrank the (markedness) constraint(s) preferring a default vowel.

- For illustrative purposes, we use *V_{-[ə]} (17), under the assumption that [ə] is the least marked vowel in Scottish Gaelic.

(17) ***V_{-[ə]}**: assign one * for each output vowel which is not [ə] (the default vowel).

(18) Analysis of full copy: /marv/ → [marav] ‘dead’

/marv/	*NK	ID-HE[±low]	*V _{-[ə]}	DEP
a. [marv]	*!		*	
b. [ma _x rə _x v]		*!	*	*
☞ c. [ma _x ra _x v]			**	*

(19) Analysis of full copy: /kɛN’p/ → [kɛN’ɛp] ‘hemp’

/kɛN’p/	*NK	ID-HE[±front]	*V _{-[ə]}	DEP
a. [kɛN’p]	*!		*	
b. [kɛ _x N’ɛ _x p]		*!	*	*
☞ c. [kɛ _x N’ɛ _x p]			**	*

⁴Morrison (2019:401) states that underlying sequences of lenis (short) sonorants followed by (preaspirated) voiceless stops are left intact, at least in certain dialects. We do not explore this further here.

(20) Analysis of full copy: /urpəL/ → [urupəL] ‘tail’

/urpəL/	*NK	ID-HE[±high]	ID-HE[±round]	*V _{-[ə]}	DEP
a. [urpəL]	*!			*	
b. [u _x r _ə pəL]		*!	*!	*	*
c. [u _x ru _x pəL]				**	*

- Since there are non-schwa vowels in the language, *V_{-[ə]} must also be dominated by the relevant IDENT-IO constraints. We will return to this in Section 4.

3.2 Partial copy

- To analyze partial copy, we only need to add one markedness constraint: AGREE[±front] (21).

(21) **AGREE[±front]**: assign one * for every output consonant-vowel sequence where the consonant and vowel are specified for different values of [±front].

- To take effect, AGREE[±front] must dominate IDENT-HE[±front].
 - Inserting a [-front] vowel after a [+front] consonant ((22)a,b) or a [+front] vowel after a [-front] ((23)a,b) consonant will fatally violate AGREE[±front].
 - Among vowels matching for [±front] ((22)c–e, (23)c–e), the other IDENT-HE constraints select the one that matches the host’s height features ((22)c, (23)c).

(22) Analyzing partial copy: /skər’v/ → [skər’ev] ‘cormorants’

/skər’v/	AGREE [±front]	ID-HE [±high]	ID-HE [±low]	ID-HE [±round]	ID-HE [±front]	*V _{-[ə]}
a. [skə _x r’ə _x v]	*!					*
b. [skə _x r’ə _x v]	*!			*!		**
c. [skə _x r’e _x v]					*	**
d. [skə _x r’ɛ _x v]			*!		*	**
e. [skə _x r’i _x v]		*!			*	**

(23) Analyzing partial copy: /ʃɛrv/ → [ʃɛrav] ‘bitter’

/ʃɛrv/	AGREE [±front]	ID-HE [±low]	ID-HE [±round]	ID-HE [±front]	*V _{-[ə]}
a. [ʃɛ _x rɛ _x v]	*!				**
b. [ʃɛ _x rɛ _x v]	*!	*!			**
c. [ʃɛ _x ra _x v]				*	**
d. [ʃɛ _x rɔ _x v]			*!	*	**
e. [ʃɛ _x rə _x v]		*!		*	*

- With one exception (see immediately below), neither AGREE[±front] nor IDENT-HE[±front] needs to be ranked with respect to the other IDENT-HE constraints, because changing any feature beside [±front] will be *harmonically bounded* by the candidate that changes only [±front].

- All that we need in order to account for the fact that the *rounded* back vowels /u,o,ɔ/ map to *unrounded* front vowels is to add a high-ranked constraint against front rounded vowels (24).

(24) *V_[+front,+round]: assign one * for each vowel which is both [+front] and [+round].

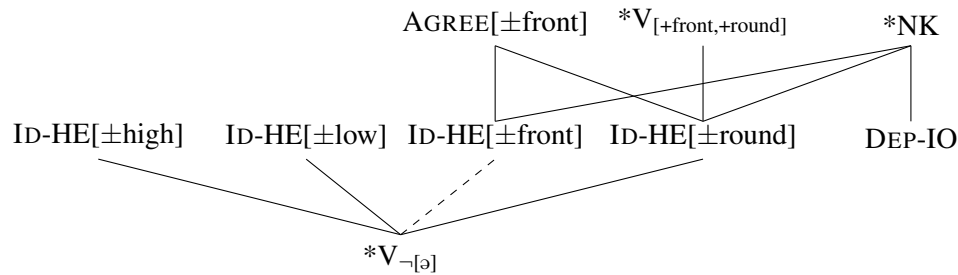
- This constraint is surface true in the language.
- As long as this constraint ranks above IDENT-HE[±round], **and** AGREE[±front] also ranks above IDENT-HE[±round], we derive the correct result (25):

(25) Analyzing partial copy: /bul'k'/ → [bul'ik'] 'bellows' (gen. sg.)

/bul'k'/	*V _[+fr,+rd]	AGREE [±front]	ID-HE [±high]	ID-HE [±round]	ID-HE [±front]	*V _{-[ə]}
a. [bu _x l'u _x k']		*!				**
b. [bu _x l'i _x k']				*	*	**
c. [bu _x l'y _x k']	*!				*	**

→ **Analysis summary:** [±front] agreement takes priority over copy-host identity (for [±front], and, parasitically, [±round]), but it does not prevent (i.e. block) copy-host identity for other features.

(26) Ranking summary



4 Lexical statistics

- We have now identified and analyzed a pattern of [±front] agreement in copy epenthesis, which results in imperfect copying. This raises the following question:

(27) Is this a general phenomenon of the language, or is it specific to copy epenthesis?

- i.e., do trends in the lexicon parallel trends in copy epenthesis? More specifically, do vowels always agree in [±front] with a preceding coronal sonorant?

- This is relevant because it will affect our model of correspondence:

(28) a. Models of copy epenthesis in which copy and host are equally faithful to the input predict that lexical vowels, like copy vowels, should participate in [±front] agreement.
 b. Models of copy epenthesis in which the copy is not faithful (or is less faithful) to the input than is the host do not make this prediction.

- To answer the question in (27), we conducted a corpus study of all the forms in Borgstrøm's (1937) lexicon.

→ Preview: we find that lexical vowels behaves differently than copy vowels.

4.1 Methods and results

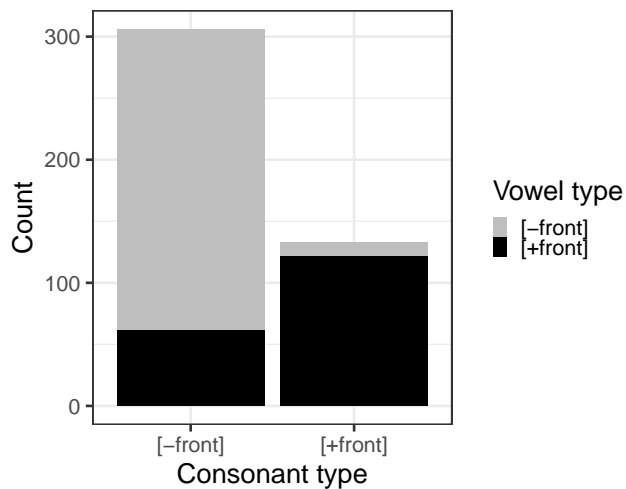
- An investigation of the 1174 forms in the lexicon found 437 coronal sonorant + vowel sequences.⁵
- Each combination of [±front] sonorant and [±front] vowel is represented in the lexicon (29).

(29) Examples from the lexicon (from Borgstrøm 1937; transcriptions adjusted)

- [-front] consonant, [-front] vowel: [nas] ‘particle bef. comparative’ (p. 232)
- [-front] consonant, [+front] vowel: [ʃɛnerʲ] ‘grandfather’ (p. 148)
- [+front] consonant, [+front] vowel: [aiNʲiçən] ‘rivers’ (p. 92, 220)
- [+front] consonant, [-front] vowel: [i-məlʲak] ‘navel’ (p. 229)

- The overall results of the corpus study are visualized in (30).

(30) Results of corpus study



- More details on the numbers:
 - Of the 306 sequences with a [-front] sonorant, in 245 it is followed by a [-front] vowel.
 - Of the 133 sequences with a [+front] sonorant, in 122 it is followed by a [+front] vowel.
- NB: sonorant-vowel sequences resulting from copy epenthesis *are included* in these counts.
 - Counts in (30) over-estimate the amount of [±front] agreement in the lexicon.
 - This is because they include a subset of forms in which [±front] agreement is near-exceptionless.
- It’s evident from (30) that [-front] sonorants are more likely to be followed by [-front] vowels, while [+front] sonorants are more likely to be followed by [+front] vowels.
 - A logistic regression reveals that this asymmetry is significant ($p < .001$).

⁵This count excludes what Børgstrøm transcribes as the obligatorily stressless, contextually variable [ə]. (While Borgstrøm (1937) does not explicitly state that /ə/ is contextually variable, he notes that its articulation is “rather loose” (p. 99), which we interpret as an indication that it has no fixed target.)

- However: the trends observed for sonorant-vowel sequences in the broader lexicon do not exactly match the trends observed for sonorant-vowel sequences in which the vowel is a copy.
 - As shown in (31), sonorant-vowel sequences are far more likely to exhibit [\pm front] agreement when the vowel is epenthetic than when it is not.
 - This asymmetry is also significant ($p < .001$, Fisher’s Exact test).

(31) Asymmetries in [\pm front] agreement

	All RV sequences	Copy RV sequences (Clements 1986)
[\pm front] agreement	367	70
No [\pm front] agreement	72	2

- **Take-away:** [\pm front] is contrastive for lexical vowels following coronal sonorants.

4.2 Analyzing [\pm front] (dis)agreement in the lexicon

- To account for the fact that [\pm front] agreement is not categorical within the lexicon (i.e. [\pm front] is fully contrastive), we need one Input-Output faithfulness constraint: IDENT-IO[\pm front] (32).

(32) **IDENT-IO[\pm front]:** assign one * for each input segment that mismatches in [\pm front] with its corresponding output segment.

- To preserve the [\pm front] contrasts, IDENT-IO[\pm front] must dominate AGREE[\pm front]. This allows for mismatches in [\pm front] to occur in the lexicon, as shown in (33).

(33) Failure of [\pm front] agreement in the lexicon

	/jɛnɛr/	IDENT-IO[\pm front]	AGREE[\pm front]
a.	[jɛnɔɾ]	*!	
b.	[jɛnɛr]		*

4.3 Local conclusions

- While copy vowels nearly categorically agree in [\pm front] with a preceding coronal sonorant, lexical vowels do not.
 - Lexical vowels maintain the [\pm front] contrast after coronal sonorants (indeed all consonants).
 - Nevertheless, the lexicon trends in the same direction as the copy vowels, preferring agreeing sequences over disagreeing sequences.
 - We can thus understand AGREE[\pm front] as a “subterranean constraint” (Zuraw 2000) in Scottish Gaelic, affecting the lexicon gradiently.
- This distribution supports models of copy epenthesis in which lexical and copy vowels are not equally faithful to an input segment:
 - Copy vowels satisfy markedness preferences more than lexical vowels do.

5 Ramifications for correspondence

→ Our interpretation: the distribution just described constitutes a classic *emergence of the unmarked* (TETU) effect (McCarthy & Prince 1994, 1995):

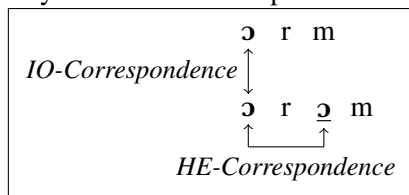
- Total contrast in contexts with full faithfulness (lexical vowels).
- Total adherence to markedness in contexts with reduced faithfulness (epenthetic vowels), i.e. exceptionless [±front]-agreement in copy vowels (the partial copy pattern).

5.1 TETU in the asymmetric IO-correspondence model

- In the framework assumed in Section 3 (following Stanton & Zukoff 2018), repeated in (34), we can understand the faithfulness distinction between lexical and copy vowels as a distinction between IO and HE correspondence.

- This model mirrors McCarthy & Prince’s (1995) “Basic Model” of reduplication (HE ~ BR).

(34) Asymmetric IO-correspondence model



- The ranking schema in (35) instantiates a general TETU ranking schema for copy epenthesis in this correspondence model:

(35) TETU in copy epenthesis ranking schema:

$$\mathbf{FAITH_{IO}} \gg \mathbf{M} \gg \mathbf{FAITH_{HE}}$$

- Implementing this approach for Scottish Gaelic, we get the ranking in (36).

- ID-IO[±front] ≫ AGREE[±front] → [±front]-contrast for lexical (host) vowels (37)i.
- AGREE[±front] ≫ ID-HE[±front] → [±front]-neutralization for epenthetic (copy) vowels (37)ii.
- * Input-output correspondence is indicated with superscript numerals.

(36) Scottish Gaelic ranking:

$$\mathbf{IDENT-IO[\pm front]} \gg \mathbf{AGREE[\pm front]} \gg \mathbf{IDENT-HE[\pm front]}$$

(37) TETU in the asymmetric correspondence model

i. Lexical vowels: disagreement via high-ranked IO-faithfulness

	/[ɛ¹nɛ²r]/	ID-IO[±front]	AGREE[±front]	ID-HE[±front]
☞ a.	[fɛ¹nɛ²r]		*	
b.	[fɛ¹nɔ²r]	*!		

ii. Copy vowels: agreement via low-ranked HE-faithfulness

	/bu¹l¹k¹/	ID-IO[±front]	AGREE[±front]	ID-HE[±front]
a.	[bu _x ¹l¹u _x k¹]		*!	
☞ b.	[bu _x ¹l¹i _x k¹]			*

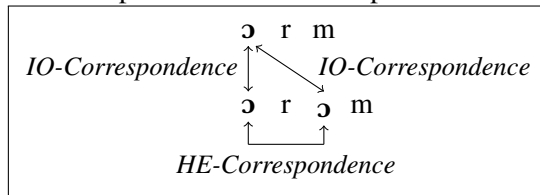
5.2 Alternative models of correspondence

- In the remainder of this section, we consider several alternative models of correspondence.
 - We find that the architectural feature that is crucial for capturing TETU in copy epenthesis is asymmetry in the correspondence relations involving lexical vs. epenthetic segments.

5.2.1 Generalized IO-correspondence

- One alternative that clearly does not account for the Scottish Gaelic TETU pattern is one which posits a general IO-correspondence relation (Stanton & Zukoff 2016a,b), illustrated in (38).
 - Both the host and the copy correspond to a single underlying vowel.
 - Therefore, host and copy are predicted to exhibit *equal* faithfulness to the input.

(38) IO-correspondence with all output vowels



- Without supplementation, this model is unable to derive TETU effects in copy epenthesis:
 - Either both host and copy will resist agreement (39), or both will succumb to agreement (40).

(39) If lexical vowels can disagree, copy vowels can disagree:

i. Lexical vowels: disagreement via high-ranked IO-faithfulness

	/ʃɛ¹nɛ²r/	ID-IO[±front]	AGREE[±front]	ID-HE[±front]
☹ a.	[ʃɛ¹nɛ²r]		*	
	b. [ʃɛ¹nɔ²r]	*!		

ii. Copy vowels: disagreement via high-ranked IO-faithfulness (incorrect)

	/bu¹l¹k¹/	ID-IO[±front]	AGREE[±front]	ID-HE[±front]
☹ a.	[bu¹l¹u¹k¹]		*	
☹ b.	[bu¹l¹i¹k¹]	*!		*

(40) If copy vowels must agree, lexical vowels must agree:

i. Lexical vowels: agreement via low-ranked IO-faithfulness (incorrect)

	/ʃɛ¹nɛ²r/	AGREE[±front]	ID-IO[±front]	ID-HE[±front]
☹ a.	[ʃɛ¹nɛ²r]	*!		
☹ b.	[ʃɛ¹nɔ²r]		*	

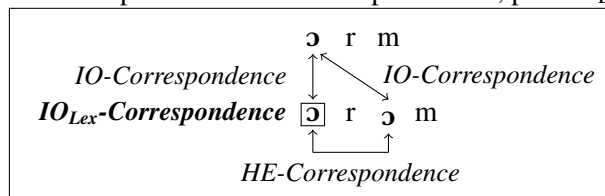
ii. Copy vowels: agreement via low-ranked IO-faithfulness

	/bu¹l¹k¹/	AGREE[±front]	ID-IO[±front]	ID-HE[±front]
	a. [bu¹l¹u¹k¹]	*!		
☹ b.	[bu¹l¹i¹k¹]		*	*

5.2.2 Generalized IO-correspondence plus faithfulness to lexical material

- The way to fix the symmetric correspondence model is to build in asymmetry by other means.
- The obvious way to do this is by adding a special IO-correspondence relation for lexical material.
 - This borrows ideas from Beckman (1998) et seq., on positional faithfulness.
 - It mirrors models of reduplication like that of Spaelti (1997) and Struijke (2002) (also Yu 2005).

(41) IO-correspondence with all output vowels, plus IO_{Lex}-correspondence for lexical vowels



- * This requires that the vowel surfacing in its expected location (the host) be parsed in the output as a lexical segment while the vowel surfacing in the unexpected location (the epenthetic copy) *not* be parsed as a lexical segment. (The same holds for the asymmetric model in Section 5.1.)
- This model predicts that epenthetic vowels *can* be faithful to the input, but *never more faithful* than their host is. This adequately describes the Scottish Gaelic situation, as demonstrated in (42).
 - * Boxes indicate lexical vowels in the output, which are subject to IDENT-IO_{Lex}[±front].
 - * Non-boxed vowels are epenthetic vowels, which are not subject to IDENT-IO_{Lex}[±front].

(42) Asymmetric faithfulness via IO_{Lex}-correspondence

i. Lexical vowels: disagreement via high-ranked IO_{Lex}-faithfulness

	/jɛ ¹ nɛ ² r/	ID-IO _{Lex} [±fr]	AGREE[±fr]	ID-IO[±fr]	ID-HE[±fr]
☞ a.	[j ¹ ɛ ¹ n ² ɛ ² r]		*		
b.	[j ¹ ɛ ¹ n ² ə ² r]	*!		*	

ii. Copy vowels: agreement via low-ranked IO-faithfulness and HE-faithfulness

	/bu ¹ l ¹ k'/	ID-IO _{Lex} [±fr]	AGREE[±fr]	ID-IO[±fr]	ID-HE[±fr]
a.	[b ¹ u ¹ l ¹ i ¹ k']		*!		
☞ b.	[b ¹ u ¹ l ¹ i ¹ k']			*	*

- The IO_{Lex} approach may obviate the need for HE-faithfulness in the partial copying pattern.
 - This could lead us to consider a correspondence model that lacks HE-correspondence, in parallel to proposals for reduplication like that of Saba Kirchner (2010, 2013).
 - However, we adhere to HE-correspondence based on the arguments from prosodic identity (both in Scottish Gaelic and cross-linguistically) made in Stanton & Zukoff (2018).

5.3 Local conclusions

- In this section, we have shown that the key to capturing TETU in copy epenthesis is an asymmetry in the correspondence relations involving lexical and epenthetic vowels.
 - In the two viable models of correspondence presented above, the lexical vowel has one more correspondence relation with the input than does the epenthetic vowel.
 - By ranking FAITH constraints on this correspondence dimension above the FAITH constraints affecting the epenthetic vowel, we derive the asymmetric faithfulness characteristic of TETU.

- One further alternative not considered is one where lexical vowels and epenthetic vowels have *distinct* correspondence relations with the input.
 - This would mirror McCarthy & Prince’s (1995) “Full Model” of reduplication with “Input-Reduplicant” (IR) faithfulness.
 - This approach would seemingly fall victim to many of the same critiques as IR faithfulness (see Struijke 2002, Riggle 2006, and many others): e.g., this should allow for retention of contrasts in epenthesis that are neutralized elsewhere.
 - We leave fuller consideration of this alternative for future research.

6 Discussion

- In this paper, we have shown that partial copy in Scottish Gaelic copy epenthesis represents an instance of *the emergence of the unmarked*.
 - A [\pm front] contrast that is maintained among lexical vowels (i.e. outside of epenthetic contexts) is neutralized in epenthesis.
- This motivates a correspondence-theoretic model with asymmetric faithfulness between lexical and epenthetic segments.
 - Either epenthetic segments fail to correspond with the input at all, and identity is enforced purely through surface *Host-Epenthetic* correspondence.
 - Or, lexical segments participate in a special Input-Output correspondence relation, which allows them to be more faithful to the input than epenthetic vowels.
 - This distribution rules out symmetric faithfulness to the input.
- One further noteworthy finding from this pattern: failure to achieve total identity (due to interference from contextual markedness) does not prevent partial identity.
 - This sort of interaction is familiar from reduplication (e.g. McCarthy & Prince 1995).
 - However, in all of the other copy epenthesis patterns known to us where contextual markedness makes full copy impossible, this results in a contextual default epenthetic vowel.
 - These include Fijian (Kenstowicz 2007, Kumagai 2016), Huave (Kim 2008, in prep), and Japanese (Kawahara 2007).
 - As such, Scottish Gaelic partial copy represents a crucial piece of the puzzle to understanding blocking in copy epenthesis, showing that some such cases are straightforwardly analyzed with correspondence.

References

- Beckman, Jill N. 1998. Positional Faithfulness. PhD Dissertation, University of Massachusetts, Amherst.
- Borgström, Carl Hj. 1937. The Dialect of Barra in the Outer Hebrides. *Norsk Tidsskrift for Sprogvidenskap* 8:71–242.
- . 1940. *A Linguistic Survey of the Gaelic Dialects of Scotland, vol 1: The Dialects of the Outer Hebrides*. Oslo: Norwegian Universities Press.
- Bosch, Anna & Kenneth de Jong. 1997. The Prosody of Barra Gaelic Epenthetic Vowels. *Studies in the Linguistic Sciences* 27:2–15.
- Clements, George N. 1986. Syllabification and Epenthesis in the Barra Dialect of Gaelic. In Koen Bogers, Harry van der Hulst & Maarten Mous (eds.), *The Phonological Representation of Suprasegmentals*, 317–336. Dordrecht: Foris Publications.
- Hall, Nancy. 2003. Gestures and Segments: Vowel Intrusion as Overlap. PhD Dissertation, University of Massachusetts, Amherst.
- Halle, Morris. 1995. Feature geometry and feature spreading. *Linguistic Inquiry* 26:1–46.
- Hammond, Michael, Natasha Warner, Andréa Davis, Andrew Carnie, Diana Archangeli & Muriel Fisher. 2014. Vowel insertion in Scottish Gaelic. *Phonology* 31(1):123–153. doi:10.1017/S0952675714000050.
- Kawahara, Shigeto. 2007. Copying and Spreading in Phonological Theory: Evidence from Echo Epenthesis. In Leah Bateman, Michael O’Keefe, Ehren Reilly & Adam Werle (eds.), *Papers in Optimality Theory III* (University of Massachusetts Occasional Papers in Linguistics 32), 111–144. Amherst, MA: GLSA.
- Kenstowicz, Michael. 2007. Saliency and Similarity in Loanword Adaptation: A Case Study from Fijian. *Language Sciences* 29:316–340.
- Kim, Yuni. 2008. Topics in the Phonology and Morphology of San Francisco del Mar Huave. PhD Dissertation, University of California, Berkeley.
- . in prep. Spreading and Correspondence in Huave Vowel Copy. Ms., University of Essex, 2021.
- Kitto, Catherine & Paul de Lacy. 1999. Correspondence and Epenthetic Quality. In Catherine Kitto (ed.), *Proceedings of AFLA VI*, 181–200. University of Toronto: Toronto Working Papers in Linguistics.
- Kumagai, Gakuji. 2016. Resolving the Issue of the Target of Vowel Copy in Fijian Loanwords. In Gunnar Ólafur Hansson, Ashley Farris-Trimble, Kevin McMullin & Douglas Pulleyblank (eds.), *Proceedings of the 2015 Annual Meeting on Phonology*. Washington, DC: Linguistic Society of America.
- McCarthy, John J. & Alan Prince. 1994. The Emergence of the Unmarked: Optimality in Prosodic Morphology. In Mercè González (ed.), *NELS 24: Proceedings of the North East Linguistic Society*, 333–379. Amherst, MA: GLSA. <http://works.bepress.com/john.j.mccarthy/43>.
- . 1995. Faithfulness and Reduplicative Identity. In Jill Beckman, Suzanne Urbanczyk & Laura Walsh Dickey (eds.), *Papers in Optimality Theory* (University of Massachusetts Occasional Papers in Linguistics 18), 249–384. Amherst, MA: GLSA. <http://works.bepress.com/john.j.mccarthy/44>.
- Morrison, Donald Alasdair. 2019. Metrical Structure in Scottish Gaelic: Tonal Accent, Glottalisation and Overlength. *Phonology* 36(3):391–432.
- Ní Chiosáin, Máire. 1994. Barra Gaelic vowel copy and (non-)constituent spreading. In *West coast conference on formal linguistics 13.3-13*, vol. 13, 3–13. Stanford, CA: CSLI Publications.
- Riggle, Jason. 2006. Infixing Reduplication in Pima and its Theoretical Consequences. *Natural Language & Linguistic Theory* 24(3):857–891.
- Saba Kirchner, Jesse. 2010. Minimal Reduplication. PhD Dissertation, University of California, Santa Cruz.
- . 2013. Minimal Reduplication and Reduplicative Exponence. *Morphology* 23(2):227–243.
- Spaelti, Philip. 1997. Dimensions of Variation in Multi-Pattern Reduplication. PhD Dissertation, University of California, Santa Cruz.
- Stanton, Juliet & Sam Zukoff. 2016a. Prosodic Effects of Segmental Correspondence. In Ksenia Ershova, Joshua Falk & Jeffrey Geiger (eds.), *CLS 51: Proceedings of the Fifty-First Annual Meeting of the Chicago Linguistic Society*, 501–515. Chicago: Chicago Linguistic Society. <https://www.samzukoff.com/stantonzukoffclsaper>.
- . 2016b. Prosodic Identity in Copy Epenthesis and Reduplication: Towards a Unified Model of Transitive Correspondence. Ms., MIT. <https://www.samzukoff.com/stantonzukoffms>.
- . 2018. Prosodic Identity in Copy Epenthesis: Evidence for a Correspondence-Based Approach. *Natural Language & Linguistic Theory* 36(2):637–684. doi:10.1007/S11049-017-9385-9.
- Struijke, Caro. 2002. *Existential Faithfulness. A Study of Reduplicative TETU, Feature Movement, and Dissimilation*. New York & London: Routledge.
- Yu, Alan C. L. 2005. Toward a Typology of Compensatory Reduplication. In John Alderete, Chung-hye Han & Alexei Kochetov (eds.), *Proceedings of the 24th West Coast Conference on Formal Linguistics*, 397–405. Somerville, MA: Cascadilla Proceedings Project.
- Zuraw, Kie. 2000. Patterned Exceptions in Phonology. PhD Dissertation, UCLA.