Albanian Word Stress

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Overview

- Basic features of Albanian word stress
- Previous approaches
- Empirical evaluation
- An OT-analysis

Basic Features of Albanian Word Stress

Basic Features of Albanian Word Stress

- 1 stress/word form
- Paradigmatic uniformity
- Right-edge orientation
- Sensitivity to vowel quality
- Sensitivity to syllable weight

1 Stress/Word Form

	from the left		from the right	
1st	***ma****.l-i*	‘the mountain’	*vësh.ti.rë.**si***	‘difficulty’
2st	*nje.**ri***	‘human’	*për.pu.**ni**.m-i*	‘the treatment’
3rd	*për.pa.**rim***	‘progress’	*gë.**njesh**.tr-a.ve*	‘of lies’
4th	*qy.te.të.**rim***	‘civilization’	***kum****.bu.ll-a.ve*	‘of the plums’

Paradigmatic Uniformity

babo, 'midwife', *agon* 'it dawns'

(C)VCV	***ba**.bo*	Nom. Sg. indef.	*a.**go***	Imperative
(C)VCVC	***ba**.bon*	Acc. Sg. def.	*a.**gon***	Pres. 3sg
(C)VCVCCV	***ba**.bo.ja*	Nom. Sg. def.	*a.**go.**je*	Impf. 2sg

→ Inflection doesn't affect stress placement

→ Extends to adverbial suffixes and prefixes

Right-Edge Orientation

Inflected Forms

	from the left		from the right	
1st	***ma****.l-i*	‘the mountain’	*vësh.ti.rë.**si***	‘difficulty’
2st	*nje.**ri***	‘human’	*për.pu.**ni**.m-i*	‘the treatment’
3rd	*për.pa.**rim***	‘progress’	*gë.**njesh**.tr-a.ve*	‘of lies’
4th	*qy.te.të.**rim***	‘civilization’	***kum****.bu.ll-a.ve*	‘of the plums’

Base Forms

1st	***mal***	‘mountain’	*vësh.ti.rë.**si***	*për.pu.**nim***
2st	*nje.**ri***	‘human’	*gë.**njesh**.tër*	***kum****.bull*
3rd	*për.pa.**rim***	‘progress’		
4th	*qy.te.të.**rim***	‘civilization’		

Sensitivity to Vowel Quality

Final Vowel =		Stress =
ë	**a**.në, **hë**.në, **e**.hë, **pro**.në, **si**.vë	
e	**fa**.qe, **ën**.dje, **en**.de, **go**.lle, **fi**.ce	**penultima**
o	**ba**.bo, **ne**.to, **lo**.ço, **bir**.ko	
a	ha.**ta**, pas.tër.**ma**, xhe.**la**, ot.**ra**, ri.**xha**	
i	ba.**ri**, gju.hë.**si**, qer.**shi**, kom.**shi**, zi.**li**	**final**
u	ash.**tu**, a.kë.**ku** ku.cu.**ru**	

- ➔ Only quality of vowels in final syllables is “visible“
- ➔ High and low vowels attract stress

Sensitivity to Syllable Weight

Final Syllable

open		closed		Stress
qer.**shi**	‘cherry’	ar.**mik**	‘enemy’	
ha.**ta**	‘calamity’	re.zul.**tat**	‘result’	**final**
ash.**tu**	‘this way’	çi.**fut**	‘gipsy’	
fa.qe	‘face ’	she.**qer**	‘sugar’	**final**
ba.bo	‘midwife’	pa.**tok**	‘gander’	
a.në	‘side’	**a**.fër	‘near’	**penultimate**

→ Only Weight of final syllables is “visible“

→ Closed Syllables with full vowels attract stress

Stress Algorithm

For a given word form W:

1. Find the base form B of W's inflectional paradigm

2. **If** Monosyllabic(B)**:** → stress only syllable of B

3. **Else:** Find the final syllable S of B

a. **If** Full_Vowel(Nucleus(S)) and Closed(S)
or Nucleus(S) = i,a,u**:** → stress final syllable of B

b. **Else:** → stress penultimate syllable of B

Three Example Applications

Input:	gju.hë.si 'linguistics'	gë.njesh.tra.ve 'of lies (abl.pl)'	pu.no.ni 'you (pl.) work'
1. Base Form	gju.hë.si	gë.njesh.tër	pu.non
2. Monosyllabic			
3. Final Syllable	si	tër	non
a. Closed + Full Vowel or i,a,u → Final	**si**		**non**
b. Else → Penultimate		**njesh**	
Output:	gju.hë.**si**	gë.**njesh**.tra.ve	pu.**no**.ni

Previous Approaches to Albanian Word Stress

Dodi and Gjinari (1983)

"the position of stress in Albanian words
cannot be determined by a general rule". (p. 129)

	from the left		**from the right**	
1st	***ma****.l-i*	'the mountain'	*vësh.ti.rë.**si***	'difficulty'
2st	*nje.**ri***	'human'	*për.pu.**ni**.m-i*	'the treatment'
3rd	*për.pa.**rim***	'progress'	*gë.**njesh**.tr-a.ve*	'of lies'
4th	*qy.te.të.**rim***	'civilization'	***kum****.bu.ll-a.ve*	'of the plums'

But this neglects:

- The difference between derivation and inflection
- The predictability of most stress assignment

Newmark et al. (1982)

> “in general, the main stress in an Albanian stem
> falls on its last syllable,
> the main stress of an Albanian word . . .
> falls on its last stem . . . (p. 15).

This doesn’t capture:

- Penultimate stress
- Sensitivity to syllable weight and vowel quality

Bevington (1974)

(1) $V \rightarrow [+stress] \_\_ C_0 \left\langle \left\{ \begin{array}{c} e \\ a \\ o \\ ë(C) \\ as \\ ull \end{array} \right\} \right\rangle]_{Stem\ <\text{-}V>}$

Problems:

- Rule doesn't refer to natural class
- Reference to syntactic categories ("-V")

Maynard (1997)

(1) **Input: pu**.në.-**tor**, ‘worker’

	1-STRESS WORD	FAITH-STRESS I/O	STRESS RIGHT-EDGE
pu.në-.**tor**	*!		
pu.në-.tor		*	*!
☞ pu.në-.**tor**		*	
pu.në-.tor		**!	

Doesn’t capture:

- Penultimate stress
- Sensitivity to syllable weight and vowel quality

Empirical Evaluation

Number of Stems with n Syllables in Annotated Data

	n=1	n=2	n=3	n=4	n=5	n=6	n=7	n=8	n=9	Sum
Verbs	0	1496	1231	273	66	11	0	1	0	3078
Nouns	0	3762	3164	1507	348	66	10	5	0	8862
Adj.	0	1794	1666	723	162	40	11	3	0	4399
Adv.	0	374	226	103	22	0	0	0	0	725
Prep.	0	12	0	1	0	0	0	0	0	13
All	0	7438	6287	2607	598	117	21	9	0	17077

Distribution of Stress Positions

syllable number of word	Stress Position 1	2	3	4	5	6	7	8
2	2820	4605						
3	33	1789	4475					
4	3	9	1167	1430				
5			6	195	398			
6					43	74		
7						5	16	
8							1	8

Vowel Quality in Vowel-Final Stems and Final Stress

	a	***i***	***u***	***o***	***e***
final	65 (78.3%)	991 (93.6%)	10 (66.7%)	25 (29.1%)	104 (7.9%)
non-final	18 (21.7%)	68 (6.4%)	5 (33.3%)	56 (70.9%)	1206 (92.1%)
all	83	1059	15	86	1310

Coda Consonants and Final Stress

Final Syllables with Full Vowel

	No Coda-C	1 Coda-C	2 Coda-C
final	1199 (46.9%)	8663 (93.8%)	1084 (99.6%)
non-final	1358 (53.1%)	775 (6.2%)	4 (0.4%)
all	2557	9238	1088

Final Syllables with Schwa

	No Coda-C	1 Coda-C	2 Coda-C
final		42 (1.7%)	49 (15.5%)
non-final		2474 (98.3%)	9 (84.5%)
all		2517	58

Evaluation of Different Theories

Proposed Algorithm

right	16247 (97.7%)
wrong	378 (2.3%)

Simple Theories on Albanian Stress

	initial	**second**	**penultimate**	**final**
right	2856 (16.7%)	6403 (37.5%)	6020 (35.3%)	11006 (64.4%)
wrong	14221 (83.3%)	10674 (62.5%)	11057 (64.7%)	6071 (35.6%)

An OT-Analysis

Capturing Right-Edge Orientation and Restriction to 1 Stress

(1) **Final Bi-syllabic Trochee**

	Align (Foot,R,PWd,R)	Trochee
☞ a. di.të.(**lind**.je)		
☞ b. di.të.lind.(**je**)		
c. di.(**të**.lind).je	*!	
d. (**di**.të.) **lind**.je	*!*	
e. (**di**.të.)(**lind**.je)	*!*	

(2) **Final Mono-syllabic Trochee**

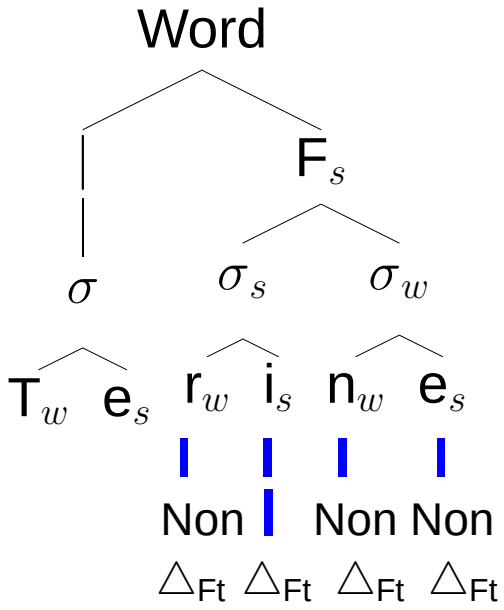
	Align (Foot,R,PWd,R)	Trochee
☞ a. ar.(**gjend**)		
☞ b. (**ar**.gjend)		
c. (**ar**).gjend	*!	

Sensibility of Stress to Vowel Quality

a, i, u >	*e, o* >	*ë*
high and low vowels	non-centralized mid vowels	centralized mid vowel
tend to be stressed in **all** final syllables	tend **not** to be stressed in **open** final syllables	tends **not** to be stressed in **all** final syllables

Formalizing the Notion “Unstressed Vowel”: (Non-)Designated Terminal Elements (de Lacy, 2002)

$\triangle_{Ft}$:	A segment dominated through an uninterrupted line of strong nodes by a foot node
*Non-$\triangle_{Ft}$:	A segment dominated by a foot node and not a $\triangle_{Ft}$



Capturing Sensibility to Vowel Quality by Constraints on Non-DTEs

a,i,u >	e,o >	ë
*Non-$\triangle_{Ft}$/{a,i,u} $\gg$	*Non-$\triangle_{Ft}$/{e,o} $\gg$	*Non-$\triangle_{Ft}$/{ë}
a,i,u should not be Non-DTE's	*e,o* should not be Non-DTE's	*ë* should not be a Non-DTE
If *a,i,u* are part of a foot they should be stressed	If *e,o* are part of a foot they should be stressed	If *ë* is part of a foot it should be stressed

Capturing Sensibility to Vowel Quality

(1) *bari*, ‘lawn’

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*Non-△$_{Ft}$/ {ë}
☞ a. ba.(**ri**)			*		
b. (**ba**.ri)		*!			

(2) *babo*, ‘midwife’

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*Non-△$_{Ft}$/ {ë}
a. ba.(**bo**)			*!		
☞ b. (**ba**.bo)				*	

(3) *balë*, ‘ball’

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*Non-△$_{Ft}$/ {ë}
a. ba.(**lë**)			*!		
☞ b. (**ba**.lë)					*

Capturing Weight by Position (Rosenthal and van der Hulst, 1999)

(1) *qershi*, 'cherry'

	Append	*μ/Cons
☞ a. qer$_\mu$.shi		*
b. q$_\mu$er$_\mu$.shi		**!
c. q$_\mu$er.shi	*!	**
d. qer.shi	*!	

(2) *qershi*, 'cherry'

	*μ/Cons	Append
a. qer$_\mu$.shi	*!	
b. q$_\mu$er$_\mu$.shi	*!*	
c. q$_\mu$er.shi	*!*	*
☞ d. qer.shi		*

Weight by Position by Position (Rosenthal and van der Hulst, 1999)

(1) *sheqer*, 'sugar'

	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append
a. (**she**.qer)		*!		*
b. she.(**qer**)	*!			*
☞ c. she.(**qer**$_{\mu}$)			*	

(2) *serbe*, 'Serbian'

	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append
☞ a. (**ser**.be)		*		*
b. (**ser**$_{\mu}$.be)		*	*!	

Capturing Sensibility to Syllable Weight

(1) *babo*, midwife

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-△$_{Ft}$/ {ë}
a. ba.(**bo**)			*!				
☞ b. (**ba**.bo)				*			

(2) *patok*, 'gander'

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-△$_{Ft}$/ {ë}
☞ a. pa.(**tok**$_{\mu}$)					*		
b. pa.(**tok**)			*!			*	
c. (**pa**.tok)				*!			

Putting it All Together (Vowel-Final Forms)

(1) *bari*, 'lawn'

	Align_{Rt} Trochee	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{a,i,u\}$	Ft-Bin	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{e,o\}$	$*\mu$/Cons	Append	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{ë\}$
☞ a. ba.(**ri**)			*				
b. (**ba**.ri)		*!					

(2) *babo*, midwive

	Align_{Rt} Trochee	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{a,i,u\}$	Ft-Bin	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{e,o\}$	$*\mu$/Cons	Append	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{ë\}$
a. ba.(**bo**)			*!				
☞ b. (**ba**.bo)				*			

(3) *balë*, 'ball'

	Align_{Rt} Trochee	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{a,i,u\}$	Ft-Bin	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{e,o\}$	$*\mu$/Cons	Append	$^{*}\text{Non-}\triangle_{\text{Ft}}/\{ë\}$
a. ba.(**lë**)			*!				
☞ b. (**ba**.lë)							*

Putting it All Together (Consonant-Final Forms)

(1) *besnik*, 'true'

	Align$_{Rt}$ Trochee	*Non-$\triangle_{Ft}$/ {a,i,u}	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-$\triangle_{Ft}$/ {ë}
☞ a. bes.(**nik**$_{\mu}$)					*		
b. (**bes**.nik)		*!				*	

(2) *patok*, 'gander'

	Align$_{Rt}$ Trochee	*Non-$\triangle_{Ft}$/ {a,i,u}	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-$\triangle_{Ft}$/ {ë}
☞ a. pa.(**tok**$_{\mu}$)					*		
b. (**pa**.tok)				*!		*	

(3) *afër*, 'near'

	Align$_{Rt}$ Trochee	*Non-$\triangle_{Ft}$/ {a,i,u}	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-$\triangle_{Ft}$/ {ë}
a. a.(**fër**$_{\mu}$)					*!		
☞ b. (**a**.fër)						*	*

Summary

- Albanian word stress is sensitive to vowel quality **and** syllable weight
- Both properties are only visible in last syllable of inflectional base forms
- Captures more than 97% of Albanian vocabulary
- Principled implementation by prosodic hierarchy and violable constraints

Theoretical Implications

- Evidence for constraint-based analysis of weight-by-position by position
- So far undocumented vowel prominence system in stress assignment

Markedness Hierarchies for Stressed Vowels

Albanian: a > [i,u] > e,o > ë

Kenstowicz (1996): a > e,o > [i,u] > ë

de Lacy (2002): a > e,o > [i,u] > ë > ~~i,u~~

- Albanian vowel prominence corresponds not to sonority, but to peripherality or distinctness
- Link to preferences in minimal vowel systems
- Specific phonetic properties of high vowels in Albanian?

Capturing Paradigm Uniformity by Output-Output Constraints

(1) **Base Form:** *argjend*, 'silver'

	Align$_{Rt}$ Trochee	*Non-$\triangle_{Ft}$/ {a,i,u}	Ft-Bin	*Non-$\triangle_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-$\triangle_{Ft}$/ {ë}
☞ a. ar.(**gjend**$_{\mu}$)					*		
b. (**ar**.gjend)		*!				*	

(2) **Derived Form:** *argjendi*, 'the silver'

	OO-Ident-Stress	Phonology
☞ a. ar.**gjen**.di		*
b. **ar**.gjen.di	*!	*
c. ar.gjen.**di**	*!	

OO-Ident-Stress: If segment S_d in a derived form corresponds to S_b in a base form S_d is the DTE of syllable σ_d, and S_b the DTE of σ_b, then σ_d is stressed if σ_b is.

Capturing Paradigm Uniformity by Cyclic Input-Output Constraints

(1) **Stem:** *argjend*, 'silver'

	Align$_{Rt}$ Trochee	*Non-△$_{Ft}$/ {a,i,u}	Ft-Bin	*Non-△$_{Ft}$/ {e,o}	*μ/Cons	Append	*Non-△$_{Ft}$/ {ë}
☞ a. ar.(**gjend**$_{\mu}$)					*		
b. (**ar**.gjend)		*!				*	

(2) **Derived Form:** *argjendi*, 'the silver'

	IO-Ident-Stress	Phonology
☞ a. ar.**gjen**.di		*
b. **ar**.gjen.di	*!	*
c. ar.gjen.**di**	*!	

IO-Ident-Stress: If segment S_d in a derived form corresponds to S_b in a base form S_d is the DTE of syllable σ_d, and S_b the DTE of σ_b, then σ_d is stressed if σ_b is.

Are there vowel-final Verb Stems?

	final C	final C	final V	final V ?
1sg	hap-Ø	vras-Ø	pi-Ø	formo-j
2sg	hap-Ø	vret-Ø	pi-Ø	formo-n
3sg	hap-Ø	vret-Ø	pi-Ø	formo-n
1pl	hap-im	vras-im	pi-më	formo-jmë
2pl	hap-ni	vris-ni	pi-ni	formo-ni
3pl	hap-in	vras-in	pi-në	formo-jnë

→2/3sg is a plausible base form

Alternative Analysis of Vowel-Final Stems

	final C	final C	final V	final V ?
1sg	hap-Ø	vras-Ø	pi-Ø	formoj-Ø
2sg	hap-Ø	vret-Ø	pi-Ø	formon-Ø
3sg	hap-Ø	vret-Ø	pi-Ø	formon-Ø
1pl	hap-im	vras-im	pi-më	formoj-më
2pl	hap-ni	vris-ni	pi-ni	formon-ni
3pl	hap-in	vras-in	pi-në	formoj-në

References

G.L. Bevington. *Albanian Phonology*. Otto Harrassowitz: Wiesbaden, 1974.

Paul de Lacy. *The formal expression of markedness*. PhD thesis, University of Massachusetts, Amherst, 2002.

A. Dodi and J. Gjinari. *Fonetika*, volume II of *Fonetika dhe Gramatika e gjuhës së sotme letrare Shqipe*. Akademia e RPS të Shqipërisë, 1983.

Michael Kenstowicz. Sonority-driven stress. Ms.,MIT, Rutgers Optimality Archive 33, 1996.

Kelly-Lynne Maynard. An optimality analysis of Albanian word stress. In Xingzhong Li, Luis Lópet, and Tom Stroik, editors, *Papers from the 1997 Mid-America Linguistics Conference*, pages 94–100, 1997.

Leonard Newmark, Phillip Hubbard, and Peter Prifti. *Standard Albanian*. Stanford University Press: Stanford, 1982.

Sam Rosenthal and Harry van der Hulst. Weight-by-position by position. *NLLT*, 17:499–540, 1999.