Explaining unnatural gaps in variation

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Variation in yodfulness

Variation in the Possessive

a. Singular possessee

possessor	paːr ‘pair’	kaːr ‘damage’	tor ‘wake’
3s	paːr**ja**	kaːr**a**	tor**a** % tor**ja**
3p	paːr**juk**	kaːr**uk**	tor**uk** % tor**juk**

b. Plural possessee

possessor	paːr ‘pair’	kaːr ‘damage’	tor ‘wake’
1s	paːr**ja**im	kaːr**a**im	tor**a**im % tor**ja**im
2s	paːr**ja**id	kaːr**a**id	tor**a**id % tor**ja**id
3s	paːr**ja**i	kaːr**a**i	tor**a**i % tor**ja**i
1p	paːr**ja**ink	kaːr**a**ink	tor**a**ink % tor**ja**ink
2p	paːr**ja**itok	kaːr**a**itok	tor**a**itok % tor**ja**itok
3p	paːr**ja**ik	kaːr**a**ik	tor**a**ik % tor**ja**ik

Variation in yodfulness: conditioning

The phonological conditioning of possessive Y-allomorphs

	stem-final segment(s)	behaviour	examples (3S POSS)
a.	V	yodful	*kapu-*a*, kapu-**ja** ‘gate’
b.	$C_{[palatal]}$	yodless	laːɲ-**a**, *laːɲ-ja ‘daughter’
c.	$C_{[sibilant]}$	yodless	koʃ-**a**, *koʃ-ja ‘ram’
d.	$VC_{[nonpalatal,nonsibilant]}$	variation	*paːr-*a*, paːr-**ja** ‘pair’ kaːr-**a**, *kaːr-ja ‘damage’ tor-**a**, tor-**ja** ‘wake’
e.	$CC_{[nonpalatal,nonsibilant]}$	mainly yodful	*domb-*a*, domb-**ja** ‘hill’

Limitations on the variation in yodfulness: UNIFORMITY (lowering stems)

backness & height of the suffix-initial vowel:		a. back & mid (back nonlowering stems)	b. back & low (back lowering stems)	c. front & low (front unrounded stems)
Non-possessive	Plural	kar-ok, tor-ok	fal-ak	pɛr-ɛk
	ADJZ	kar-oʃ, tor-oʃ	fal-aʃ	pɛr-ɛʃ
	Verbz	kar-ol, tor-ol	fal-az	pɛr-ɛl
Possessive	1s	kar-om, tor-om	fal-am	pɛr-ɛm
	2s	kar-od, tor-od	fal-ad	pɛr-ɛd
	3s	kar-ja | kar-a tor-ja % tor-a	fal-a	pɛr-ɛ
uniformity with 3s		**no / no**	**yes**	**yes**
		‘arm | choir’ ‘wake’	‘wall’	‘trial’

Generalization 1: linking vowel uniformity

PU-V: Paradigm Uniformity in Suffix Vowel

Suffix-initial vowels agree within the paradigm of a stem.

AS-V: Analogical Support of Suffix Vowel

Given a choice of allomorphs, prefer the one(s) that result in PU-V.

Limitation on the variation in yodfulness: RECENT LOANS

yodful	yodless	
feːzbuk-jɑ	* feːzbuk-ɑ	‘Facebook-3S.POSS’
blog-jɑ	* blog-ɑ	‘blog-3S.POSS’
pɑb-jɑ	* pɑb-ɑ	‘pub-3S.POSS’

Generalization 2: stem identity

M-σ Align: Morph-Syllable Alignment

In a suffixed “novel” stem, align the right edge of the stem with a syllable boundary

AS-C: Analogical Support of Suffix Consonant

Given a choice of suffix allomorphs, prefer the one(s) that result in M-σ Align.

Variation in harmony: Bɛ stems

Variation in the harmonic behaviour of Bɛ stems

		a. back preference	b. front preference	c. no preference (vacillation)
C-initial suffix	DAT	matɛk-n̲ak	?*kontsɛrt-n̲ak	fotɛl-n̲ak
		?matɛk-n̲ɛk	kontsɛrt-n̲ɛk	fotɛl-n̲ɛk
	SUBL	matɛk-r̲a	?*kontsɛrt-r̲a	fotɛl-r̲a
		?matɛk-r̲ɛ	kontsɛrt-r̲ɛ	fotɛl-r̲ɛ
V-initial suffix	PLUR	matɛk-o̲k	?*kontsɛrt-o̲k	fotɛl-o̲k
		*matɛk-ɛ̲k	kontsɛrt-ɛ̲k	fotɛl-ɛ̲k
	1S.POSS	matɛk-o̲m	?*kontsɛrt-o̲m	fotɛl-o̲m
		*matɛk-ɛ̲m	kontsɛrt-ɛ̲m	fotɛl-ɛ̲m
		'maths'	'concert'	'armchair'

Generalization 3: harmonic consistency

HC-Affix: Harmonic Consistency in Affix

All the harmonic suffixes have identical harmonic values (F, B or F/B) within the paradigm of a stem.

B	F/B
mɑdrid-nɑk ‘Madrid-DAT’	mɑrtini-nɛk/nɑk
mɑdrid-i-nɑk ‘Madrid-ADJ-DAT’	

AS-H: Analogical Support of Harmonic Value

Given a choice of harmonic suffix allomorphs, prefer the one(s) that result in HC-Affix.

The independence yodfulness and backness harmony

- no variation in either dimension → 1 form

	Yodful	Yodless
Back	paːr-**jɑ** ‘pair’	kaːr-**ɑ** ‘damage’
Front	yːr-**jɛ** ‘space’	bøːr-**ɛ** ‘skin’

- variation in one dimension → 2 alternative forms: tor-**ɑ** % tor-**jɑ**
  notɛs-**yk** % notɛs-**uk**

- *orthogonality:* variation in both dimensions → 4 alternative forms are expected:

yodful F % yodless F % yodful B % yodless B

Asymmetry: absence of *yodless B* in 3POSS

Variation in yodfulness and variation in harmony are orthogonal

		Yodfulness	
		out of ZV	in ZV
Harmony	out of ZV	koʃ-**uk**	tor-**juk** % tor-**uk**
	in ZV	notɛs-**yk** % notɛs-**uk**	hotɛl-**jyk** % hotɛl-**yk** % hotɛl-**juk** % hotɛl-**uk**

Variation in yodfulness and variation in harmony are NOT orthogonal in 3s POSS

		Yodfulness	
		out of ZV	in ZV
Harmony	out of ZV	koʃ-**ɑ**	tor-**jɑ** % tor-**ɑ**
	in ZV	notɛs-**ɛ** % notɛs-**ɑ**	hotɛl-**jɛ** % hotɛl-**jɑ** % hotɛl-**ɛ** / *hotɛl-**ɑ**

Bɛ stems with *no harmonic preference in variation*: relative frequencies of possessive variants (Google search)

	yodful F	yodless F	yodful B	yodless B
3S (this stem type)	fotɛl-jɛ 4.2%	fotɛl-ɛ 93.9%	fotɛl-jɑ 1.8%	*fotɛl-ɑ 0.004%
3P (this stem type)	fotɛl-jyk 23.6%	fotɛl-yk 71.3%	fotɛl-juk 4.7%	fotɛl-uk 0.4%
3S (this stem)	*notɛs-jɛ 0.008%	notɛs-ɛ 89.3%	*notɛs-jɑ 0.008%	notɛs-ɑ 10.7%

Questions

1. With a stem that is variable in both dimensions why do we *not* find four alternative forms when the suffix vowel is low and why is it the **-ɑ** (i.e. the yodless back) form that is missing?

2. Why is the **-ɑ** form *not* missing when there are no yodful forms?

3. When a stem is variable in both dimensions why do forms behave differently when the suffix vowel is u~y vs. when it is ɑ~ɛ?

3POSS subparadigms

max 4 forms: 2^4=16 possible subparadigms <yodful F, yodless F, yodful B, yodless B>

3POSS subparadigms of prototypical stem classes

e.g.(variants: 3s-3p)	harmony	sib./ pal.#	lowering	novel	familiar	3s POSS <je e ja a>	3p POSS <jük ük juk uk>
a. tor (2-2)	B	–	–	–	–	0 0 1 1	0 0 1 1
b. koʃ	B	+	–	–	–	0 0 0 1	0 0 0 1
c. fɑl/hɑʃ	B	–/+	+	–	–	0 0 0 1	0 0 0 1
d. pɛr/keːʃ	F	–/+	×	–	–	0 1 0 0	0 1 0 0
e. blog (1–2)	B	–	–	+	–	0 0 1 0	0 0 **1** 1
f. koːʧ	B	+	–	+	–	0 0 0 1	0 0 0 1
g. tɛg (2–2)	F	–	×	+	–	**1** 1 0 0	**1** 1 0 0
h. bɛʤ	F	+	×	+	–	0 1 0 0	0 1 0 0
i. fotɛl (3–4)	F/B	–	–	+	–	1 **1** 1 0	1 **1** 1 1
j. notɛs (2–2)	F/B	+	–	+	–	0 **1** 0 1	0 **1** 0 1
k. hɑvɛr (2–3)	F/B	–	–	+	+	1 0 **1** 0	1 0 **1** 1
l. kolɛs (2–2)	F/B	+	–	+	+	0 1 0 **1**	0 1 0 **1**
constraints	AS-H	*Sib+j	AS-V	AS-C	AS-V		

Our analysis is like classical OT

- competing candidates
- evaluated on a ranked set of constraints

Our analysis is unlike classical OT: *candidates*

- ➢ not an infinite number of candidates by Gen (Archangeli and Pulleyblank 2015)
- ➢ (sub)paradigms, not individual forms (McCarthy 2005)
- ➢ the logically possible (sub)paradigms of forms resulting from the combination of one, more than one, all or none of the available affix allomorphs with the relevant stem (4 forms: 2^4=16 subparadigms)

Our analysis is unlike classical OT: *constraints*

- are not part of UG but language-specific generalisations over (sets of) surface forms
- evaluate each member of the candidate paradigm and the violations are added up (McCarthy 2005)
- have a *strict interpretation*: a candidate paradigm is penalised by a constraint Z (and Z is violated) if the candidate paradigm
    i. contains a form that is not facilitated by Z or
    ii. does not contain a form that is facilitated by Z

  e. g. if Z facilitates < 0 1 0 0 >, then
  (i) *< 1 . . . > and *< . . 1 . > and *< . . . 1 >
  (ii) *< . 0 . . >

- *constraint combination*: a form
    i. must occur if supported by at least one of the constraints
    ii. cannot occur if supported by neither constraint
    < 1 0 1 0 > + < 0 1 0 0 > = < 1 1 1 0 >

3S POSS subparadigm of *non-sibilant-final* Bɛ stems

fotɛl + {jɛ,ɛ,ja,a}		AS-H < 1;1 >	AS-C + AS-V <1010> + <0100>=<1110>
☞ fotɛl-jɛ, -ɛ, -ja	<1110>		
fotɛl-jɛ, -ɛ, -ja, -a	<1111>		* <1111>
fotɛl-jɛ, -ja	<1010>		* <1010>
fotɛl-ɛ, -ja	<0110>		* <0110>
fotɛl-jɛ, -ɛ, -a	<1101>		** <1101>
fotɛl-jɛ, -ja, -a	<1011>		** <1011>
fotɛl-ɛ, -ja, -a	<0111>		** <0111>
fotɛl-jɛ, -a	<1001>		*** <1001>
fotɛl-ɛ, -a	<0101>		*** <0101>
fotɛl-jɛ, -ɛ	<1100>	* <1100>	* <1100>
fotɛl-jɛ	<1000>	* <1000>	** <1000>
fotɛl-ɛ	<0100>	* <0100>	** <0100>
fotɛl-ja	<0010>	* <0010>	** <0010>
fotɛl-ja, -a	<0011>	* <0011>	*** <0011>
fotɛl-a	<0011>	* <0001>	**** <0001>
(no form)	<0000>	** <0000>	*** <0000>

The constraint AS-V: 3S POSS vs. 3P POSS

(stems *with no harmonic preference in variation*)

1/2 POSS forms (supporter)		3 POSS forms (supportee)	AS-V
1S	fotɛl-o̲m		
	fotɛl-ɛ̲m		
2S	fotɛl-o̲d	*fotɛl-a̲	no (o≠a)
	fotɛl-ɛ̲d	**fotɛl-ɛ̲**	**yes**
2P	fotɛl-o̲tok		
	fotɛl-ɛ̲tɛk		
1P	**fotɛl-u̲ŋk**	**fotɛl-u̲k**	**yes**
	fotɛl-y̲ŋk	**fotɛl-y̲k**	**yes**

3P POSS subparadigm of *non-sibilant-final* Bɛ stems

fotɛl + {jyk,yk,juk,uk}		AS-H <1;1>	AS-C + AS-V <1010>+<0101>=<1111>
☞ fotɛl-jyk, -yk, -juk, -uk	<1111>		
fotɛl-jyk, -yk, -juk	<1110>		* <1110>
fotɛl-jyk,-yk,-uk	<1101>		* <1101>
fotɛl-jyk, -juk, -uk	<1011>		* <1011>
fotɛl-yk, -juk, -uk	<0111>		* <0111>
fotɛl-yk, -uk	<0101>		** <0101>
fotɛl-jyk,-uk	<1001>		** <1001>
fotɛl-yk,-juk	<0110>		** <0110>
fotɛl-jyk,-juk	<1010>		** <1010>

3S POSS subparadigm of *sibilant-final* Bɛ stems

notɛs + {jɛ,ɛ,ja,a}		AS-H <1;1>	*Sib + j <0.0.>	AS-C + AS-V <1010>+<0100>=<1110>
☞ notɛs-ɛ, -*a*	<0101>			*** <0101>
notɛs-ɛ, -*ja*	<0110>		* <0110>	* <0110>
notɛs-jɛ, -*a*	<1001>		* <1001>	*** <1001>
notɛs-jɛ, -ɛ, -*ja*	<1110>		** <1110>	
notɛs-jɛ, -*ja*	<1010>		** <1010>	* <1010>
notɛs-jɛ,-ɛ,-*ja*,-*a*	<1111>		** <1111>	* <1111>
notɛs-ɛ	<0100>	* <0100>		** <0100>
notɛs-*a*	<0001>	* <0001>		**** <0111>

“Familiar” Bɛ stems with *BACK harmonic preference in variation*: relative frequencies of possessive variants (Google search)

	yodful F	yodless F	yodful B	yodless B
3S (this stem type)	havɛr-jɛ 0.5%	*havɛr-ɛ 0.012%	havɛr-ja 99.5%	*havɛr-a 0.004%
3P (this stem type)	havɛr-jyk 0.9%	*havɛr-yk 0.044%	havɛr-juk 98.8%	havɛr-uk 0.2%
3S (this stem)	*kolɛs-jyk 0%	kolɛs-yk 4.9%	*kolɛs-juk 0%	kolɛs-uk 95.1%

The constraint AS-V: 3S POSS vs. 3P POSS

(stems *with BACK harmonic preference in variation*)

1/2 POSS forms (supporter)		3 POSS forms (supportee)	V-support
1S	havɛr-o̲m		
	*havɛr-ɛ̲m		
2S	havɛr-o̲d	*havɛr-a̲	no (o≠*a*)
	*havɛr-ɛ̲d	*havɛr-ɛ̲	no (*-ɛ…)
2P	havɛr-o̲tok		
	*havɛr-ɛ̲tɛk		
1P	**havɛr-u̲ŋk**	**havɛr-u̲k**	**yes**
	*havɛr-y̲ŋk	*havɛr-y̲k	no (*-y…)

3S POSS subparadigm of *non-sibilant-final* FAMILIAR Bɛ stems

havɛr + {jɛ,ɛ,ja,a}		AS-H <1;1>	AS-C + AS-V <1010>+<0000>=<1010>
☞ havɛr-jɛ, -ja	<1010>		
havɛr-jɛ, -ɛ, -ja	<1110>		* <1110>
havɛr-jɛ, -ja, -a	<1011>		* <1011>
havɛr-jɛ, -ɛ, -ja, -a	<1111>		** <1111>
havɛr-ɛ, -a	<0101>		**** <0101>
havɛr-ja	<0010>	* <0010>	* <0010>
havɛr-jɛ	<1000>	* <1000>	* <1000>
havɛr-jɛ, -ɛ	<1100>	* <1100>	** <1100>

3P POSS subparadigm of *nonsibilant-final* FAMILIAR Bɛ stems

havɛr + {jyk,yk,juk,uk}		**AS-H <1;1>**	**AS-C + AS-V <1010> + <0001>=<1011>**
☞ havɛr-jyk, -juk, -uk	<1011>		
havɛr-jyk, -juk	<1010>		* <1010>
havɛr-jyk,-yk,-juk,-uk	<1111>		* <1111>
havɛr-jyk, -uk	<1001>		* <1001>
havɛr-yk, -uk	<0101>		*** <0101>
havɛr-juk, -uk	<0011>	* <0011>	* <0011>

3S POSS subparadigm of *sibilant-final* FAMILIAR Bɛ stems

kolɛs + {jɛ,ɛ,jɑ,ɑ}	AS-H <1;1>	*Sib + j <0.0.>	AS-C + AS-V <1010> + <0000>=<1010>
☞ kolɛs-ɛ, -ɑ <0101>			**** <**0101**>
kolɛs-jɛ, -jɑ <1010>		** <**1**0**1**0>	
kolɛs-jɛ, -ɛ, -ɑ <1101>		* <**1**101>	*** <1**101**>
kolɛs-jɛ, -ɛ, -jɑ <1110>		** <**1**1**1**0>	*<1**1**10>
kolɛs-jɛ, -ɛ, -jɑ, -ɑ <1111>		** <**1**1**1**1>	** <1**1**1**1**>
kolɛs-ɛ <0100>	* <01**00**>		*** <**010**0>

Relative frequencies of possessive variants (Google search)

3P this stem:	*blog-jyk 0%	*blog-yk 0%	blog-juk **92.1%**	blog-uk 7.9%
3s this stem:	tɛg-jɛ **91.5%**	tɛg-ɛ 8.5%	*tɛg-ja 0%	*tɛg-*a* 0%
3s this type:	fotɛl-jɛ 4.2%	fotɛl-ɛ **93.9%**	fotɛl-ja 1.8%	*fotɛl-*a* 0.004%
3P this type:	fotɛl-jyk 23.6%	fotɛl-yk **71.3%**	fotɛl-juk 4.7%	fotɛl-uk 0.4%
3s this stem:	*notɛs-jɛ 0.008%	notɛs-ɛ **89.3%**	*notɛs-ja 0.008%	notɛs-*a* 10.7%
3s this type:	havɛr-jɛ 0.5%	*havɛr-ɛ 0.012%	havɛr-ja **99.5%**	*havɛr-*a* 0.004%
3P this type:	havɛr-jyk 0.9%	*havɛr-yk 0.044%	havɛr-juk **98.8%**	havɛr-uk 0.2%
3P this stem:	*kolɛs-jyk 0%	kolɛs-yk 4.9%	*kolɛs-juk 0%	kolɛs-uk **95.1%**

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- & harmony in general