# Assessing the typology of person portmanteaux

Sebastian Bank, Daniela Henze, Jochen Trommer & Eva Zimmermann

Department of Linguistics
University of Leipzig

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## Transitive agreement

Lakhota intransitive/transitive verbal agreement prefixes (Robbs / Taylour 1996)

| **subject** | | **subject** | **object** 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|---|
| 1SG | wa | 1SG | ▪ | ▪ | c'i | c'i | wa | wic'a-wa |
| 1PL | uŋ | 1PL | ▪ | ▪ | uŋ-ni | uŋ-ni | uŋ | wic'a-uŋ |
| 2SG | ya | 2SG | ma-ya | uŋ-ya | ▪ | ▪ | ya | wic'a-ya |
| 2PL | ya | 2PL | ma-ya | uŋ-ya | ▪ | ▪ | ya | wic'a-ya |
| 3SG | | 3SG | ma | uŋ | ni | ni | | wic'a |
| 3PL | | 3PL | ma | uŋ | ni | ni | | wic'a |

*ya*- SA[+2] *ma*- P[+1 +sg] *uŋ*- SAP[+1 +pl] *wic'a*- P[+1 +pl]





## Portmanteau agreement

A single affix marks a combination of subject and object agreement simultaniously

| **subject** | | **subject** | **object** 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|---|
| 1SG | **wa** | 1SG | ▪ | ▪ | **c'i** | **c'i** | **wa** | wic'a-**wa** |
| 1PL | uŋ | 1PL | ▪ | ▪ | uŋ-**ni** | uŋ-**ni** | uŋ | wic'a-uŋ |
| 2SG | ya | 2SG | ma-ya | uŋ-ya | ▪ | ▪ | ya | wic'a-ya |
| 2PL | ya | 2PL | ma-ya | uŋ-ya | ▪ | ▪ | ya | wic'a-ya |
| 3SG | | 3SG | ma | uŋ | **ni** | **ni** | | wic'a |
| 3PL | | 3PL | ma | uŋ | **ni** | **ni** | | wic'a |

***c'i*- [+1 +sg]A→P[+2]** ***wa*-** SA[+1 +sg] ***ni*-** P[+2]





## Two hypotheses on portmanteau agreement

Local Portmanteau Hypothesis (LPH) & Direct Portmanteau Hypothesis (DPH)

**Portmanteau agreement is preferred in**

- contexts that only allow single agreement affixes
- **local contexts** (Heath 1991, 1998; Wunderlich 2006; Georgi 2012)
- **direct context** (Lakämper / Wunderlich 1998; Woolford 2010)

'You and me' contexts (1→2, 2→1)

| 1↔2 **subject** | **object** 1 | 2 | 3 |
|---|---|---|---|
| 1 | ▪ | local | nonlocal |
| 2 | local | ▪ | nonlocal |
| 3 | nonlocal | nonlocal | nonlocal |

'High on low' contexts (1→2, 1/2/3→3)

| 1 > 2 > 3 **subject** | **object** 1 | 2 | 3 |
|---|---|---|---|
| 1 | ▪ | direct | direct |
| 2 | inverse | ▪ | direct |
| 3 | inverse | inverse | direct |

## Goal of the study, method, innovations

Empirical assessment of the Local Portmanteau and Direct Portmanteau Hypothesis

- operationalize and test both hypotheses (LPH and DPH)
- use automatic procedures to identify (non-)portmanteaux
- given the unanalyzed main verb paradigm (w/o stem)
- taken from a small but balanced sample of languages
- avoid interference from unstable analytical biases
- transparent and uniform criteria for portmanteaux





## Portmanteaux as strategy of transparency avoidance

Instead of marking 1↔2 predications with their regular affixes for subject and object

Heath (1998: 84–86)

[. . . ] the correct cross-linguistic generalization is a negative one, namely, that **transparent 1↔2 combinations are avoided** (Heath 1991). In other words, maximally transparent 'I saw you', 'you saw me', etc., tend to form negative or **taboo** targets and are often replaced by **more opaque surface forms**. [. . . ] The departures from this idealized maximal transparency [. . . ] can be organized into the following "strategies":
[. . . ] (2) one of the two markers expressed by isolated suppletive allomorph
[. . . ] (4) number neutralization, sometimes including use of "pl" for semantic "sg"
[. . . ] (6) **entire combination expressed by unanalyzable portmanteau** [. . . ] (12) [. . . ]

**Prediction**

{1→2, 2→1} contexts
contain **more** occurrences of portmanteaux than
{1→3, 2→3, 3→1, 3→2, 3→3} contexts





## Portmanteaux only in 'high on low/equal' configuration

Person Restriction on Portmanteau Agreement Formation (Woolford 2010: 24)

In a portmanteau agreement form, the person of the **subject must be higher** than or equal to the person of the object.

| 1→2 PORTMX | 2→1 PORTMX **true** | 2→1 PORTMX **false** |
|---|---|---|
| **true** | attested | attested |
| **false** | **non-attested** | attested |

Object-Subject Constraint (Lakämper / Wunderlich 1998: 127)

The **object** may be **marked separately** from the subject only if it refers to a person that is **higher** on the hierarchy of person than the person to which the subject refers.
Hierarchy of person: $1 > 2 > 3$

**Prediction**

{1→2, 1→3, 2→3, 3→3} contexts
contain **more** occurrences of portmanteaux than
{2→1, 3→1, 3→2} contexts





## Predicted contexts with more portmanteaux

| | **object** | | |
|---|---|---|---|
| **subject** | 1 | 2 | 3 |
| 1 | ▪ | LPH/DPH | DPH |
| 2 | LPH | ▪ | DPH |
| 3 | | | DPH |

Null hypothesis

No connection between local/nonlocal or direct/inverse and portmanteau ratio

## Remove forms that occur in the intransitive paradigm

Heuristically identify non-portmanteaux and count cells that contain nothing else

| subject | | object: 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|
| 1SG | wa | ▪ | ▪ | c'i | c'i | wa | wic'awa |
| 1PL | uŋ | ▪ | ▪ | uŋni | uŋni | uŋ | wic'auŋ |
| 2SG | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 2PL | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 3SG | | ma | uŋ | ni | ni | | wic'a |
| 3PL | | ma | uŋ | ni | ni | | wic'a |

| *trans. cell* IS LOCAL | HAS FORM: **true** | **false** | RATIO: **true** |
|---|---|---|---|
| **true** | 6 | 2 | 75% |
| **false** | 12 | 6 | 66% |

| *trans. cell* IS DIRECT | HAS FORM: **true** | **false** | RATIO: **true** |
|---|---|---|---|
| **true** | 10 | 4 | 71% |
| **false** | 8 | 4 | 66% |





## Remove forms with perfect non-portmanteau distribution

*ya*- SA[+2] *ma*- P[+1 +sg] *uŋ*- SAP[+1 +pl] *wic'a*- P[+3 +pl]

| subject | | object: 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|
| 1SG | wa | ▪ | ▪ | c'i | c'i | wa | wic'awa |
| 1PL | uŋ | ▪ | ▪ | uŋni | uŋni | uŋ | wic'auŋ |
| 2SG | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 2PL | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 3SG | | ma | uŋ | ni | ni | | wic'a |
| 3PL | | ma | uŋ | ni | ni | | wic'a |

| *trans. cell* IS LOCAL | HAS FORM: **true** | **false** | RATIO: **true** |
|---|---|---|---|
| **true** | 4 | 4 | 50% |
| **false** | 6 | 12 | 33% |

| *trans. cell* IS DIRECT | HAS FORM: **true** | **false** | RATIO: **true** |
|---|---|---|---|
| **true** | 6 | 8 | 42% |
| **false** | 4 | 8 | 33% |





## Measuring the accuracy of form-meaning pairs

| CELL HAS MEANING | CELL HAS FORM: **true** | **false** | `precision` |
|---|---|---|---|
| **true** | true positives | false positives | $\frac{tp}{tp+fp}$ |
| **false** | false negatives | true negatives | |
| `recall` | $\frac{tp}{tp+fn}$ | | |

false positives = **over**insertion = lower precision
false negatives = **under**insertion = lower recall

| *uŋ*- SAP[+1 +pl] CELL HAS MEANING | CELL HAS FORM: **true** | **false** | `precision` |
|---|---|---|---|
| **true** | 9 | 0 | 100% |
| **false** | 0 | 25 | |
| `recall` | 100% | | |





| subject | | object: 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|
| 1SG | wa | ▪ | ▪ | c'i | c'i | wa | wic'awa |
| 1PL | uŋ | ▪ | ▪ | uŋni | uŋni | uŋ | wic'auŋ |
| 2SG | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 2PL | ya | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 3SG | | ma | uŋ | ni | ni | | wic'a |
| 3PL | | ma | uŋ | ni | ni | | wic'a |

| *wa*- SA[+1 +sg] CELL HAS MEANING | CELL HAS FORM: **true** | **false** | `precision` |
|---|---|---|---|
| **true** | 3 | 2 | 60% |
| **false** | 0 | 29 | |
| `recall` | 100% | | |

| *c'i*- SA[+1 +sg] CELL HAS MEANING | CELL HAS FORM: **true** | **false** | `precision` |
|---|---|---|---|
| **true** | 2 | 3 | 40% |
| **false** | 0 | 29 | |
| `recall` | 100% | | |

# Remove forms with 50% precise non-portmanteau meaning

Reproduces both the Local Portmanteau and Direct Portmanteau Hypothesis

| | | POSITIVES | | | | |
|---|---|---|---|---|---|---|
| FORM | MEANING | **true** | **false** | PRECISION | ... | RECALL |
| *ya-* | SA[+2] | 10 | 0 | 100% | | 100% |
| *uŋ-* | SAP[+1 +pl] | 9 | 0 | 100% | | 100% |
| *wic'a-* | P[+3 +pl] | 6 | 0 | 100% | | 100% |
| *ma-* | P[+1 +sg] | 4 | 0 | 100% | | 100% |
| *ni-* | P[+2] | 6 | 2 | 75% | | 100% |
| *wa-* | SA[+1 +sg] | 3 | 2 | 60% | | 100% |
| *c'i-* | SA[+1 +sg] | 2 | 3 | 40% | | 100% |

| **subject** | | **subject** | **object** 1SG | 1PL | 2SG | 2PL | 3SG | 3PL |
|---|---|---|---|---|---|---|---|---|
| 1SG | wa | 1SG | ▪ | ▪ | c'i | c'i | wa | wic'awa |
| 1PL | uŋ | 1PL | ▪ | ▪ | uŋni | uŋni | uŋ | wic'auŋ |
| 2SG | ya | 2SG | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 2PL | ya | 2PL | maya | uŋya | ▪ | ▪ | ya | wic'aya |
| 3SG | | 3SG | ma | uŋ | ni | ni | | wic'a |
| 3PL | | 3PL | ma | uŋ | ni | ni | | wic'a |





# Iterative algorithm for segmentation and analysis I

1. A Let $P$ be the set of perfect hypotheses, i.e. all $\langle form, meaning \rangle$ pairs combining all free affix strings lacking a free affix as substring with every *meaning* subsuming all and only the cells with the *form*
   B Select the optimal marker hypotheses $O \subseteq P$ having $(\alpha > \beta > \gamma)$:
   - $\alpha$ maximal number of (free or bound) true positives
   - $\beta$ non-portmanteau $>$ portmanteau
   - $\gamma$ maximal number of segments
2. If $O = \varnothing$ then
   A Let $M$ be the set of marker hypotheses with minimal 50% precision, i.e. all $\langle form, meaning \rangle$ pairs combining all free affix strings with every *meaning* subsuming at least half of the cells with the *form*
   B Select the optimal marker hypotheses $O \subseteq M$ having $(\alpha > \beta > \ldots \zeta)$:
   - $\alpha$ maximal number of free true positives
   - $\beta$ non-portmanteau $>$ portmanteau
   - $\gamma$ maximal number of bound true positives
   - $\delta$ minimal number of false negatives
   - $\epsilon$ minimal number of false positives
   - $\zeta$ maximal number of segments





# Iterative algorithm for segmentation and analysis II

Akin to the Harmonic Serialism version of Optimality Theory (McCarthy 2010)

3. Add some $\langle form, meaning \rangle \in O$ to the lexicon and remove a single occurrence of *form* from all cells with it subsumed by *meaning*
4. If any paradigm cell has a non-empty affix string, go to 1, else end

(see also Bank & Trommer 2012)

**affix string** element of a paradigm cell (already segmented)
**free** the form itself occurs as an affix string
**bound** the form occurs as proper substring of an affix string

(see also Bank & Trommer 2015)

**In brief**

- try perfect markers, fall back to 50% precision markers
- prefer more general markers, combine already segmented forms
- avoid portmanteaux, minimize homophony
- assume but minimize blocking, avoid adding morpheme breaks





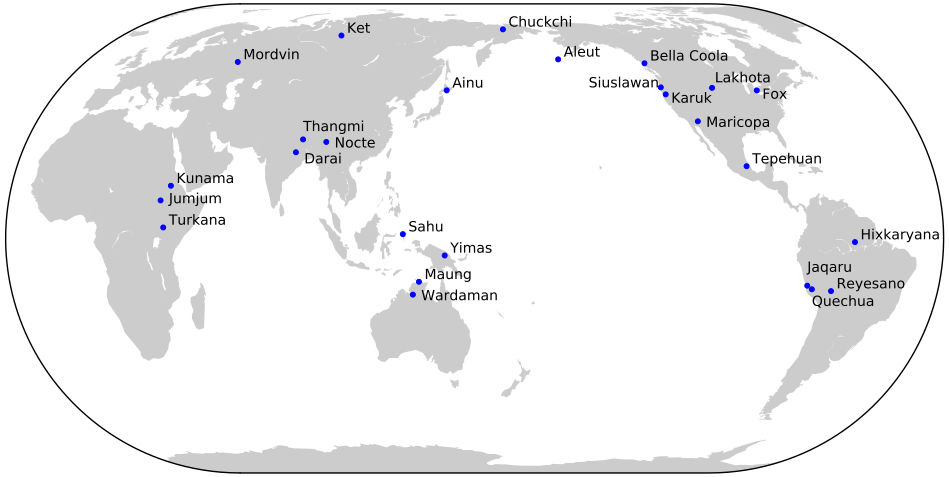
# Algorithm results for Ayacucho Quechua (Lakämper / Wunderlich 1998)

| **subject** | | **subj** | **object** 1SG | 1PE | 1PI | 2SG | 2PL | 3SL | 3PL |
|---|---|---|---|---|---|---|---|---|---|
| 1SG | n-i | 1SG | ▪ | ▪ | ▪ | **yki** | **yki**-cis | n-i | n-i |
| 1PE | n-i-ku | 1PE | ▪ | ▪ | ▪ | **yki**-ku | **yki**-cis | n-i-ku | n-i-ku |
| 1PI | n-cis | 1PI | ▪ | ▪ | ▪ | ▪ | ▪ | n-cis | n-cis |
| 2SG | n-ki | 2SG | wa-n-ki | wa-n-ki-ku | ▪ | ▪ | ▪ | n-ki | n-ki |
| 2PL | n-ki-cis | 2PL | wa-n-ki-cis | wa-n-ki-ku | ▪ | ▪ | ▪ | n-ki-cis | n-ki-cis |
| 3SG | n | 3SG | wa-n | wa-n-ku | wa-n-cis | **su**-n-ki | **su**-n-ki-cis | n | n |
| 3PL | n-ku | 3PL | wa-n-ku | wa-n-ku | wa-n-cis | **su**-n-ki-ku | **su**-n-ki-cis | n-ku | n-ku |

| FORM | MEANING | PRECISION | RECALL |
|---|---|---|---|
| ***-yki*** | **[+1 −2]A→P[−1 +2]** | 100% | 100% |
| *-n* | [] | 90% | 100% |
| *-wa* | P[+1] | 100% | 100% |
| ***-su*** | **[+3]A→P[−1 +2]** | 100% | 100% |
| *-cis* | SAP[+2 +pl] | 92% | 100% |
| *-ki* | SAP[−1 +2] | 77% | 100% |
| *-ku* | SAP[−2 +pl] | 61% | 100% |
| *-i* | SA[+1 −2] | 60% | 100% |

# Transitive agreement paradigms from 26 languages

Data at `http://proalki.uni-leipzig.de/wiki/Project:Portmanteau_Analyses`








# Criteria for data selection

- only languages with obligatory agreement with subject and object of (mono-)transitive verbs (A and P)
- exclude markers considered clitics (e.g. in the source)
- areal and genealogical control (see next slide)
- prefer descriptions with complete intransitive and transitive verb paradigms (or equivalent)
- use underlying forms where available





# Balancing the language sample for family and area

Genealogy and geography from AUTOTYP database (Nichols / Witzlack-Makarevich / Bickel 2013)

| LANGUAGE | ISO639-3 | FAMILY/ISOLATE | AREA | CONTINENT |
|---|---|---|---|---|
| Jumjum | jum | Western Nilotic | African Savannah | Africa |
| Kunama | kun | Kunama | Greater Abyssinia | Africa |
| Turkana | tuv | Eastern Nilotic | S Africa | Africa |
| Ket | ket | Yeniseian | Inner Asia | N-C Asia |
| Mordvin | myv | Finno-Ugric | Inner Asia | N-C Asia |
| Ainu | ain | Ainu | N Coast Asia | N-C Asia |
| Aleut | ale | Aleut | N Coast Asia | N-C Asia |
| Chuckchi | ckt | Chukotkan | N Coast Asia | N-C Asia |
| Darai | dry | Indo-Iranian | Indic | S/SE Asia |
| Thangmi | thf | Remnant Himalayish | Indic | S/SE Asia |
| Nocte | njb | Brahmaputran (Sal) | Southeast Asia | S/SE Asia |
| Yimas | yee | Lower Sepik | N Coast New Guinea | NG and Oceania |
| Sahu | saj | North Halmaheran | Oceania | NG and Oceania |
| Maung | mph | Iwaidjan | N Australia | Australia |
| Wardaman | wrr | Wagiman - Wardaman | N Australia | Australia |
| Bella Coola | blc | Salishan | Alaska-Oregon | W N America |
| Siuslawan | sis | Siuslawan | Alaska-Oregon | W N America |
| Karuk | kyh | Karok | California | W N America |
| Lakhota | lkt | Siouan | Basin and Plains | E N America |
| Maricopa | mrc | Yuman | Basin and Plains | E N America |
| Fox | sac | Algonquian | E North America | E N America |
| Tlachichilco Tepehuan | tee | Totonac-Tepehuan | Mesoamerica | C America |
| Jaqaru | jqr | Aymaran | Andean | S America |
| Quechua (Ayacucho) | quy | Quechuan | Andean | S America |
| Hixkaryana | hix | Cariban | NE South America | S America |
| Reyesano | rey | Tacanan | NE South America | S America |
| NUMBER OF DISTINCT | **26** | **26 of 593** | **17 of 24** | **9 of 10** |

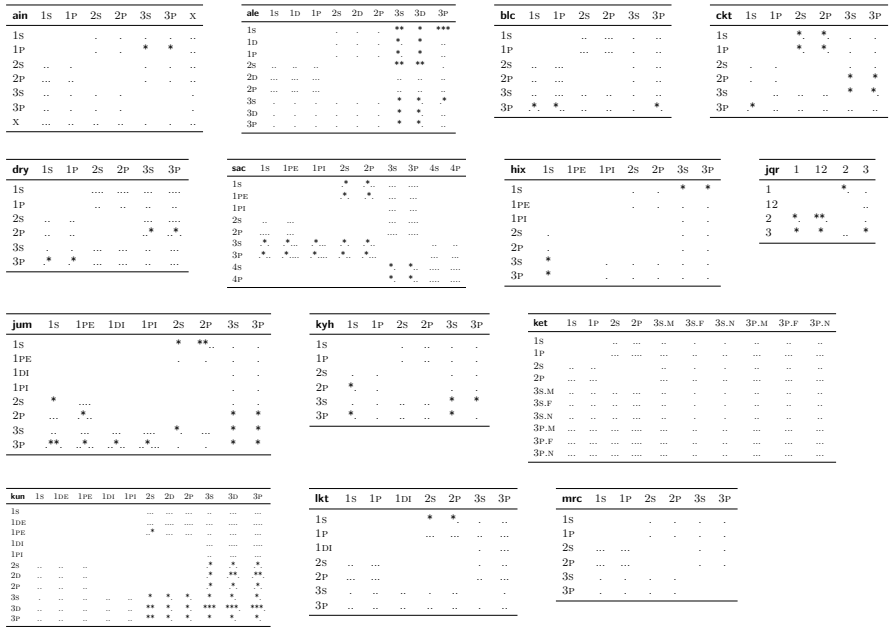




# Results overview

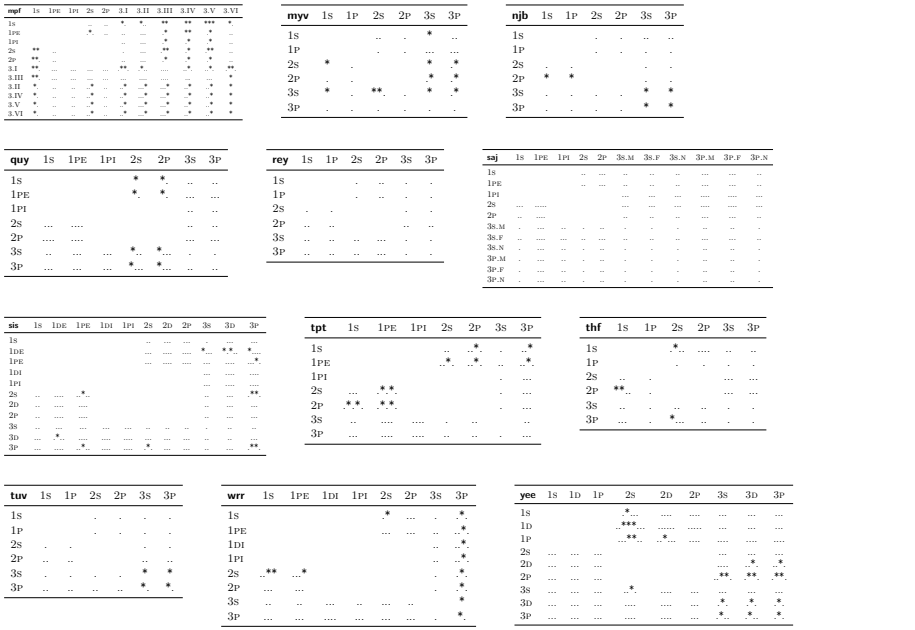
Are portmanteaux more likely to occur in local paradigm cells and/or direct paradigm cells?

| | | LEARNED LEXEMES | | TRANSITIVE CELLS WITH AFFIX | | | |
|---|---|---|---|---|---|---|---|
| LANGUAGE | ISO | **nonport** | **port** | **nonlocal** | **local** | **inverse** | **direct** |
| Ainu | ain | 9 | 1 | 29 | 8 | 16 | 21 |
| Aleut | ale | 8 | 9 | 45 | 18 | 27 | 36 |
| Bella Coola | blc | 9 | 2 | 20 | 8 | 12 | 16 |
| Chuckchi | ckt | 10 | 5 | 19 | 8 | 11 | 16 |
| Darai | dry | 9 | 2 | 20 | 8 | 12 | 16 |
| Fox | sac | 13 | 4 | 32 | 8 | 14 | 26 |
| Hixkaryana | hix | 7 | 2 | 22 | 6 | 10 | 18 |
| Jaqaru | jqr | 4 | 5 | 7 | 3 | 5 | 5 |
| Jumjum | jum | 16 | 9 | 28 | 8 | 16 | 20 |
| Karuk | kyh | 10 | 3 | 20 | 8 | 12 | 16 |
| Ket | ket | 12 | 0 | 84 | 8 | 28 | 64 |
| Kunama | kun | 11 | 6 | 57 | 18 | 33 | 42 |
| Lakhota | lkt | 7 | 1 | 23 | 8 | 14 | 17 |
| Maricopa | mrc | 3 | 0 | 16 | 8 | 12 | 12 |
| Maung | mpf | 19 | 16 | 96 | 8 | 34 | 70 |
| Mordvin | myv | 10 | 8 | 20 | 8 | 12 | 16 |
| Nocte | njb | 8 | 2 | 20 | 8 | 12 | 16 |
| Quechua | quy | 6 | 2 | 24 | 8 | 14 | 18 |
| Reyesano | rey | 4 | 0 | 20 | 8 | 12 | 16 |
| Sahu | saj | 19 | 0 | 96 | 8 | 34 | 70 |
| Siuslawan | sis | 10 | 6 | 57 | 18 | 33 | 42 |
| Tepehuan | tpt | 9 | 3 | 23 | 8 | 14 | 17 |
| Thangmi | thf | 7 | 3 | 20 | 8 | 12 | 16 |
| Turkana | tuv | 6 | 1 | 20 | 8 | 12 | 16 |
| Wardaman | wrr | 7 | 5 | 27 | 8 | 16 | 19 |
| Yimas | yee | 18 | 10 | 45 | 18 | 27 | 36 |
| | | **251** | **105** | 890 | 241 | 454 | 677 |







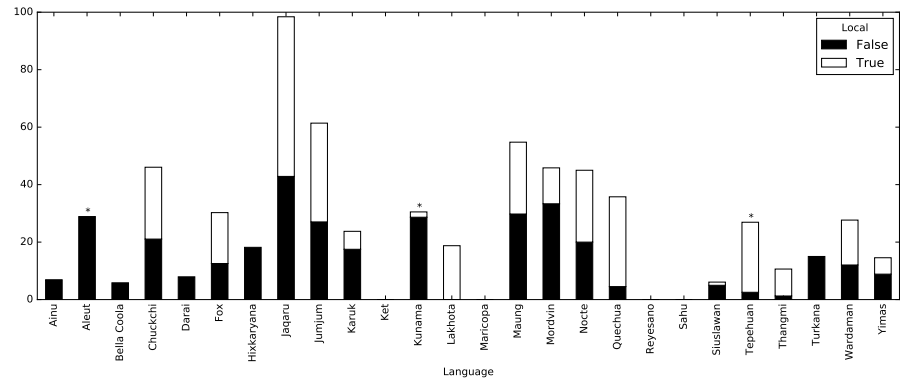






# Nonlocal vs. local

Mean percentage of portmanteaux affixes per cell



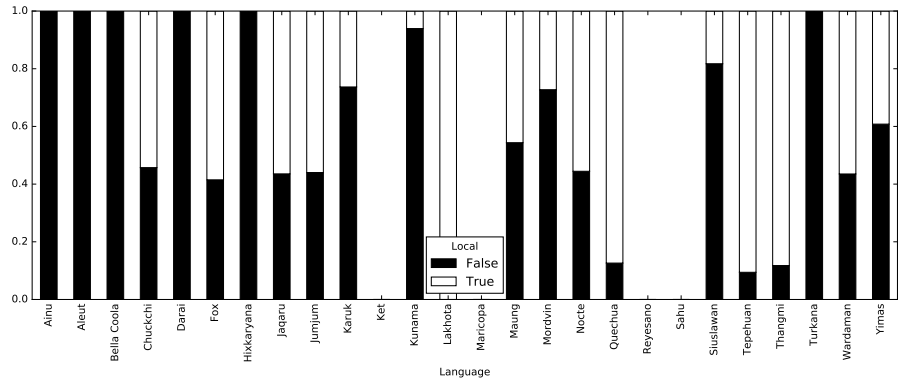

*: significant interaction of portmanteau status with occurrence locality (Fisher's exact $p < .05$)





# Nonlocal vs. local

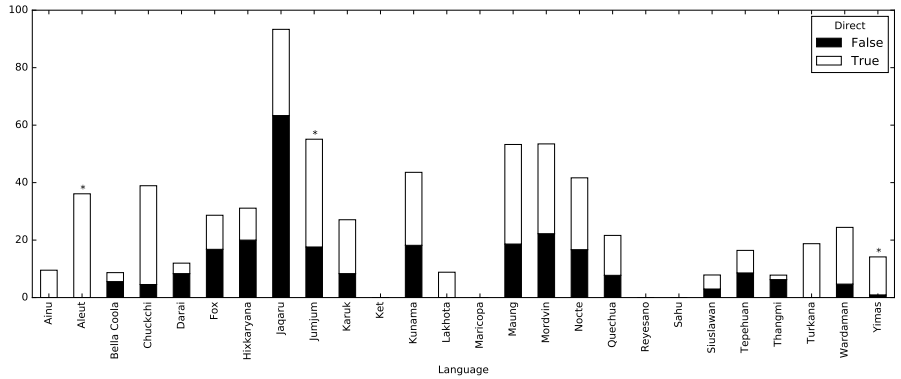
Normalized mean percentage of portmanteaux affixes per cell




Point-biserial correlation $r_{pb} = -0.31$, $p = .043$

# Inverse vs. direct

Mean percentage of portmanteaux affixes per cell



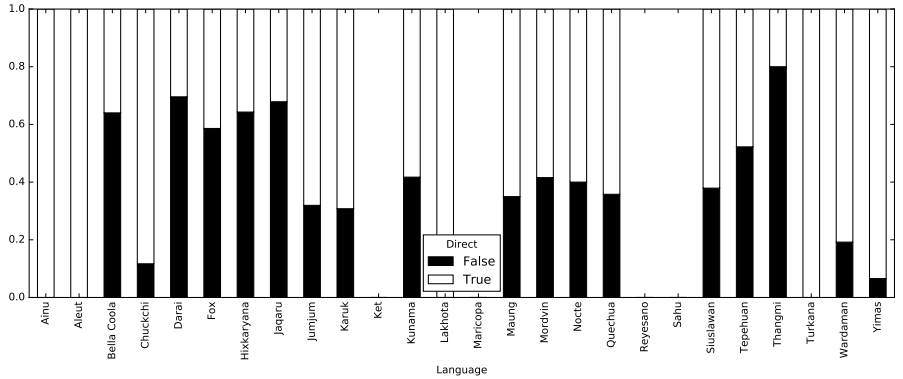

*: significant interaction of portmanteau status with occurrence direct (Fisher's exact $p < .05$)





# Inverse vs. direct

Normalized mean percentage of portmanteaux affixes per cell




Point-biserial correlation $r_{pb} = 0.50$, $p = .0006$





# No support for the Local Portmanteau Hypothesis

- no correlation of local cell and high portmanteau ratio in our data (rather a mildly significant correlation with *low* ratio)
- 1↔2 taboo anti-transparency (Heath 1991, 1998) might still apply (one strategy down, eleven to go)
- while Lakhota 1sg→2 *c'i-* is not decomposable into intransitive person markers, does it really ofuscate the awkward 'me acts on you' meaning?





# Evidence for the Direct Portmanteau Hypothesis

- portmanteau ratios higher in direct than in inverse cells
- also observable with simpler methods (e.g. removal of forms with 50% precision nonportmanteau distribution)
- no language has portmanteaux only in inverse cells, four only in direct
- seems to depend on the directness of 3→3 cells
- fossilization of a $1 > 2 > 3$ hierarchy?

## Conclusion and next steps

- automation of analysis allows to evaluate typological claims avoiding interference from variation in analytical biases (consistency, reproducibility)
- the required level of explictness allows/forces us to clarify/discuss the strategies for detecting morphological structure
- compute full morphological grammars including linearization and blocking relations between affixes, parametrize for different analytical options, estimate the uncertainty of analysis
- test typological claims for. . . ?





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