Non-Local Allomorphy in a Strictly Local System

Jurij Božič

McGill University
Montreal, QC

jurij.bozic@mail.mcgill.ca

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Locality of Contextual Allomorphy

- Prominent view in Distributed Morphology (Halle & Marantz 1993): allomorphy is triggered by **strictly local/adjacent** syntactic heads (Embick 2010; Arregi & Nevins 2012)
- This was pointed out as a relevant generalization before: (Siegel 1978; Allen 1979; Simpson & Withgott 1986; Carstairs-McCarthy 1992; Stump 1996)
- However, certain **non-locally triggered patterns** (non-adjacent triggers) have been identified (Merchant 2015; Moskal 2015)

Question

What is the status of non-local allomorphy in grammar?
How do we derive it?

Non-Local Allomorphy: Markedness

- Existing approaches to non-locality (Merchant 2015; Moskal 2015) effectively treat non-locality as a general property of grammars
  - a grammar permits non-locality
  - the only distinction betwen local/non-local patterns is *lexical*
- I argue that this is incorrect: local vs. non-local distinction

Main Generalization

Markedness distinction:
local allomorphy $\rightsquigarrow$ UNMARKED, *default*
non-local allomorphy $\rightsquigarrow$ MARKED, *exceptional*

PROPOSAL

A model of allomorphy must include two ingredients:

1. **Locality bias**: *grammar encodes a* LOCALITY BIAS
   My implementation: ECONOMY *condition at PF.*
2. **Mechanism deriving non-locality**

Cross-linguistic survey of non-local allomorphy

- I conducted a cross-linguistic survey of non-local allomorphy:
  - **Root suppletion**: based on Surrey Suppletion Database (Brown et al. 2003) and reported cases in literature
  - **Affixal allomorphy**: based on reported cases in literature

- CRITERIA EMPLOYED:
  1. LOCAL PATTERN: $\sqrt{X}$–Y–Z or Z–$\sqrt{X}$–Y
     NON-LOCAL PATTERN: $\sqrt{X}$–Y–Z or $\sqrt{X}$–Y–Z
     ▭ = target of alllomorphy, ▬ = trigger of allomorphy
  2. Null heads ≠ interveners, cf. (Embick 2010; Arregi & Nevins 2012)

Cross-linguistic survey: Root suppletion

ROOT SUPPLETION – RESULTS:

- 8 different languages
- Greek, Slovenian, Tamil, Totonac, Lak, Tariana, Ket, Basque

Two examples of non-local suppletion patterns from the survey (ask for remaining data in question period):

- **GREEK**
  Voice^0-Asp^0-triggered suppletion in VERBS (Merchant 2015)

√tro(ɣ)	-∅	-∅	-o	
eat	ACT	IMPF	1P.SG	
√troɣ	-∅	-∅	-omun	
eat	NON-ACT	IMPF	1P.SG	
√fa	-∅	-∅	-o	
eat	ACT	PRF	1P.SG	
√faɣo	-θ	-ik	-a	
eat	NON-ACT	PRF	1P.SG	

- **SLOVENIAN** (South Slavic)
  Ptc^0-triggered suppletion in V (Božič 2016)

√žanj	-e	-∅	-m	
reap	ASP/THM	PRES.TNS	1P.SG	[tensed verb]
√ž	-e	-l	-a	
reap	ASP/THM	PTC	F.SG	[participle]

Cross-linguistic survey: Root suppletion

- Overview of Non-Local Suppletion (SSD database + reported in lit.)

LANGUAGE	PATTERN	CAT	SOURCE
1. *Greek*	$\sqrt{\text{RT}}$ - Voice^0 - Asp^0	V	Merchant (2015)
2. *Slovenian*	$\sqrt{\text{RT}}$ -Asp^0- Ptc^0	V	Božič (2016)
3. *Tamil*	D^0 -#^{0}- K^0	D^0	Moskal & Smith (2016)
4. *Totonac*	$\sqrt{\text{RT}}$ -Asp^0- Agr$^0_{\text{2P}}$	V	Brown et al. (2003)
5. *Lak*	$\sqrt{\text{RT}}$ -#^{0}- K^0	N	Radkevich (2014)
6. *Tariana*	$\sqrt{\text{RT}}$ -Cl^0- #^{0}	A	Brown et al. (2003)
7. *Ket*	T^0 -AgrO^0- $\sqrt{\text{RT}}$	V	Brown et al. (2003)
8. *Basque*	$\sqrt{\text{RT}}$ -Dim^0- Cmpr^0	A	Bobaljik (2012)

- Results from just the **Surrey Suppletion Database**

Number of lang.	*Local Suppletion?*	*Non-Local Suppletion?*
34	31	4

- Non-local suppletion/allomorphy is RARE!
- Local suppletion/allomorphy is COMMON!

Cross-linguistic survey: Affixal allomorphy

- Two cases of non-local affixal allomorphy have been pointed out in the literature:

LANGUAGE	PATTERN	CAT	SOURCE
1. *Kiowa*	$\sqrt{\text{RT}}$- v^0 –Neg^0-Dist^0- Mod^0	V	Bonet & Harbour (2012)
2. *Bulgarian*	$\sqrt{\text{RT}}$- Thm^0 - T^0 - Agr^0	V	Stump (1996), Scatton (1984)

- Ask for data in question period
- No database for affixal allomorphy; results more tentative

Cross-linguistic survey: Generalizations

Locality Implication: *non-local* $\Longrightarrow$ *local*

If a language exhibits non-local contextual allomorphy, it also exhibits local contextual allomorphy.

- This can be shown for every language here:
  Merchant (2015), Brown et al. (2003), Aikhenvald (2003), Werner (1997), Arregi & Nevins (2012), Harbour (2008), Mel'čuk (2000), Harizanov (2014).
- Furthermore, **strict adjacency** asserts itself in languages that otherwise contain non-local allomorphy
  (ask for data in question period)

Cross-linguistic survey: Generalizations

- Also, non-local allomorphy is always *exceptional*, never the primary pattern in the language
- Non-local allomorphy is somehow secondary to local allomorphy
- I treat this as a **Markedness distinction**:

Markedness Scale

LOCAL allomorphy $\rightsquigarrow$ UNMARKED
NON-LOCAL allomorphy $\rightsquigarrow$ MARKED

- There is a *bias* for strictly local patterns in allomorphy $\rightarrow$ some LOCALITY BIAS needs to be expressed in models of allomorphy

Cross-linguistic Survey: Generalizations

- The data reveal another generalization:

Distance in Non-Locality

Non-local allomorphy/suppletion can only involve treating two heads as context and not more.

- In other words, all the patterns are of these types distance-wise:

$$\boxed{\sqrt{\text{RT}}} - X^0 - \underline{Y^0} \quad , \quad \underline{Y^0} - X^0 - \boxed{\sqrt{\text{RT}}}$$

- Interesting: **more conservative** 'non-locality' than expected
- The only exception is the affixal case of allomorphy in Kiowa: three heads need to be considered as context
  - Not a strong counter-example
  - Suspicious phonological facts surround this pattern (ask in question period)

Proposal: Formal model

Some caveats:

- As in Embick (2010) and Arregi & Nevins (2012), I treat allomorphic locality as a condition on *Vocabulary Insertion* (VI)
- VI = function that maps phonological exponents to X^0's at PF
  - I do not assume the often criticized Readjustment Rules, following Siddiqi (2009), Bye & Svenonius (2012), Bermúdez-Otero (2012)
  - I do not treat null heads as interveners for allomorphy:

    I assume that null heads between the TARGET and TRIGGER of allomorphy undergo *generalized fusion* to the TARGET, as in Siddiqi (2006, 2009).
  - In what follows, only overt heads are shown

Proposal: Formal model

- Based on Trommer (1999), we assume that VI is defined as the 3-tuple $\langle PHON, TARG, CTXT \rangle \longrightarrow CTXT$ ('context')
- I propose that *CTXT* is formally implemented as a *buffer* $\mathfrak{B}$, which stores the context of insertion

Formal properties of $\mathfrak{B}$:

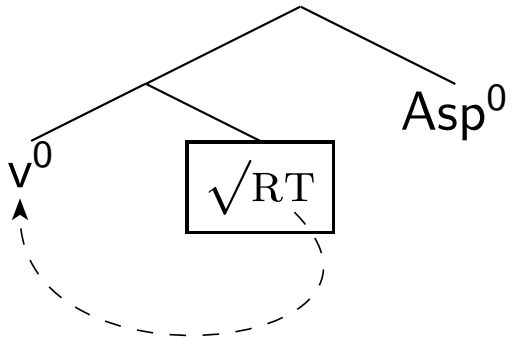
- $\mathfrak{B} = \{S_\alpha, S_\alpha\} \longrightarrow$ *two slots for storing context* ($|\mathfrak{B}| \leq 2$)
- *Let* α *be a set of directionality labels/features s.t.* $\alpha = \{\pm L, \pm R\}$

  $\pm L =$ *left*, $\pm R =$ *right*

  $-\alpha \rightsquigarrow$ UNVALUED, $+\alpha \rightsquigarrow$ VALUED
- *For instance: given* $\mathfrak{B} = \{S_{-L}, S_{-R}\}$, *storing a left-adjacent head in* S_{-L}, *values the label* $\rightarrow S_{+L}$

Proposal: Formal model

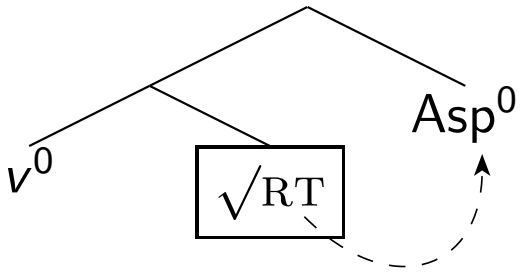
- The unvalued α-labels on the slots in $\mathfrak{B}$ need to be satisfied; to do this, they trigger a *search procedure* to find the appropriate head that matches their α-label:
  - SCAN
    Search for a head H_α of category α, where $\alpha = \{L, R\}$.
    (INFORMALLY: search for a *left* or *right* adjacent head.)
- Inserting at $\sqrt{\text{RT}}$ with default $\mathfrak{B} = \{S_{-L}, S_{-R}\}$



Scan increment #1: S_{-L}

$\longrightarrow$ store v^0 in S_{-L}

$\longrightarrow \mathfrak{B} = \{ [v^0]_{+L}, S_{-R}\}$



Scan increment #2: S_{-R}

$\longrightarrow$ store Asp^0 in S_{-R}

$\longrightarrow \mathfrak{B} = \{ [v^0]_{+L}, [\text{Asp}^0]_{+R} \}$

Proposal: Formal model

- This SCAN+store-in-$\mathfrak{B}$ procedure is constrained by an **economy condition** of the PF-interface:

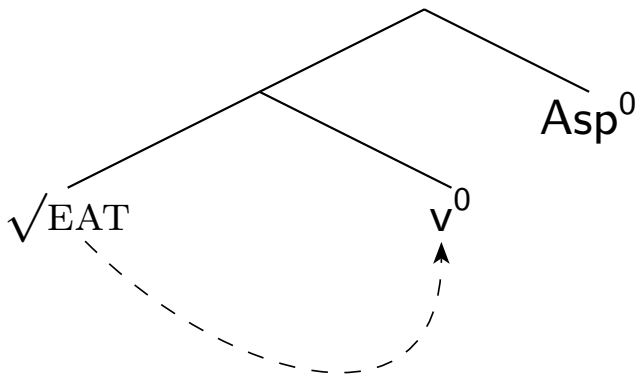
BUFFER ECONOMY

Access each $S \in \mathfrak{B}$ only once. (No unneeded tampering with $\mathfrak{B}$!)

  - This condition allows only *strictly local/adjacent* triggers of allomorphy
  - One S is accessed for a LEFT-adjacent head, and one S for a RIGHT-adjacent head
  - This condition is **not** *ad hoc*: we can show that any non-local pattern actually violates it

Proposal: Formal model

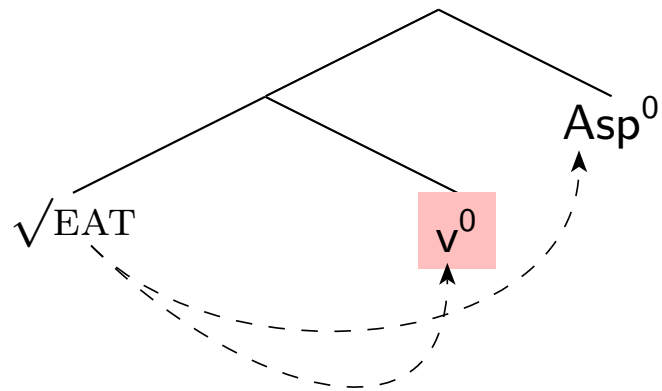
- Let us observe what happens when computing non-local context: assume $\mathfrak{B} = \{S_R, S_R\}$ (i.e. non-local for two to the right)
- Inserting at $\sqrt{\text{EAT}}$ with $\mathfrak{B} = \{S_{-R}, S_{-R}\}$



Scan increment #1: S_{-R}

$\longrightarrow$ store v^0 in S_{-R}

$\longrightarrow \mathfrak{B} = \{ [v^0]_{+R}, S_{-R}\}$



Scan increment #2: S_{-R}

$\longrightarrow$ store v^0 in S_R

$\longrightarrow \mathfrak{B} = \{ [v^0]_{+R}, [v^0]_{+R} \} \rightsquigarrow$ CLASH!

$\longrightarrow$ store Asp^0 in S_{-R}

$\longrightarrow \mathfrak{B} = \{ [v^0]_{+R}, [\text{Asp}^0]_{+R} \}$

Proposal: Formal model

- Computing a non-local pattern violates Buffer Economy:
  - second S_R is accessed twice
  - $\mathfrak{B}$ gets 'tampered' with; a clash needs to be resolved
  - more computationally complex
- It appears that Buffer Economy is in fact grounded in the principles of Minimal Computation (Chomsky 2013)
  - 'Compute as little as possible to determine the minimal context of insertion'
  - PF-interface is expected to exhibit such 'third factor' design properties (Chomsky 2005)
- This condition represents a locality bias in allomorphy, and it also derives the **Markedness distinction**:
  - No violations of Buffer Economy $\rightsquigarrow$ unmarked
  - Violations of Buffer Economy $\rightsquigarrow$ marked

Proposal: Formal model

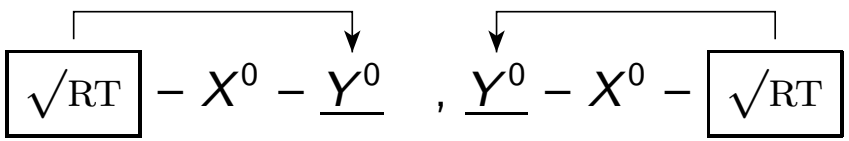
- How do *non-local* patterns ever get manifested in the grammar? Buffer Economy can be **violated**!
  - However, it can only be violated by following a certain 'schema'
  - This schema is the RE-LABELLING HYPOTHESIS :

$\longrightarrow$ Default $\mathfrak{B} = \{S_L, S_R\}$ [local]
$\longrightarrow$ $S \in \mathfrak{B}$ can be *re-labelled* to $\{S_L, S_L\}$ or $\{S_R, S_R\}$ [non-local]

- Re-Labelling is tied to the property of a specific syntactic head:
  - Default VI 3-tuple: $\langle$TARG, PHON, $\{S_L, S_R\}\rangle$
  - Re-labelled: $\langle\sqrt{}$EAT, PHON, $\{S_L, S_L\}\rangle$ or
    $\langle\sqrt{}$EAT, PHON, $\{S_R, S_R\}\rangle$

Proposal: Formal model

- The Re-Labelling Hypothesis constrains non-locality and only allows any pattern to be non-local **for two heads** in the L or R-direction
- In the first half of the talk, we pointed out the Generalization on *Distance in Non-Locality*
  - non-locality only occurs for two heads in one direction:



  - the Re-Labelling Hypothesis derives this generalization

Competing approaches

- An important strength of this proposal:
  - it expressed a LOCALITY BIAS, which may be violated to derive NON-LOCALITY
  - this model can derive **strict locality effects**, such as **adjacency blocking** of allomorphy
- Competing approaches to non-locality (Merchant 2015; Moskal 2015) express no distinction between local and non-local patterns
  - Merchant (2015), Moskal (2015) and Moskal & Smith (2016): strict adjacency effects, such as blocking, need to be interpreted as lexical accidents under these views (in most cases)
  - The proposed account can, however, offer principled accounts of these phenomena
- Also, Merchant's (2015) approach to non-locality involves treated any 'span' of heads in an extended projection as context
  - e.g. $\langle v^0, \text{Asp}^0, \text{Mod}^0, \text{T}^0, \text{Mood}^0, \ldots \rangle \leftarrow$ *a contextual Span*
  - This cannot derive the conservative nature of **distance** observed in non-local patterns

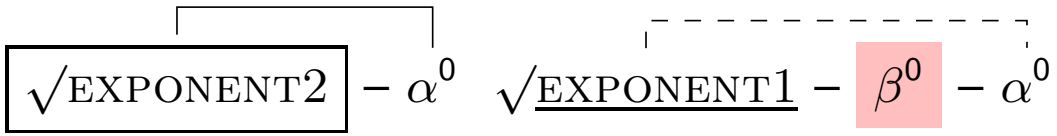
Conclusion

- Non-local allomorphy is in a markedness relation with local allomorphy, where the latter is UNMARKED
- I have proposed a formal model of Vocabulary Insertion where this markedness distinction stems from an ECONOMY condition at PF, grounded in principles of MINIMAL COMPUTATION
- The proposed model makes more constrained predictions about allomorphy in natural language than competing approaches

Jurij Božič,
jurij.bozic@mail.mcgill.ca
https://jurijbozic.wordpress.com

APPENDIX I: Why is a locality bias necessary?

- Two types of generalizations show that strict locality plays a role in allomorphic patterns:
  1. **Local blocking effects**:



  2. **Fusion-allomorphy conspiracies**:

	SG	PL
NOM	√EXPON1 – {#0} – {K0}	√EXPON1 – {#0} – {K0}
GEN	√EXPON2 – {#0+K0}	√EXPON1 – {#0} – {K0}
ACC	√EXPON2 – {#0+K0}	√EXPON1 – {#0} – {K0}

     - Suppletion correlates with *fusional morphology*, but not with *agglutinative morphology*

- By failing to distinguish between local and non-local allomorphy, phenomena of these kind cannot be analyzed in a principled way
- A locality bias is needed to encode this distinction

Local blocking effects

- Consider a case of local blocking from Slovenian: noun 'man'

	SG	DU	PL
N	√človek-∅	√človek-a	√ljudj-e
N+DIM	√človeč-ek-∅	√človeč-k-a	√človeč-k-i
	$\sqrt{}_{\text{RT}}-\ (\text{DIM}^0-)\ \#^0$	$\sqrt{}_{\text{RT}}-\ (\text{DIM}^0-)\ \#^0$	$\sqrt{}_{\text{RT}}-\ (\text{DIM}^0-)\ \#^0$

  - [PL]-specified $\#^0$-head triggers suppletion
  - DIM^0 blocks suppletion
- Merchant (2015) permits '*spans of heads*' to constitute context for allomorphy (i.e. context for Vocabulary Insertion)
- This predicts Slovenian as well as Slovenian′:
  - Slovenian: $\sqrt{\text{MAN}} \leftrightarrow$ *ljudj-* / _____$\langle[\text{PL}]\rangle$ $\rightsquigarrow$ *local*
  - Slovenian′: $\sqrt{\text{MAN}} \leftrightarrow$ *ljudj-* / _____$\langle \text{Dim}^0, [\text{PL}]\rangle$ $\rightsquigarrow$ *non-local*
- Implication: Slovenian 'blocking' arises only because the **lexical context of the rule** is $\langle[\text{PL}]\rangle$
- All blocking effects are **lexical accidents** under such a view

Fusion-Allomorphy Conspiracies

- Kartvelian languages reveal an instance of a *fusion-allomorphy conspiracy* (=generalization on the distributon of suppletion):
  - Suppletion is correlated with the presence of FUSIONAL morphology in an otherwise agglutinative system
  - In Georgian, the fusion of $\#^0$ and K^0 in pronouns facillitates suppletion; but agglutinative morphology blocks it

Georgian 3P demonstrative

Hewitt (1995: 77-78), Tuite (1998: 50)

	SG	PL
NOM	eg	ege -eb-i
DAT	maga -s(a)	maga -t(a)
ERG	maga -n	maga -t(a)
GEN	mag -is(a)	maga -t(a)
INST	mag -it(a)	maga -t(a)
ADVB	maga -d(a)	maga -t(a)

Split fusional-agglutinative

Georgian noun 'woman'

SG	PL
kal-i	kal-eb-i
kal-s	kal-eb-s
kal-ma	kal-eb-ma
kal-is	kal-eb-is
kal-it	kal-eb-it
kal-ad	kal-eb-ad

Just agglutinative

Fusion-Allomorphy Conspiracies

- This generalization is borne out in other dialects of Georgian, which tend to *generalize agglutination* and *level the paradigm*:

Lower Imeretian 3P.PL (Tuite 1998: 55)

	PL
NOM	mage-n-i
DAT	mage-n-ma
ERG	mage-n-s
GEN	mage-n-is

- The same tendency is found in other Kartvelian languages:

Laz

	SG	PL
NOM	mu-k	mu-t-epe-∅
DAT	mu-s	mu-t-epe-s
ERG	mu-k	mu-t-epe-k
GEN	mu-ši	mu-t-epe-ši

Mingrelian (Tuite 1998: 55)

SG	PL
mu-∅	mu-n-epi-∅
mu-s	mu-n-en-s
mu-k	mu-n-en-k
mu-ši	mu-n-ep-iši

Fusion-Allomorphy Conspiracies

- A principled solution that captures this generalization involves some notion of STRICT LOCALITY/ADJACENCY:
  - D^0– $[\#^0$+$K^0]$ vs. D^0– $\#^0$ – K^0
  - Fusion makes K^0 local to D^0, facillitating suppletion

- **Merchant's (2015)** contextual spans cannot express this generalization, i.e. conspiracy:
  - Georgian: $D^0 \leftrightarrow$ *maga-* / _____$\langle[\#^0$+$K^0]\rangle$
    Georgian′: $D^0 \leftrightarrow$ *maga-* / _____$\langle\#^0, K^0\rangle$
  - Fusion cannot be tied with suppletion in any way; that suppletion does not correlate with agglutination is just a lexical accident

Fusion-Allomorphy Conspiracies

- **Moskal (2015), Moskal & Smith (2016)** argue against adjacency as a locality condition on Vocabulary Insertion: a 'domain for suppletion' is set by the CATEGORIAL/PHASE HEAD in the structure
  - Pronouns have no categorial head $\rightsquigarrow$ no locality effects in pronominal allomorphy (**key prediction**)
  - This prediction seems to be incorrect
  - This view must also reduce the correlation of *fusion and suppletion* to a lexical accident

Strict locality effects: Summary

- What do Local Blocking Effects and Fusion-Allomorphy Conspiracies tell us about allomorphy?
  - If the grammar freely allows **non-locality**, it fails to offer principled accounts of strict locality effects
  - All strict locality effects are reduced to lexical accidents
- **Solution?** Strict locality needs to be encoded as a type of LOCALITY BIAS which coexists with a mechanism that derives non-locality

Appendix II: Survey on non-local suppletion

- **GREEK**
  Voice^0-Asp^0-triggered suppletion in v (Merchant 2015)

$\sqrt{\text{tro}}$	-∅	-∅	-o	$\sqrt{\text{troɣ}}$	-∅	-∅	-omun
eat	ACT	IMPF	1P.SG	eat	NON-ACT	IMPF	1P.SG
$\sqrt{\text{fa}}$	-∅	-∅	-o	$\sqrt{\text{faɣo}}$	-θ	-ik	-a
eat	ACT	PRF	1P.SG	eat	NON-ACT	PRF	1P.SG

- **SLOVENIAN** (South Slavic)
  Ptc^0-triggered suppletion in v (Božič 2016)

$\sqrt{\text{žanj}}$	-e	-∅	-m
reap	ASP/THM	PRES.TNS	2P.SG
$\sqrt{\text{ž}}$	-e	-l	-a
reap	ASP/THM	PTC	F.SG

Appendix II: Survey on non-local suppletion

- **TAMIL** (Dravidian)
  K^0-triggered suppletion of D^0 in PRONOUN (Moskal & Smith 2016: 306)

naan	-gal	-∅
1P.PRON	PL	NOM

en	-gal	-ukku
1P.PRON	PL	DAT

- **TOTONAC** (Totozoquean)
  PERSON-triggered suppletion in V (Brown et al. 2003)[1]

√ma:	-ná	-∅
lie	IMPF	1P.PL

√pa:′	-nán	-tit
lie	IMPF	2P.PL

ta-	√má:	-na
3P.PL	lie	IMPF

[1] Brown et al. (2003) specify personal communication from Paulette Levy as the source for this pattern.

Appendix II: Survey on non-local suppletion

- **LAK** (Northeast Caucasian)

  K^0-triggered suppletion in N (Radkevich 2014; Moskal 2015: 35)

$\boxed{\sqrt{\text{barz}}}$	-ru	-∅
moon	PL	NOM

$\boxed{\sqrt{\text{zur}}}$	-dald	-il
moon	PL	ERG

- **TARIANA** (Arawakan)

  NUMBER-triggered suppletion in A (Brown et al. 2003; Aikhenvald 2003: 173)

$\boxed{\sqrt{\text{hanu}}}$	-pua	-∅
big	CLASS	SG

$\boxed{\sqrt{\text{male}}}$	-pua	-pe
big	CLASS	PL

Appendix II: Survey on non-local suppletion

- **KET** (Yeniseian)

  $T^0_{\text{PRES/PAST}}$-triggered suppletion in V (Brown et al. 2003; Werner 1997: 284)

ku-	∅-	ɣu-	√tus’
2P.SUBJ	PRES.TNS	2P.OBJ	intend

∅-	il’-	gu-	√dɛn
2P.SUBJ	PAST.TNS	2P.OBJ	intend

- **BASQUE**

  CMPR^0-triggered suppletion in A (Bobaljik 2012: 156-158)

√asko		
much		[positive degree]

√gehi	-ago	
much	CMPR	[comparative degree]

√gehi	-xe	-ago	
much	DIM	CMPR	[comparative degree]

Survey on non-local affixal allomorphy

- **BULGARIAN** (South Slavic)
  $T^0_{[\text{IMPRF/AOR}]}$-THM-triggered allomorphy (Scatton 1984: 223-228; Božič 2017)

√krad	-ɛ	-ʃɛ	**-∅**
steal	THM_{CL1}	IMPERF.TNS	2P.SG

√krad^j	-a	-x	-tɛ
steal	THM_{CL1}	IMPERF.TNS	2P.PL

√krad	-ɛ	-∅	**-∅**
steal	THM_{CL1}	AOR.TNS	2P.SG

√krad	-o	-x	-tɛ
steal	THM_{CL1}	AOR.TNS	2P.PL

Survey on non-local affixal allomorphy

- **KIOWA** (Tanoan)
  $v^0_{\text{TRANS/INTRANS}}$-triggered allomorphy of Mod^0 (Bonet & Harbour 2012: 231)

  héíb -e -gụụ -mɔɔ **-tɔɔ**
  enter TR DISTR NEG MOD

  'will not bring in at different times/locations'

  héíb -é -gụụ -mɔɔ **-t'ɔɔ**
  enter INTR DISTR NEG MOD

  'will not come in at different times/locations'

Aikhenvald, A. Y. (2003). *A grammar of Tariana, from northwest Amazonia*. Cambridge: Cambridge University Press.

Allen, M. (1979). *Morphological investigations*. University of Connecticut.

Arregi, K. & Nevins, A. (2012). *Morphotactics: Basque Auxiliaries and the Structure of Spellout*. Studies in Natrual Language and Linguistic Theory 86. New York: Springer.

Bermúdez-Otero, R. (2012). The architecture of grammar and the division of labour in exponence. In Trommer, J. (Ed.), *The morphology and phonology of exponence*, (pp. 8–83)., Oxford. Oxford University Press.

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