

Class 15

Alternation with Zero

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Samoan

Perfective verbs in Samoan

- Here are some verb forms from Samoan (Austronesian): simple verbs are on the left, perfective verbs (\approx ‘have X’ed’) are on the right.

Simple	Perfective	Gloss	Simple	Perfective	Gloss
olo	oloia	‘rub’	naumati	naumatia	‘be waterless’
lafo	lafoia	‘cast’	sa:uni	sa:unia	‘prepare’
aʻa	aʻaia	‘face’	seʻi	seʻia	‘be shy’
usu	usua	‘get up and go early’	lele	lelea	‘fly’
tau	tauia	‘reach a destination’	suʻe	suʻea	‘uncover’
taui	tauia	‘repay’	taʻe	taʻea	‘smash’
sa:ʻili	sa:ʻilia	‘look for’	tafe	tafea	‘flow’
vaʻai	vaʻaia	‘face each other’	ta:upule	ta:upulea	‘confer’
paʻi	paʻia	‘touch’	palepale	palepalea	‘hold firm’

- Sometimes [-ia], sometimes [-a].

Samoan

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paʻi	paʻia	‘touch’	palepale	palepalea	‘hold firm’

- Sometimes [-ia], sometimes [-a]. **What conditions the difference?**

Samoan

The perfective suffix

- If we isolate the sounds in the perfective that are not shared with the basic verb, we get different results for different roots:

Simple	Perfective	Gloss	Simple	Perfective	Gloss
olo	olo- ia	‘rub’	naumati	naumati- a	‘be waterless’
lafo	lafo- ia	‘cast’	sa:uni	sa:uni- a	‘prepare’
aŋa	aŋa- ia	‘face’	seŋi	seŋi- a	‘be shy’
usu	usu- ia	‘get up and go early’	lele	lele- a	‘fly’
tau	tau- ia	‘reach a destination’	suʔe	suʔe- a	‘uncover’
taui	taui- a	‘repay’	taʔe	taʔe- a	‘smash’
sa:ʔili	sa:ʔili- a	‘look for’	tafe	tafe- a	‘flow’
vaŋai	vaŋai- a	‘face each other’	ta:upule	ta:upule- a	‘confer’
paʔi	paʔi- a	‘touch’	palepale	palepale- a	‘hold firm’

- Sometimes [-**ia**], sometimes [-**a**]. **What conditions the difference?**

Samoan

Alternations with the perfective suffix

- The roots where we see [-a] all have a final **front vowel** ([i,e]). The roots where we see [-ia] don't.

Simple	Perfective	Gloss
olo	olo- ia	'rub'
lafo	lafo- ia	'cast'
aŋa	aŋa- ia	'face'
usu	usu- ia	'get up and go early'
tau	tau- ia	'reach a destination'
taui	taui- a	'repay'
sa:ʔili	sa:ʔili- a	'look for'
vaŋai	vaŋai- a	'face each other'
paʔi	paʔi- a	'touch'

Simple	Perfective	Gloss
naumati	naumati- a	'be waterless'
sa:uni	sa:uni- a	'prepare'
seŋi	seŋi- a	'be shy'
lele	lele- a	'fly'
suʔe	suʔe- a	'uncover'
taʔe	taʔe- a	'smash'
tafe	tafe- a	'flow'
ta:upule	ta:upule- a	'confer'
palepale	palepale- a	'hold firm'

Samoan

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olo	olo- ia	'rub'
lafo	lafo- ia	'cast'
aʔa	aʔa- ia	'face'
usu	usu- ia	'get up and go early'
tau	tau- ia	'reach a destination'
taui	taui- a	'repay'
sa:ʔili	sa:ʔili- a	'look for'
vaʔai	vaʔai- a	'face each other'
paʔi	paʔi- a	'touch'

Simple	Perfective	Gloss
naumati	naumati- a	'be waterless'
sa:uni	sa:uni- a	'prepare'
seʔi	seʔi- a	'be shy'
lele	lele- a	'fly'
suʔe	suʔe- a	'uncover'
taʔe	taʔe- a	'smash'
tafe	tafe- a	'flow'
ta:upule	ta:upule- a	'confer'
palepale	palepale- a	'hold firm'

▷ Can we use this to explain what's going on?

Samoan

Understanding the perfective alternation

- We can characterize the distribution with morphological rules:

- (1) a. PERFECTIVE → [-ia] / BackV_
b. PERFECTIVE → [-a] / FrontV_

★ To explain this with a *phonological* rule, **what would we have to say?**

Samoan

Understanding the perfective alternation

- We can characterize the distribution with morphological rules:

- (1) a. PERFECTIVE \rightarrow [-**ia**] / BackV_
b. PERFECTIVE \rightarrow [-**a**] / FrontV_

★ To explain this with a *phonological* rule, **what would we have to say?**

- **Insert** [i] after back vowels (suffix UR is /-**a**/):

- (2) / \emptyset / \rightarrow [i] / BackV_(a)

or

- **Delete** /i/ after front vowels (suffix UR is /-**ia**/):

- (3) /i/ \rightarrow [\emptyset] / FrontV_(a)

★ **Deletion and insertion (“epenthesis”)** are common types of rules across languages. This will be the focus of this unit.

Samoan

Understanding the perfective alternation

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b. PERFECTIVE \rightarrow [-**a**] / FrontV_

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- **Insert** [i] after back vowels (suffix UR is /-**a**/):

- (2) / \emptyset / \rightarrow [i] / BackV_(a)

or

- **Delete** /i/ after front vowels (suffix UR is /-**ia**/):

- (3) /i/ \rightarrow [\emptyset] / FrontV_(a)

▷ **Which of these is better for our data?**

Samoan

Which rule?

- We see plenty of back vowels that not followed by [i] (**✗ insertion rule**)
- We don't see any front vowels followed by [i] (**✓ deletion rule**)

Simple	Perfective	Gloss
olo	olo- ia	'rub'
lafo	lafo- ia	'cast'
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suʔe	suʔe- a	'uncover'
taʔe	taʔe- a	'smash'
tafe	tafe- a	'flow'
ta:upule	ta:upule- a	'confer'
palepale	palepale- a	'hold firm'

Samoan

Deletion in Samoan

(3) Deletion: /i/ → [∅] / FrontV_

UR	SR	UR	SR
/olo- ia /	→ [olo- ia]	/naumat i-ia /	→ [naumat i-a]
/lafo- ia /	→ [lafo- ia]	/sa:uni- ia /	→ [sa:uni- a]
/aŋa- ia /	→ [aŋa- ia]	/seŋ i-ia /	→ [seŋ i-a]
/usu- ia /	→ [usu- ia]	-----	
/tau- ia /	→ [tau- ia]	/lele- ia /	→ [lele- a]
/tau i-ia /	→ [tau i-a]	/su?e- ia /	→ [su?e- a]
/sa:ʔili- ia /	→ [sa:ʔili- a]	/ta?e- ia /	→ [ta?e- a]
/vaŋai- ia /	→ [vaŋai- a]	/tafe- ia /	→ [tafe- a]
/paʔi- ia /	→ [paʔi- a]	/ta:upule- ia /	→ [ta:upule- a]
		/palepale- ia /	→ [palepale- a]

- Underlying representation of PERFECTIVE is /-**ia**/:
- ★ Underlying representation of the root is identifiable from the simple form.

Samoan

More data

- Here's some more perfective verbs that complicate the picture.

Simple	Perfective	Gloss	Simple	Perfective	Gloss
tu:	tu:lia	'stand'	au	aulia	'flow on'
tau	taulia	'cost'	ma:tau	ma:taulia	'observe'
ʔalo	ʔalofia	'avoid'	ili	ilifia	'blow'
oso	osofia	'jump'	ulu	ulufia	'enter'
asu	asuŋia	'smoke'	soa	soaŋia	'have a friend'
pole	poleŋia	'be anxious'	fesili	fesiliŋia	'question'
milo	milosia	'twist'	laʔa	laʔasia	'step'
valu	valusia	'scrape'	taŋi	taŋisia	'cry'
api	apitia	'be lodged'	mataʔu	mataʔutia	'fear'
lava:	lava:tia	'be able'	oʔo	oʔotia	'arrive'
siʔo	siʔomia	'be enclosed'	moʔo	moʔomia	'admire'
sopo	sopoʔia	'go across'	fana	fanaʔia	'shoot'

- ▷ Going through the same process as before, **what different forms of the perfective suffix do we see here?**

Samoan

Perfective allomorphy?

★ We get 7 different allomorphs, each with a different consonant.

Simple	Perfective	Gloss	Simple	Perfective	Gloss
tu:	tu:- lia	‘stand’	au	au- lia	‘flow on’
tau	tau- lia	‘cost’	ma:tau	ma:tau- lia	‘observe’
ʔalo	ʔalo- fia	‘avoid’	ili	ili- fia	‘blow’
oso	oso- fia	‘jump’	ulu	ulu- fia	‘enter’
asu	asu- ŋia	‘smoke’	soa	soa- ŋia	‘have a friend’
pole	pole- ŋia	‘be anxious’	fesili	fesili- ŋia	‘question’
milo	milo- sia	‘twist’	laʔa	laʔa- sia	‘step’
valu	valu- sia	‘scrape’	taʔi	taʔi- sia	‘cry’
api	api- tia	‘be lodged’	mataʔu	mataʔu- tia	‘fear’
lava:	lava:- tia	‘be able’	oʔo	oʔo- tia	‘arrive’
siʔo	siʔo- mia	‘be enclosed’	moʔo	moʔo- mia	‘admire’
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pole	pole- ŋia	‘be anxious’	fesili	fesili- ŋia	‘question’
milo	milo- sia	‘twist’	laʔa	laʔa- sia	‘step’
valu	valu- sia	‘scrape’	taji	taji- sia	‘cry’
api	api- tia	‘be lodged’	mataʔu	mataʔu- tia	‘fear’
lava:	lava:- tia	‘be able’	oʔo	oʔo- tia	‘arrive’
siʔo	siʔo- mia	‘be enclosed’	moʔo	moʔo- mia	‘admire’
sopo	sopo- ʔia	‘go across’	fana	fana- ʔia	‘shoot’

▷ Do we need to posit 7 different perfective suffixes?

Samoan

A different morphological segmentation

- For the other data, we determined that the UR of the perfective was **/-ia/**.
- If we assume **/-ia/** for this new data, we can break them up differently:

Simple	Perfective	Gloss	Simple	Perfective	Gloss
tu:	tu:l- ia	‘stand’	au	aul- ia	‘flow on’
tau	taul- ia	‘cost’	ma:tau	ma:taul- ia	‘observe’
?alo	?alof- ia	‘avoid’	ili	ilif- ia	‘blow’
oso	osof- ia	‘jump’	ulu	uluf- ia	‘enter’
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api	apit- ia	‘be lodged’	mata?u	mata?ut- ia	‘fear’
lava:	lava:t- ia	‘be able’	o?o	o?ot- ia	‘arrive’
si?o	si?om- ia	‘be enclosed’	mo?o	mo?om- ia	‘admire’
sopo	sopo?- ia	‘go across’	fana	fana?- ia	‘shoot’

Samoan

Consonant deletion

- ★ The unpredictable consonants are actually part of the UR of the root:
 → These consonants get **deleted** in the *simple forms*.

Simple (UR)	Perfective (UR)
/tu: l /	/tu:l- ia /
/tau l /	/taul- ia /
/ʔalo f /	/ʔalof- ia /
/oso f /	/osof- ia /
/asu ŋ /	/asuŋ- ia /
/pole ŋ /	/poleŋ- ia /
/milo s /	/milos- ia /
/valu s /	/valus- ia /
/api t /	/apit- ia /
/lava: t /	/lava:t- ia /
/siʔo m /	/siʔom- ia /
/sopo ʔ /	/sopoʔ- ia /

Samoan

Consonant deletion

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→ These consonants get **deleted** in the *simple forms*.

Simple (UR)	Perfective (UR)
/tu: l /	/tu:l- ia /
/tau l /	/taul- ia /
/ʔalo f /	/ʔalof- ia /
/oso f /	/osof- ia /
/asu ŋ /	/asuŋ- ia /
/pole ŋ /	/poleŋ- ia /
/milo s /	/milos- ia /
/valu s /	/valus- ia /
/api t /	/apit- ia /
/lava: t /	/lava:t- ia /
/siʔo m /	/siʔom- ia /
/sopo ʔ /	/sopoʔ- ia /

▷ **What's the deletion rule?**

Samoan

Samoan summary

- By proposing two deletion rules (3,4), we've reduced the apparent complexity of the system.

(3) /i/ → ∅ / FrontV_

(4) C → ∅ / _#

→ Instead of there being at least 9 different allomorphs of the perfective suffix, there is only one UR and two rules.

- * Deletion rules can be conditioned by various kinds of environments. We'll think more about that after spring break.

Back to Bukusu

Nasal place assimilation and postnasal voicing in Bukusu again

- Recall the following data from Bukusu:

IMPERATIVE	1SG PRES. /n-/
tʃa	n- tʃ a
tʃexa	n- tʃ exa
tʃutʃu:ŋga	n- tʃ utʃu:ŋga
tala:nda	n-dala:nda
te:xa	n-de:xa
tira	n-di:ra
pi:ma	m-bi:ma
pakala	m-bakala
ketulula	ŋ-getulula
kona	ŋ-gona
kula	ŋ-gula
kwa	ŋ-gwa

- Nasals assimilate to the place of a following obstruent:

(5) **Nasal place assimilation**
 /+nasal/ → [αPLACE] / _[αPLACE, -son]

- Obstruents take on the voicing of a preceding nasal consonant:

(6) **Post-nasal voicing**
 /-voice, -son/ → [+voice] / [+nasal]_

Back to Bukusu

Nasals and fricatives

- All of the new forms have roots beginning in voiceless fricatives.

IMPERATIVE	1SG PRES. /n-?/	IMPERATIVE	1SG PRES. /n-/
fuma	fuma	tʃ a	n-tʃ a
fu:ndixa	fu:ndixa	tʃ exa	n-tʃ exa
fwa	fwa	tʃ utʃu:ŋga	n-tʃ utʃu:ŋga
xala	xala	t ala:nda	n-d ala:nda
xala:ŋga	xala:ŋga	t exa	n-d exa
xwe:sa	xwe:sa	t i:ra	n-d i:ra
se:sa	se:sa	p i:ma	m-b i:ma
si:mbwa	si:mbwa	p akala	m-b akala
somya	somya	k etulula	ŋ-g etulula
sukuwa	sukuwa	k ula	ŋ-g ula
sya	sya	k wa	ŋ-g wa

▷ What would we need to keep using /n-/ as the UR?

Back to Bukusu

Nasal deletion

1SG PRES.	
UR	SR
/n-fuma/	→ [fuma]
/n-fu:ndixa/	→ [fu:ndixa]
/n-fwa/	→ [fwa]
/n-xala/	→ [xala]
/n-xala:ŋga/	→ [xala:ŋga]
/n-xwe:sa/	→ [xwe:sa]
/n-se:sa/	→ [se:sa]
/n-si:mbwa/	→ [si:mbwa]
/n-somya/	→ [somya]
/n-sukuwa/	→ [sukuwa]
/n-sya/	→ [sya]

- We can maintain a single UR by positing a *nasal deletion rule*:

(7) $N \rightarrow \emptyset / _(\text{voiceless}) \text{ fricative}$

Back to Bukusu

Nasal deletion and post-nasal voicing

1SG PRES.	
UR	SR
/n-fuma/	→ *[vuma]
/n-fu:ndixa/	→ *[vu:ndixa]
/n-fwa/	→ *[vwa]
/n-xala/	→ *[ɣala]
/n-xala:ŋga/	→ *[ɣala:ŋga]
/n-xwe:sa/	→ *[ɣwe:sa]
/n-se:sa/	→ *[ze:sa]
/n-si:mbwa/	→ *[zi:mbwa]
/n-somya/	→ *[zomya]
/n-sukuwa/	→ *[zukuwa]
/n-sya/	→ *[zya]

(6) /-voi,-son/ → [+voi] / N_

- The context for *post-nasal voicing* is met by these inputs, so we might have expected it to apply.
- ★ There are several possible solutions.

Back to Bukusu

Solution 1: change the rule

1SG PRES.	
UR	SR
/n-fuma/	→ *[vuma]
/n-fu:ndixa/	→ *[vu:ndixa]
/n-fwa/	→ *[vwa]
/n-xala/	→ *[ɣala]
/n-xala:ŋga/	→ *[ɣala:ŋga]
/n-xwe:sa/	→ *[ɣwe:sa]
/n-se:sa/	→ *[ze:sa]
/n-si:mbwa/	→ *[zi:mbwa]
/n-somya/	→ *[zomya]
/n-sukuwa/	→ *[zukuwa]
/n-sya/	→ *[zya]

- Perhaps the simplest solution:
→ Specify [-cont] in the target of the rule.

(8) **Post-nasal voicing (version 2):**
/−voi, −son, −cont/ → [+voi] / N_

- The post-nasal voicing rule will simply not apply to fricatives.
- * This captures the data, but might lose out on some generality.

Back to Bukusu

Solution 2: rule ordering

1SG PRES.	
UR	SR
/n-fuma/	→ *[vuma]
/n-fu:ndixa/	→ *[vu:ndixa]
/n-fwa/	→ *[vwa]
/n-xala/	→ *[ɣala]
/n-xala:ŋga/	→ *[ɣala:ŋga]
/n-xwe:sa/	→ *[ɣwe:sa]
/n-se:sa/	→ *[ze:sa]
/n-si:mbwa/	→ *[zi:mbwa]
/n-somya/	→ *[zomya]
/n-sukuwa/	→ *[zukuwa]
/n-sya/	→ *[zya]

- We can also capture the data if we say that *nasal deletion happens before post-nasal voicing*:

INPUT	/n-fuma/
Nasal deletion	fuma
Post-nasal voicing	<i>cannot apply</i>
OUTPUT	[fuma]

Back to Bukusu

Solution 2: rule ordering

1SG PRES.	
UR	SR
/n-fuma/	→ *[vuma]
/n-fu:ndixa/	→ *[vu:ndixa]
/n-fwa/	→ *[vwa]
/n-xala/	→ *[ɣala]
/n-xala:ŋga/	→ *[ɣala:ŋga]
/n-xwe:sa/	→ *[ɣwe:sa]
/n-se:sa/	→ *[ze:sa]
/n-si:mbwa/	→ *[zi:mbwa]
/n-somya/	→ *[zomya]
/n-sukuwa/	→ *[zukuwa]
/n-sya/	→ *[zya]

- This **rule ordering** would be crucial, because the wrong result would happen if we reversed it:

INPUT	/n-fuma/
Post-nasal voicing	nvuma
Nasal deletion	vuma
OUTPUT	*[vuma]

- * Rule ordering can solve a number of complicated problems like this cross-linguistically.

Back to Bukusu

Solution 3: a ban on voiced fricatives

1SG PRES.	
UR	SR
/n-fuma/	→ *[vuma]
/n-fu:ndixa/	→ *[vu:ndixa]
/n-fwa/	→ *[vwa]
/n-xala/	→ *[ɣala]
/n-xala:ŋga/	→ *[ɣala:ŋga]
/n-xwe:sa/	→ *[ɣwe:sa]
/n-se:sa/	→ *[ze:sa]
/n-si:mbwa/	→ *[zi:mbwa]
/n-somya/	→ *[zomya]
/n-sukuwa/	→ *[zukuwa]
/n-sya/	→ *[zya]

- One more solution: simply say that the language **doesn't allow voiced fricatives**.
 - True of Bukusu as long as [β] is an approximant not a fricative.
- This “constraint” would prevent post-nasal voicing from applying to an underlying fricative, even without adjusting the rule.

(9) ***VoicedFricative**: No voiced fricatives.

INPUT	/n-fuma/
Post-nasal voicing	BLOCKED BY *VOICEDFRICATIVE
Nasal deletion	fuma
OUTPUT	[fuma]