The linearization of morphological weight

Jochen Trommer & Eva Zimmermann (University of Leipzig)

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Major Theories of Affix Linearization

Phonological Dislocation

Affixes are prefixes or suffixes to the base, but may infix under the pressure of phonological constraints

(Moravcsik 1977, Prince&Smolensky 1993/2002, Halle 2003, Horwood 2002, Klein 2005)

Morphological pivot affixation

Affixes are prefixes or suffixes to specific (possibly internal) base positions ('pivots') and cannot be dislocated by phonological processes

(Yu 2002, Yu 2007)

Tagalog *um*-Infixation

(Bloomfield 1933, McCarthy&Prince 1993, Zoll 1996)

(1)

Base	Actor Focus	
abot	**um**abot	'reach for, pf.'
tawag	t**um**awag	'call, pf.'

Infixation as Affixation+Phonological Dislocation

(Horwood 2002)

(2) um ↔ ___ Base[

(3) *V-initial Base*

um-abot	NoCoda	Lin
☞ a. **u.m**a.bot	*	
b. a.**um**.bot	**!	*
c. a.b**u.m**ot	*	*!*

(4) *C-initial Base*

um-tawag	NoCoda	Lin
a. **um**.ta.wag	**!	
☞ b. t**u.m**a.wag	*	*
c. ta.**um**.wag	**!	**

Infixation as Pivot Affixation

(Yu 2007)

(5) um ↔ $_{\text{Base}}[\ \ldots\ \underline{\quad}\ \text{V}$

Infixation as Pivot Affixation

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(5) um ↔ $_{\text{Base}}[\ \ldots\ \underline{\quad}\ \text{V}$

(6) *Possible pivots for affixation*

a. **Initial pivot**
   (i) First consonant/onset
   (ii) First vowel/nucleus
   (iii) First syllable

b. **Final pivot**
   (i) Final vowel/nucleus
   (ii) Final syllable

c. **Prominence pivot**
   (i) Stressed syllable
   (ii) Stressed vowel/nucleus

Mora affixation

(7) *Emphatic adjectives in Shizuoka Japanese* (Davis&Ueda 2006)

	Adjective	Emphatic Form				
a.	katai	ka**t:**ai	‘hard’			
	osoi	o**s:**oi	‘slow’	CV.C̥...	⇒	CV.C̥:...
	takai	ta**k:**ai	‘high’			
b.	hade	ha**n**de	‘showy’			
	ozoi	o**n**zoi	‘terrible’	CV.C̬...	⇒	CV**N**.C̬...
	nagai	naŋgai	‘long’			
c.	zonzai	z**o:**nzai	‘impolite’			
	sup:ai	s**u:**p:ai	‘sour’	CVC.C...	⇒	CV:C.C...
	ok:anai	**o:**k:anai	‘scary’			

Central Question of this Talk

How are μ-affixes linearized?

Linearization of mora affixes

Phonological Dislocation

The μ strives to be a prefix/suffix (morpheme-specific ALIGN/EDGEMOST) but may infix under the pressure of phonological constraints

(SamekLodovici 1992, Grimes 2002, Davis&Ueda 2002)

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Prosodic Circumscription

Bases can be (recursively) delimited to certain prosodically defined portions and the outparsed portion or the extraprosodic remainder can then be targetted by further operations like prefixation/suffixation.

(Lombardi&McCarthy 1991)

Our claim

➢ μ-affixation is pivot affixation
and there is no phonological dislocation for μ-affixes

A typology of mora affixation

Morphological μ's

I. A μ as morpheme

(8) *Gidabal* (Geytenbeek&Geytenbeek 1971, Kenstowicz&Kisseberth 1977)

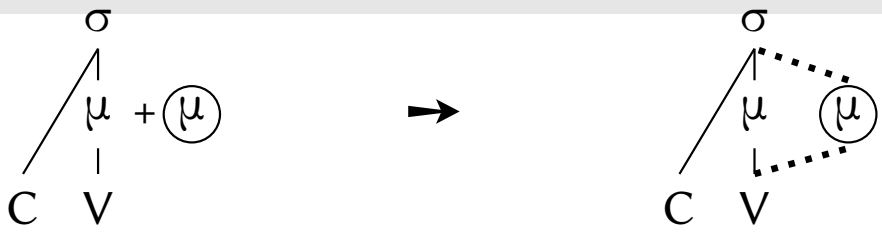
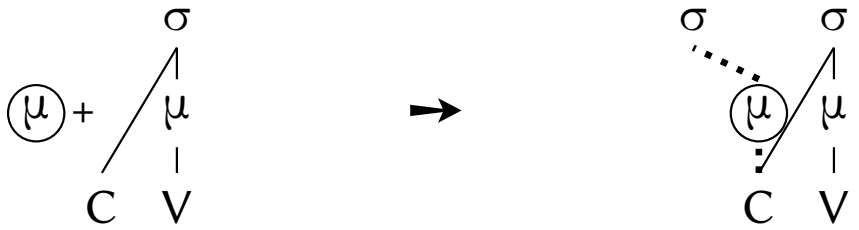
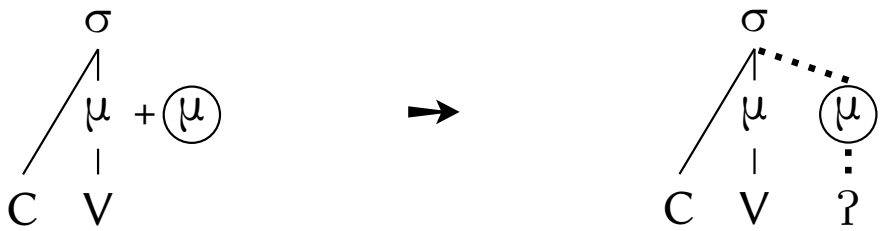
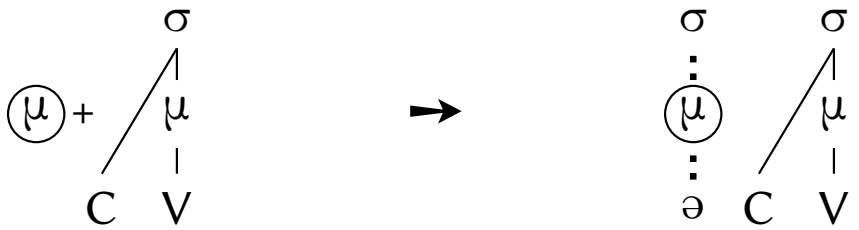
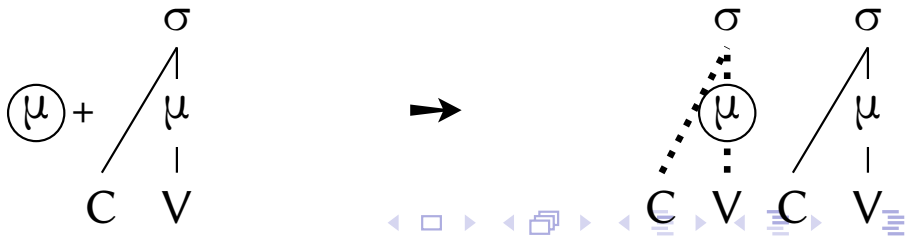
Base		Imperative
gida	'to tell'	gida:
ma	'to put'	ma:

II. A μ is part of a morpheme

(9) *Plural suffix /–weʔ/ in Zuni* (Newman 1965, Saba Kirchner 2007)

Base		Plural
lupa	'box of ashes'	lupa:weʔ
homata	'juniper tree'	homata:weʔ

Realization of a μ-affix

a. **Vowel lengthening**	
b. **Gemination**	
c. C-Epenthesis	
d. V-Epenthesis	
e. Reduplication	

Empirical survey on μ-affixes: selection criteria

(10) The set of phonologically predictable allomorphs *A* expresses a morphological category *M*

a. **μ-affixation**
Either (i) or (ii) holds:
(i) a 'strictly μ-induced' operation (gemination, vowel lengthening) is one operation in *A*
(ii) at least two different 'potentially μ-induced' operations (C- or V-epenthesis, μ-sized reduplication) are part of *A*

b. **Exclusion of templatic morphology**
Not all forms expressing *M* through *A* conform to a prosodic shape.

c. **Relevance for linearization**
At least some bases to which *A* apply are polysyllabic.

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➙ 26 μ-affixation patterns in 24 languages distributed over 19 families

(classification according to AUTOTYP)

Language	Stock	Area	Continent
Shizuoka Japanese	Japanese	N Coast Asia	N-C Asia
Alabama	Muskogean	E North America	EN America
Zuni	Zuni	Basin and Plains	EN America
Lardil	Tangkic	N Australia	Australia
Gidabal	Pama-Nyungan	S Australia	Australia
Arbizu Basque	Basque	Europe	W and SW Eurasia
Slovak	Slavic	Europe	W and SW Eurasia
Hausa	Chadic	African Savannah	Africa
Asante Twi	Kwa	African Savannah	Africa
Luganda	Benue-Congo	S Africa	Africa
Aymara	Jaqui	Andean	S America
Quechua	Quechuan	Andean	S America
Guajiro	Arawakan	NE South America	S America
Southern Sierra Miwok	Yokuts-Utian	California	WN America
Nootka	Wakashan	Alaska-Oregon	WN America
Diegueño	Yuman	California	C America
Saanich	Salishan	Alaska-Oregon	WN America
Upriver Halkomelem	Salishan	Alaska-Oregon	WN America
Hiaki	Uto-Aztecan	Mesoamerica	C America
Shoshone	Uto-Aztecan	Mesoamerica	C America
Tepecano	Uto-Aztecan	Mesoamerica	C America
Tawala	Austronesian	Oceania	NG and Oceania
Keley-i	Austronesian	Oceania	S/SE Asia
Marshallese	Austronesian	Oceania	S/SE Asia

Where (in their base) are morphological μ's realized?

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➙ **on the consonant following the first vowel.**

(11) *Shoshone* (Crum&Dayley 1993, Haugen 2008, McLaughlin 2012)

Base		Durative
kati	'sit'	kat:i
jakai	'cry'	jak:ai
nemi	'travel'	nem:i
maka	'feed'	mak:a

Where (in their base) are morphological μ's realized?

➙ **on the final vowel.**

(12) *Gidabal* (Geytenbeek&Geytenbeek 1971, Kenstowicz&Kisseberth 1977)

Base		Imperative
gida	'to tell'	gid**aː**
ma	'to put'	m**aː**
jaga	'to fix'	jag**aː**
gaːda-li-wa	'keep on chasing'	gaːdaliw**aː**

	Language	#(C)	V	C	…	C	V	(C)#
1.	Saanich	■	■	■				
2.	Tawala	■	■					
3.	U. Halkomelem	■	■					
4.	Luganda	■						
5.	Marshallese	■						
6.	Keley-i I	■						
7.	Hiaki I		■					
8.	Sh. Japanese		■	■				
9.	Tepecano			■				
10.	Keley-i II			■				
11.	Shoshone			■				
12.	Hiaki II			■				
13.	Alabama					■	■	
14.	Arbizu Basque						■	
15.	Gidabal						■	
16.	Zuni						■	
17.	Hausa						■	
18.	Diegeño						■	
19.	Slovak						■	
20.	Nootka						■	
21.	Asante Twi						■	■
22.	Guajiro						■	■
23.	Quechua						■	■
24.	Lardil						■	■
25.	S. Sierra Miwok						■	■
26.	Aymara						■	■

Language(s)	**Pivot**	*Examples*		
Saanich	#μ__	μ (μ) s ə q	μ (μ) μ μ w e ʔ q ə s	μ (μ) μ q e q ə n
Tawala	#__μ	(μ)μ μ μ t aː t a w a	(μ) μ μ g e g a e	
Hiaki I	#__μ	(μ)μ μ μ iː v a k t a		
U. Halkomelem	#μ__	(μ)μ h i l t	(μ) μ μ q i q ə s ə t	(μ) μ h ə m q ə t
Lug., Marsh., Keley-i I	#__μ	(μ)μ μ k u b o		
Sh. Japanese	#μ__	μ (μ) μ h a n d e	μ (μ) μ k a tː ai	μ (μ) μ z o n z ai
Tepecano	#σ__	μμ (μ) μ iː pː u r	μ (μ) μ μ g o ʔ g o c	
Shosh., Hiaki II, Keley-i II	#__μ	μ (μ) μ j ɨ kː w i		
Alabama	__μ#	μ (μ)μ b a l aː	μ (μ) μ c o bː a	
Gid., Zuni, Hausa, Dieg., Slovak, Nootka	μ__#	μ μ(μ) j a g aː		
Asante Twi	μ__#	μ μ μ(μ) o b i s aː	μ (μ) n o mː	
Quech., Lard., S.S.Miwok, Aym.	μ__#	μ μ μ(μ) j o h k aː	μμ μ μ (μ) h aː j a ŋ k ɨ	

μ-affixation as Pivot Affixation

Pivots for μ-affixation

- first/last μ
- first σ

→ they describe all and only the possible landing sites for μ-affixes

Against phonological μ-dislocation

Arguments against Phonological μ-Dislocation

- **Lack of non-local infixation**
- **Lack of Variable Infixation**
- **Cases of Fixed Infixation**
- **Morphologically contrastive μ-affixes**

The general logic of μ-dislocation approaches

(13) *Long vowels in Gidabal*

gida, $^{\mu}$	*C:	ALIGN(μ_{IMP},R)	*V:
☞ a. gida$^{\mu}$ [gida:]		*	*
b. gid$^{\mu}$a [gid:a]	*!	**	

The general logic of μ-dislocation approaches

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☞ a. gida$^{\mu}$ [gida:]		*	*
b. gid$^{\mu}$a [gid:a]	*!	**	

(14) *Geminates in Shoshone*

maka, μ	*#C:	*V:	Align(μ$_{Dur}$,R)	*C:
a. m$^{\mu}$aka [m:aka]	*!			*
b. ma$^{\mu}$ka [ma:ka]		*!	*	
☞ c. mak$^{\mu}$a [mak:a]			**	*

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Lack of non-local infixation

- the pivots first/last μ and first σ are sufficient to predict all attested cases of μ-affixation

Lack of non-local infixation

- the pivots first/last μ and first σ are sufficient to predict all attested cases of μ-affixation
- phonological dislocation accounts inherently predict non-local infixation

(15) *Non-local gemination in unattested Shoshone'*

Base	μ-affixed form
gadali	gada**l:**i
pukalimbu	puka**l:**imbu
sanagumkilte	sana**g:**umkilte

Serious misprediction: non-local infixation

(16) **Shoshone'*

sanagumkilte, $^{\mu}$		*V:	DepLink$_{\#\sigma}$	Align(μ,L)	*C:
a.	sa$^{\mu}$nagumkilte [sa:nagumkilte]	*!	*	*	
b.	san$^{\mu}$agumkilte [san:agumkilte]		*!	**	*
c.	sana$^{\mu}$gumkilte [sana:gumkilte]	*!		***	
☞ d.	sanag$^{\mu}$umkilte [sanag:umkilte]			****	*

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A serious misprediction: Shoshone”

- only CV, CVC- syllables are licit
- the leftmost C that can be geminated (not followed by another C), is lengthened

(17) **Shoshone”*

Base	μ-affixed form
mataku	mat**ː**aku
funtemi	funtem**ː**i
malkuftika	malkufti**kː**a

A serious misprediction: Shoshone”

(18) *Derivation of Shoshone”*

			*Compl	*V:	Align(μ,L)	*C:
I.	mataku, μ					
a.	ma[μ]ta.ku	[mat:aku]		*!	*	
☞ b.	mat[μ]a.ku	[mat:aku]			**	*
II.	funtemi, μ					
a.	fu[μ]n.te.mi	[fu:ntemi]		*!	*	
b.	fun[μ]te.mi	[fun:temi]	*!		**	*
☞ c.	fun.tem[μ]i	[funtem:i]			*****	*
III.	malkuftika, μ					
a.	ma[μ]l.kuf.ti.ka	[ma:lkuftika]		*!	*	
b.	mal[μ]kuf.ti.ka	[mal:kuftika]	*!		**	*
c.	mal.kuf[μ]ti.ka	[malkuf:tika]	*!		*****	*
☞ d.	mal.kuf.tik[μ]a	[malkuftik:a]			********	*

. . . but isn't Keley-i such a language?

Samek-Lodovici (1992):

'Gemination is caused by random affixation of a moraic morpheme. A very simple set of independently motivated constraints determines its eventual location and what segment is involved.' (p.8)

Gemination in Keley-i

Hohulin (1971), Hohulin&Kenstowicz (1979), Archangeli (1987), Lombardi&McCarthy (1991)

- three tenses (Prs, Pst, Fut) and five foci

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- Samek-Lodovici's generalization:
  gemination of the leftmost consonant that can be geminated in the Prs+Fut (=non-perfect)

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- Samek-Lodovici's generalization:
  gemination of the leftmost consonant that can be geminated in the Prs+Fut (=non-perfect)

(19) *Non-perfect gemination* (Hohulin&Kenstowicz 1979)

Access.Focus	Ben.Foc
ʔi-**pː**ili	ʔi-**pː**ili-ʔan
ʔi-**dː**ujag	ʔi-**dː**ujag-an

Subj.Focus	Obj.Focus	Ref.Foc
um-pi**lː**i	pi**lː**i-ʔen	pi**lː**i-ʔan
um-du**jː**ag	du**jː**ag-en	du**jː**ag-an

Analysis for Keley-i in Samek-Lodovici (1992)

- left-edge proximity for the affix
- syllabic wellformedness: only CV/CVC are licit

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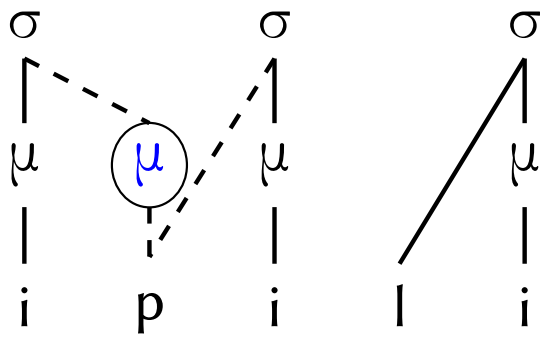
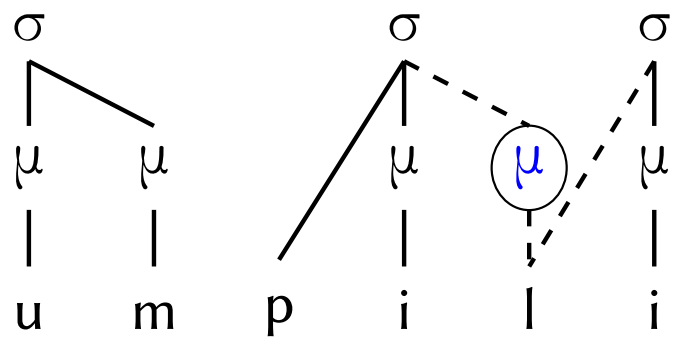
i. Initial gemination



ii. Medial gemination



Gemination in Keley-i I

(20) *Non-perfect root-initial gemination* (Hohulin&Kenstowicz 1979)

	Access.Focus	Ben.Foc	
Fut	ʔi-**pː**ili	ʔi-**pː**ili-ʔan	
Past	ʔim-pili	ʔim-pili-ʔan	'to choose'
Pres	ke-ʔi-**pː**ili	ke-ʔi-**pː**ili-ʔi	
Fut	ʔi-**dː**ujag	ʔi-**dː**ujag-an	
Past	ʔin-dujag	ʔin-dujag-an	'to pour'
Pres	ke-ʔi-**dː**ujag	ke-ʔi-**dː**ujag-i	

Gemination in Keley-i II

(21) *Non-perfect root-medial gemination* (Hohulin&Kenstowicz 1979)

	Subj.Focus	Obj.Focus	Ref.Foc	
Fut	um-pilːi	pilːi-ʔen	pilːi-ʔan	
Past	p-imː-ili	p-in-ili	p-in-ili-ʔan	'to choose'
Pres	ka-ʔum-pilːi	ke-pilːi-ʔa	ke-pilːi-ʔi	
Fut	um-dujːag	dujːag-en	dujːag-an	
Past	d-imː-ujag	d-in-ujag	d-in-ujag-an	'to pour'
Pres	ka-ʔum-dujːag	ka-dujːag	ka-dujːag-i	

Morphological analysis for Keley-i

	Focus				
	Access.	**Ben.**	**Sbj.**	**Obj.**	**Ref.**
Pst					
Prs	ʔi–	ʔi–	ʔum–	ke–	ke–
Fut	ʔi–	ʔi–	ʔum–		

initial G. | medial G.

➙ partially complementary distribution of initial/medial μ-affixation

Morphological analysis for Keley-i

	Focus					
	Access.	**Ben.**	**Sbj.**	**Obj.**	**Ref.**	stative
Pst						ʔi–
Prs	ʔi–	ʔi–	ʔum–	ke–	ke–	ʔi–
Fut	ʔi–	ʔi–	ʔum–			ʔi–

initial G. | medial G.

→ partially complementary distribution of initial/medial μ-affixation

→ **but:** both gemination patterns cooccur in the stative paradigm

Morphological analysis for Keley-i

	Focus					
	Access.	**Ben.**	**Sbj.**	**Obj.**	**Ref.**	stative
Pst						ʔi–
Prs	ʔi–	ʔi–	ʔum–	ke–	ke–	ʔi–
Fut	ʔi–	ʔi–	ʔum–			ʔi–

initial G. | medial G.

➙ partially complementary distribution of initial/medial μ-affixation

➙ **but:** both gemination patterns cooccur in the stative paradigm

(22) *Initial and medial gemination in Keley-i* (Hohulin&Kenstowicz 1979)

		Pst	**Prs**	**Fut**
bitu	'to put'	ne-ʔi-bitw-an	ke-ʔi-**b**ːi**t**ːu-ʔan	me-ʔi-**b**ːi**t**ːu-ʔan

Morphological analysis for Keley-i

There are two μ-affixes!

Morphological analysis for Keley-i

There are two μ-affixes!

I. μ / [__μ $\leftrightarrow$ [−pst, Access $\vee$ Ben $\vee$ Stat]

II. μ / [σ__ $\leftrightarrow$ [−pst, Sbj $\vee$ Obj $\vee$ Ref $\vee$ Stat]

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Shizuoka Japanese

(23) *Emphatic adjectives in Shizuoka Japanese* (Davis&Ueda 2006)

	Adjective	Emphatic Form				
a.	katai	ka**tː**ai	'hard'			
	osoi	o**sː**oi	'slow'	CV.C̥...	⇒	CV.C̥ː...
	takai	ta**kː**ai	'high'			
b.	hade	ha**n**de	'showy'			
	ozoi	o**n**zoi	'terrible'	CV.C̬...	⇒	CV**N**.C̬...
	nagai	naŋgai	'long'			
c.	zonzai	z**oː**nzai	'impolite'			
	supːai	s**uː**pːai	'sour'	CVC.C...	⇒	CVːC.C...
	okːanai	**oː**kːanai	'scary'			

Shizuoka Japanese in Davis & Ueda (2006)

(24) *CVO̥V*

katai, μ		σ-Cond	*V:	Dep n	*C:
☞	a. kat$^{\mu}$ai [kat:ai]				*
	b. ka n$^{\mu}$ tai [kantai]			*!	
	c. ka$^{\mu}$tai [ka:tai]		*!		

(25) *CVO̯V*

hade, μ		σ-Cond	*V:	Dep n	*C:
	a. had$^{\mu}$e [had:e]	*C̯:	*		*
☞	b. ha n$^{\mu}$ de [hande]			*	
	c. ha$^{\mu}$de [ha:de]		*!		

Shizuoka Japanese in Davis & Ueda (2006)

(26) *CVN.OV*

zonzai, $^{\mu}$		σ-Cond	*V:	Dep n	*C:
a. zonz$^{\mu}$ai	[zon.z:ai]	$^{*}{}_{\sigma}[C_{\mu}!$	*		*
b. zon n $^{\mu}$zai	[zon:zai]	$^{*}CC]_{\sigma}!$		*	
☞ c. zo$^{\mu}$nzai	[zo:n.zai]		*		

Sh. Japanese Linearization by Pivot Affixation

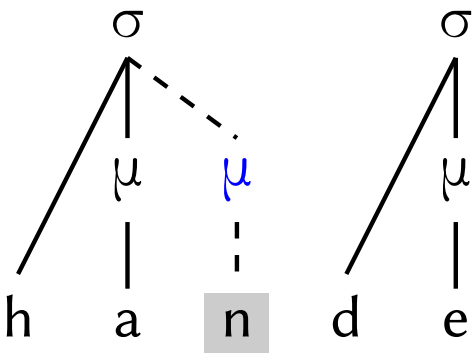
(27) $\mu \leftrightarrow \text{Base}[\ \mu$ ——

Sh. Japanese Linearization by Pivot Affixation

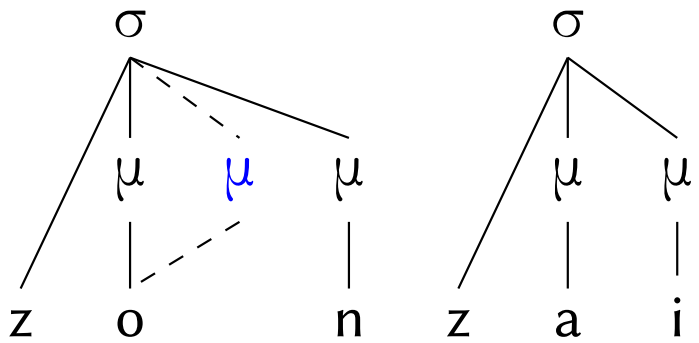
(27) $\mu \leftrightarrow \text{Base}[\ \mu\ \_\_$

(28)

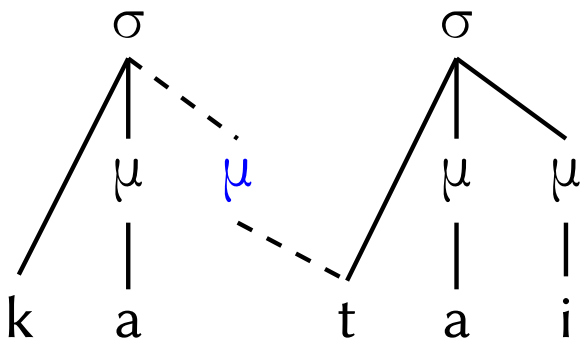
a.



b.



c.



Shizuoka Japanese as a Problem for Dislocation

ALIGN(μ,L) must be ranked below *V: to allow μ-metathesis in n-epenthesis

(29) *Wrong ranking for CVQV*

hade, μ		σ-COND	ALIGN(μ,L)	*V:	DEP n	*C:
a. had$^{\mu}$e	(had:e)	*C:	**	*		*
☞ b. ha n$^{\mu}$ de	(hande)		*!*		*	
☛ c. ha$^{\mu}$de	(ha:de)		*	*		

(30) *Correct ranking for CVQV*

hade, μ		σ-COND	*V:	ALIGN(μ,L)	DEP n	*C:
a. had$^{\mu}$e	[had:e]	*C:	*	**		*
☞ b. ha n$^{\mu}$ de	[hande]			**	*	
c. ha$^{\mu}$de	[ha:de]		*!	*		

Shizuoka Japanese as a Problem for Dislocation

ALIGN(μ,L) must be ranked above *V: to block gemination beyond the first σ

(31) *Wrong ranking for CVN.OV*

kata, μ		σ-COND	*V:	ALIGN(μ,L)	DEP n	*C:
a. onz$^{\mu}$okutai	[on.z:okutai]	*$_{\sigma}$[C$_{\mu}$!		**		*
☛ a'. onzok$^{\mu}$utai	[on.zok:utai]			****		*
b. on n$^{\mu}$ zai	[on:zokutai]	*CC]$_{\sigma}$!		*	**	
☞ c. o$^{\mu}$nzokutai	[o:n.zokutai]		*			

(32) *Correct ranking for CVN.OV*

kata, μ		σ-COND	ALIGN(μ,L)	*V:	DEP n	*C:
a. onz$^{\mu}$okutai	[on.z:okutai]	*$_{\sigma}$[C$_{\mu}$!	**	*		*
a'. onzok$^{\mu}$utai	[on.zok:utai]		*!***			*
b. on n$^{\mu}$ zai	[on:zokutai]	*CC]$_{\sigma}$!	**		*	
☞ c. o$^{\mu}$nzokutai	[o:n.zokutai]			*		

μ-Alignment in Davis & Ueda (2006:4)

(33) ALIGN-L(μ_e,Wd)
Align the emphatic mora with the beginning (left edge) of the word.

"In our analysis, the evaluation of the alignment constraint in (5) is with respect to the syllable so that if the emphatic mora (μ_e) is realized in the first syllable of the word then the constraint is satisfied; it is violated if it is realized beyond the first syllable."

Arguments against Phonological μ-Dislocation

- **Lack of non-local infixation**
- **Lack of Variable Infixation**
- **Cases of Fixed Infixation**
- **Morphologically contrastive μ-affixes**

Moraic Distinctiveness

- different μ-affixes in the same language result in different outputs
  (Guerssel&Lowenstamm 1990, Lowenstamm 2003)

(34) *Binyanim in Classical Arabic* (McCarthy 1979, McCarthy&Prince 1990)

	'write'	'do'
Binyan I	katab	faʔal
Binyan II	katːab	faʔːal
Binyan III	kaːtab	faːʔal

Problem for the Dislocation Approach

If both Binyanim are μ-prefixes

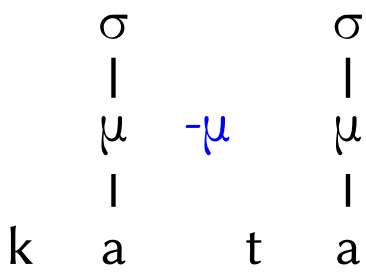
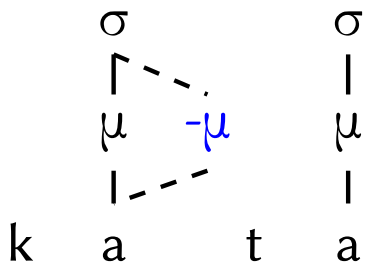
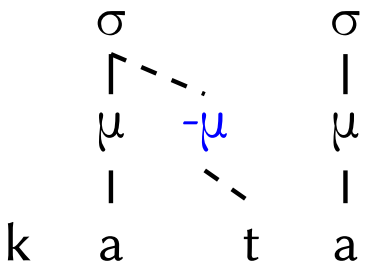
they should infix in exactly the same way

Classical Arabic under pivot-affixation

(35) *Two μ-affixes in Classical Arabic*

Binyan II	↔	μ / [μ__	(Gemination)
Binyan III	↔	μ / [__ μ	(Vowel lengthening)

(36) *Binyan II: Gemination*

Input: = a.		∗×	σ ↑ μ	μ ↓ ●	*V:
	a. 		*!	*	
	b. 				*!
☞	c. 				

(37) *Binyan III: Vowel Lengthening*

Input: = a.	∗×	σ ↑ μ	μ ↓ ●	*V:
a. μ- σ σ | | μ μ | | k a t a		*!	*	
☞ b. μ- σ σ ⌐ | μ μ | | k a t a				*
c. μ- σ σ ⌐ | μ μ | | k a t a	*!			

Conclusion

- μ-affixation is pivot-affixation

Conclusion

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- phonological dislocation theories:

Conclusion

- μ-affixation is pivot-affixation
- phonological dislocation theories:
  - predict unattested instances of non-local infixation

Conclusion

- μ-affixation is pivot-affixation
- phonological dislocation theories:
  - predict unattested instances of non-local infixation
  - predict unattested instances of variable μ-infixation

Conclusion

- μ-affixation is pivot-affixation
- phonological dislocation theories:
  - predict unattested instances of non-local infixation
  - predict unattested instances of variable μ-infixation
  - fail to predict instances of Fixed Infixation without additional (stipulated) machinery

Conclusion

- μ-affixation is pivot-affixation
- phonological dislocation theories:
  - predict unattested instances of non-local infixation
  - predict unattested instances of variable μ-infixation
  - fail to predict instances of Fixed Infixation without additional (stipulated) machinery
  - fail to predict morphologically contrastive μ-affixes in one language

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