

Complex Scales in Multiargument Agreement

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Abstract

Languages whose agreement morphology is governed by the relative prominence of subject and object sometimes exhibit an agreement pattern that emerges from the interaction of different prominence hierarchies (e.g. person, number, and grammatical function). I show that these data can't be deduced from *simple* prominence scales which are well-established (e.g. $1 > 2 > 3$; $pl > sg$; $A > P$). Therefore I propose a principle-constrained way to construct category-conflating *complex* scales from single ones (e.g. $1 > 2pl > 2sg > 3$). Finally, I introduce a more restricted subtype of hierarchy effect that only takes effect if a hierarchy mismatch is strong enough (crossing of at least two scale positions).

1. Introduction

In languages with rich inflectional morphology, verbal agreement often reflects the relative markedness of the subject and the object. The agreement patterns that are driven by such prominence comparison between the arguments are known as *hierarchical agreement/alignment* and *direction marking*. Languages with hierarchical agreement have the (syntactic) potential to agree with either argument of transitive sentences, but (morphologically) choose to only agree with the argument, that is most prominent on a certain hierarchy, like one of the following more common scales.

- (1) a. $1 > 2 > 3$ b. $pl > du > sg$ c. $+anim > -anim$ ¹

Hence, a language with hierarchical agreement governed by (1a) marks first person as soon as there is a first person argument (irrespective of its grammatical function) and third person only, in case both subject and object are

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¹Abbreviations and conventions used: $1/2/3$ = first/second/third person, $sg/du/pl$ = singular/dual/plural, $\pm anim$ = (in)animate, A/P = transitive subject/object, $pos/opt/neg$ = positive/optative/negative order, $\alpha \rightarrow \beta$ = transitive subject α object β .

third person. Additionally, these languages often exhibit direction marking (*direct/inverse marking*): An inverse marker occurs if the subject is lower on a given hierarchy than the object – and thus marked –, while the opposite (direct) configuration typically remains unmarked (Comrie 1980). If direction marking is governed by a hierarchy similar to that of the other agreement markers, this may serve to at least partially reduce the ambiguity introduced by hierarchical agreement – both inflectional patterns are thus functionally related and therefore frequently occur together.

Hierarchical agreement and direction marking have been reported for a range of genetically unrelated languages (e.g. Menominee (Algonquian), Bloomfield 1963; Turkana (Nilotic), Dimmendaal 1983; Nocte (Tibeto-Burman), Gupta 1971). While this has shown that they can be driven by diverse morphosyntactic categories – e.g. the person scale (1a) for Nocte (Gupta 1971), or the number scale (1b) for Dumi (Trommer 2006) –, it has usually been implicitly assumed that the effects of person and number hierarchies are in principle independent of each other (e.g. Béjar 2003, where person and number agreement are triggered by different syntactic probes). On a more general level, the involvement of markedness scales like (1) relates these patterns to more widespread kinds of *hierarchy effects* like differential argument encoding (e.g. differential object marking, Bossong 1985) – they all share the property of being functionally driven by the economic use of formal marking. Again, virtually all existing formal approaches to such effects (e.g. Aissen 1999) relate them to mismatches on atomic scales that rank feature values for one specific category (a single person, number, or animacy scale).

In this paper, I show that the agreement pattern of the Hokan language Karuk (also Karok, Bright 1957, Macaulay 1992) extends the range of observable hierarchy effects in two important ways: It demands an analysis that *firstly* makes reference to *complex scales* which combine different categories (e.g. $1 > 2\text{pl} > 2\text{sg} > 3$ combining person and number) and *secondly* measures the *strength of mismatches* on such scales resulting in two-step-effects. As I will show in section 2, Karuk hierarchical agreement and inverse marking exhibit a pattern that can't be fully described in terms of independent (non-intermingled) person and number scales: While the pronominal prefixes always agree with the local (first or second) person argument when combined with a non-local (third) person (obeying the well-known hierarchy $\{1, 2\} > 3$), their agreement with two local person arguments depends on specific combinations of person and number values (differential behavior of second person singular and plural).

Yet, this can straightforwardly be represented hierarchically by constructing a complex scale and weighting mismatches thereon. I develop a principle-constrained theory for the construction of the needed (language-specific) complex scales from (universal) base scales in subsection 2.2. As shown in subsection 2.3, this can also account for the distribution of the inverse suffix in Karuk which is considered problematic in previous work (Macaulay 1992). On the resulting scales, a hierarchy mismatch actually triggers a (visible) hierarchy effect only if it is big enough as there is at least one scale position between the compared points on the scale (minimum two-step distance). Otherwise – if no such significant hierarchy mismatch is present – the default behavior for the given domain of the grammar comes into play.

Nevins & Sandalo (to appear) abolish the usage of complex scales and claim that they need to be avoided: Examining a similar agreement pattern in the Mataco-Guaicuru language Kadiwéu, they conclude that the explanation is to be shifted to the properties of individual exponents. They derive the pattern from the exponents' morphotactics interacting with general markedness statements instead. However, as I will show in section 3, a complex scale approach is empirically superior: The Kadiwéu pattern can straightforwardly be described in terms of complex scales, but the Karuk data can't be captured analogously to their analysis, as the relevant morphotactic peculiarities it relies on are not present in Karuk. In fact, an analysis using a complex scale and the sketched switching to default agreement quite naturally fits their data: There is also no need to measure hierarchy mismatches in this case. As shown in subsection 3.4, the differential behavior of first person singular and plural when combined with second person simply emerges from the latter always being plural in the language (obligatory honorification). Hence the superficially equivalent agreement patterns of the two languages result from differently complex instances of hierarchical agreement. Section 4, finally, concludes.

2. Hierarchy Effects in Karuk

Karuk is a nearly extinct Amerindian language spoken by the Karuk people living along the Klamath River in Northwestern California. It has been claimed to belong to the (controversial) Hokan language family, though may better be seen as an isolate forming a *sprachbund* with areal related languages like Yurok,

Hupa and Chimariko. In fact, its verbal morphology is structurally similar to systems found in Algonquian and Algonquian languages (e.g. Cree and Yurok).

As exemplified by (2), Karuk verbal agreement comprises pronominal prefixes like the highlighted *?u-* and *kín-* marking both (first, second, or third) person and (singular, plural, or unspecified) number, plus the single suffix *-ap* which is a (contextually restricted) inverse marker.

- (2) a. *?u-?áák-tih*
 3(SG)-hit-DUR
 ‘He’s hitting him/them.’
 b. *?iim-pú=kín-?ááku-tih-ap*
 you(sg)-NEG=1-hit-DUR-INV
 ‘You’re not hitting us.’

(Macaulay 1992: 185)²

As the person/number prefixes typically only cross-reference one argument in transitives, they give rise to at least some ambiguity. Such ambiguity may be resolved by the (optional) use of pronouns and full nominal phrases – as seen in (2b). Aside from the person and number of subject and object, the inventory and distribution of markers additionally vary slightly with respect to polarity (positive vs. negative) and the mood (indicative vs. optative). Following Macaulay (1992), I will call the resulting three subparadigms *positive*, *negative* and *optative ‘order’* – adopting the term *inflectional order* from the Algonquianist literature (originally introduced by Bloomfield 1946).³

For an informal description of hierarchical agreement, it’s also quite useful to think of transitive paradigms as being made from four different subparadigms according to the arguments’ position on the canonical {1, 2} > 3 hierarchy:⁴

- (3) *Classifying transitive paradigm parts by their {1, 2} > 3 hierarchy relation*

A	P	paradigm part	1/2>3		1/2 _P	3 _P
1/2	→ 3	<i>direct</i>	A>P	1/2 _A	<i>local</i>	<i>direct</i>
3	→ 1/2	<i>inverse</i>	A<P			
1/2	→ 1/2	<i>local</i>	A=P	3 _A	<i>inverse</i>	<i>non-local</i>
3	→ 3	<i>non-local</i>	A=P			

²Note that the original glosses for the pronominal prefixes fully specify subject and object features, although they typically solely cross-reference a single argument as indicated here.

³Note that the optative forms are positive; a negative optative can be formed periphrastically.

⁴This classification is again found in many descriptions of Algonquian languages.

While there is a canonical mismatch in the *direct* and *inverse* part of the paradigm – favoring subject agreement in the former and object agreement in the latter –, there is no such preference in the *local* and *non-local* configuration.

2.1. Data & Observations

The following tables contain the agreement affixes' transitive paradigm for each order – subject features shown in the rows, object features in the columns:

(4) *Karuk* agreement affixes transitive paradigm (by subparadigm)

a.	pos	1sg	1pl	2sg	2pl	3sg	3pl
	1sg	–	–	<i>nu-</i>	<i>ki·k- -ap</i>	<i>ni-</i>	<i>ni-</i>
	1pl	–	–	<i>nu-</i>	<i>ki·k- -ap</i>	<i>nu-</i>	<i>nu-</i>
	2sg	<i>ná-</i>	<i>kín-</i>	–	–	<i>?i-</i>	<i>?i-</i>
	2pl	<i>kaná-</i>	<i>kín-</i>	–	–	<i>ku-</i>	<i>ku-</i>
	3sg	<i>ná-</i>	<i>kín-</i>	<i>?i- -ap</i>	<i>ki·k- -ap</i>	<i>?u-</i>	<i>?u-</i>
	3pl	<i>kaná-</i>	<i>kín-</i>	<i>?i- -ap</i>	<i>ki·k- -ap</i>	<i>kun-</i>	<i>kín-</i>
b.	opt	1sg	1pl	2sg	2pl	3sg	3pl
	1sg	–	–	<i>nú-</i>	<i>ki·k- -ap</i>	<i>kán-</i>	<i>kán-</i>
	1pl	–	–	<i>nú-</i>	<i>ki·k- -ap</i>	<i>nú-</i>	<i>nú-</i>
	2sg	<i>ná-</i>	<i>kín-</i>	–	–	∅	∅
	2pl	<i>kaná-</i>	<i>kín-</i>	–	–	<i>ki·k-</i>	<i>ki·k-</i>
	3sg	<i>ná-</i>	<i>kín-</i>	<i>?i- -ap</i>	<i>ki·k- -ap</i>	<i>kám-</i>	<i>kám-</i>
	3pl	<i>kaná-</i>	<i>kín-</i>	<i>?i- -ap</i>	<i>ki·k- -ap</i>	<i>kun-</i>	<i>kín-</i>
c.	neg	1sg	1pl	2sg	2pl	3sg	3pl
	1sg	–	–	<i>kín-</i>	<i>ki·k- -ap</i>	<i>ná-</i>	<i>ná-</i>
	1pl	–	–	<i>kín-</i>	<i>ki·k- -ap</i>	<i>kín-</i>	<i>kín-</i>
	2sg	<i>ná-</i>	<i>kín- -ap</i>	–	–	∅	∅
	2pl	<i>kaná- -ap</i>	<i>kín- -ap</i>	–	–	<i>-ap</i>	<i>-ap</i>
	3sg	<i>ná-</i>	<i>kín- -ap</i>	<i>-ap</i>	<i>ki·k- -ap</i>	∅	<i>-ap</i>
	3pl	<i>kaná- -ap</i>	<i>kín- -ap</i>	<i>-ap</i>	<i>ki·k- -ap</i>	<i>-ap</i>	<i>kín- -ap</i>

(Macaulay 1992: 184)⁵

⁵In sentences with first person acting on first person or second person acting on second person, a reflexive construction is obligatory. Resulting gaps are indicated by a dash, absence of an overt marker by the null marker instead. The intransitive forms are the same as the ones in the third person singular object column (i.e. there is no overt agreement with third person singular objects). Acute accents mark underlying high pitch whose overt (non-)realization depends on stem morphophonemics. In the non-negative paradigms, *kín-*, *kun-*, *ki·k-*, *nu-* and *kaná-* cause an accent shift in certain stems (originally indicated by accented hyphens).

Briefly looking at the whole paradigm, the first impression is of its massive syncretism, both between and within the different orders: Positive and optative are almost the same: Their mood difference is expressed explicitly only in some cases with third person objects (e.g. 1sg→3 *ni-* vs. *kán-*).⁶ The negative order is characterized mostly by omission of prefixes (*?i-*, *ku/ki-k-*, *?u/kám-*, *kun-*), use of more general first person markers (*ná-*, *kín-*), as well as generalization of the suffix (*-ap*). The syncretism patterns within the paradigms are also pretty stable throughout the orders, displaying a general tendency to prefer object marking: There is no marking of the subject's person with first person singular objects, no marking of the subject's number with second person singular objects, and with first and second person plural objects, the subject's features are fully neutralized. Third person objects display a common hierarchy effect in the inverse paradigm part: Their number is neutralized with (higher) first and second person subjects. Furthermore, an eye-catching hierarchical pattern is found in having the same high person marker for subject and object in direct and inverse configurations (see the 'L-shaped' syncretism field of *?i-* in the positive or *ki-k-* in the optative order). These markers are thus not specified for grammatical function. Finally one may notice, that there are many different first person markers – some marked, most underspecified for order, some underspecified for number and/or grammatical function (*kín-*, *ná-*) and some specialized subject markers (*nu/nú-*, *ni-*, *kán-*). There are different second person plural markers as well (*ki-k-* and *ku-*, the latter being a positive order subject marker).

A closer look at prefixes occurring with transitives combining first or second with third person – a canonical hierarchy mismatch – confirms that they exhibit hierarchical agreement: Only the first and second person arguments are marked – independently of their grammatical function.

(5) *Hierarchical agreement syncretisms comparing 1/2→3 with 3→1/2 prefixes*

a.	1→3	3sg	3pl	3→1	1sg	1pl	(neg)
	1sg	<i>ná-</i>	<i>ná-</i>	3sg	<i>ná-</i>	<i>kín-</i>	
	1pl	<i>kín-</i>	<i>kín-</i>	3pl	<i>ka-ná-</i>	<i>kín-</i>	
b.	2→3	3sg	3pl	3→2	2sg	2pl	(pos)
	2sg	<i>?i-</i>	<i>?i-</i>	3sg	<i>?i-</i>	<i>ki-k-</i>	
	2pl	<i>ku-</i>	<i>ku-</i>	3pl	<i>?i-</i>	<i>ki-k-</i>	

⁶Note that the first person subject marker *-nu* additionally has an underlying pitch accent in the optative order, potentially disambiguating its positive and optative occurrences.

With *ná-* and *kín-* being first person markers (singular and generic) and *?i-* and *ku/ki·k-* expressing second person singular and plural, (5a) and (5b) thus form perfect instances of hierarchical agreement governed by the scale $\{1, 2\} > 3$ (Siewierska 1996).⁷ Moreover, in case of (5b), there is also canonical inverse marking: The inverse suffix *-ap* occurs in all cells of the (right side) inverse subparadigm, resolving the inherent ambiguity of *?i-* and *ki·k-* in these cases.

The agreement pattern in contexts with local persons only ('you and me' forms), however, is more complex:

(6) *Examining the competition between first and second person prefixes*

$1 \rightarrow 2$	2sg	2pl	$2 \rightarrow 1$	1sg	1pl	(neg)
1sg	<i>kín-</i>	<i>ki·k-</i>	2sg	<i>ná-</i>	<i>kín-</i>	
1pl	<i>kín-</i>	<i>ki·k-</i>	2pl	<i>ka-ná-</i>	<i>kín-</i>	

If the competition of first and second person was resolved by a strict person hierarchy (ranking one over the other), (6) had to consist only of markers for one – namely the higher ranked – person, as is the case in (5a) and (5b). Instead, the general requirement to agree with only one of the arguments reveals an interaction of person, number, and finally agreement by grammatical function: In transitives with a first person and a second person singular argument (7a-d) there is always (hierarchical) agreement with the first person argument (*ná-* and *kín-*), while in contexts with a first person and a second person plural argument (7e-h) we are faced with (default) object agreement (*ki·k-*, *ná-*, and *kín-* chosen on basis of the object's features).

(7) *Agreement for $1 \rightarrow 2$ and $2 \rightarrow 1$ forms (agreed-with argument in bold)*

- | | | | |
|--------------------|--------------------|--------------------|--------------------|
| a. 1sg →2sg | c. 1pl →2sg | e. 1sg→ 2pl | g. 1pl→ 2pl |
| b. 2sg→ 1sg | d. 2sg→ 1pl | f. 2pl →1sg | h. 2pl →1pl |

Crucially, by comparison of (7a) with (7g), it becomes clear, that any analysis utilizing simple (person, number, grammatical function) scales – or a non-intermingled combination of them – could not avoid to spuriously predict agreement with the same argument for these two cases – which then again is the case in the other 'minimal mismatch pair' (7b) compared with (7h): In all four cases, the competition between subject and object agreement can't be

⁷Note that there is an additional *ka-* number prefix marking subject's plural that only occurs in contexts with first person singular objects (in combination with *na-*).

resolved by the number hierarchy due to the missing mismatch. In the pair (7b) and (7h), person and grammatical function of the agreed-with argument converge (first person and object): Hence in both cases, the agreement can be attributed to one (or both) of the scales $1 > 2$ and $P > A$. In the pair (7a) and (7g) on the other hand, both person and grammatical function of the agreed-with argument contradict each other (and so do the corresponding scales):

(8) Scales resulting from $1sg \rightarrow 2sg$ subject and $1pl \rightarrow 2pl$ object agreement

$$\begin{array}{ccc}
 1sg \rightarrow 2sg \Leftrightarrow 1sgA > 2sgP & & 2plP > 1plA \Leftrightarrow 1pl \rightarrow 2pl \\
 1 > 2 & \text{⚡} & 2 > 1 \\
 A > P & \text{⚡} & P > A \\
 sg = sg & & pl = pl
 \end{array}$$

This makes it impossible to capture both cases with the same (possibly ranked) set of uncombined scales: As they can only be differentiated by their different number one has to refer to specific person/number (or grammatical function/number) combinations to capture them both.

In fact, Béjar's (2003) analysis treating person and number agreement as completely independent processes (triggered by different syntactic probes) can't fully account for the Karuk data: In her analysis, the feature specification on the person probe and its structural position conspire to switch person agreement from object to subject, only if the object is third person.⁸ However, for $1 \rightarrow 2sg$, this predicts second person singular object agreement (*?i-*) but in fact there is first person subject agreement (*nu-/kin-*). Similar problems arise from the independence of number agreement as well.

2.2. Analysis

The complex pattern of syncretism emerging from all (sub-)paradigms of (4) mostly results from single argument agreement.⁹ In (9), I give an abstract paradigm, where the subjects' and objects' person and number features in each cell are reduced to the features, that are actually expressed by markers occurring in that cell. As can be seen, person agreement exclusively cross-references a single argument, while there are two cases, where the marker additionally depends on the number feature of the other argument ($pl \rightarrow 1sg$ *ka-ná-* and

⁸See Georgi (this volume) for a detailed summary of Béjar's (2003) agreement mechanism.

⁹See Sappir (this volume) for a more traditional analysis of the positive order paradigm that implements the single argument agreement requirement in terms of impoverishment rules.

pl→3pl *kín*¹⁰). Together with the general neutralization of subject number with second person singular objects, this yields all of the syncretisms stable over the three orders.

(9) *Subject and object features expressed by Karuk agreement affixes*

	1sg	1pl	2sg	2pl	3sg	3pl
1sg	–	–	1sg→	→2pl	1sg→	1sg→
1pl	–	–	1pl→	→2pl	1pl→	1pl→
2sg	→1sg	→1pl	–	–	2sg→	2sg→
2pl	pl→1sg	→1pl	–	–	2pl→	2pl→
3sg	→1sg	→1pl	→2sg	→2pl	→3sg	→3pl
3pl	pl→1sg	→1pl	→2sg	→2pl	3pl→	pl→3pl

The distribution of person agreement is as follows:

Karuk person agreement distribution

Agreement is with the object, superseded by subject-agreement if either:

- a) the subject is first or second and the object is third person (1→3, 2→3)
- b) the subject is first and the object is second person singular (1→2sg)
- c) the object is third person singular and the subject is anything different (3pl→3sg)

At this point, a) is clearly an effect of the general person scale (10a), while b) and c) differentiate first and second person and second and third person by specific number values: In terms of scales, the person scale (10a) is subdifferentiated through the number scale (10b).

(10) *Base scales for composition*

- a. {1, 2} > 3
- b. pl > sg
- c. A > P

For this, apart from the notion of *atomic* and *complex scales* (11), we will also need to define an order of precedence of the atomic scales used. This *ranking of scales* will serve to guarantee that the restrictions of a scale are maintained, when it is differentiated by another scale – already suggested implicitly by the term subdifferentiation.

¹⁰This highly specialized third person plural marker is not to be confused with the homonymous general first person marker occurring throughout the paradigm.

(11) **Scale Basics**

- a. Atomic scales rank features (e.g. 1, 2, sg, pl, A, P, etc.)
 Complex scales rank bundles of features (e.g. 1pl, 2sgA, etc.)
- b. A bundle B_1 is higher than a bundle B_2
 for an atomic scale $S = F_n > F_{n-1} > \dots > F_1$ **iff**:
 there is a feature $F_i \in B_1$ and a feature $F_j \in B_2$ such that $F_i > F_j$

The creation of complex scales constitutes the central departure from established approaches where particular instantiations of universal hierarchies are captured either by the language-specific parametrization of feature structure (Béjar & Rezac 2009), or the construction of optimality-theoretic constraints which are then ranked (Aissen 1999). Here, the burden of explanation is shifted to the licensing of (language-specific) complex scales by (universal) simplex scales. Licensing of such scales follows the Scale Composition Principle:

(12) **Scale Composition**

- A complex scale $CS = B_m, B_{m-1}, \dots, B_1$ is licensed
 by the ranking of atomic scales $SS = S_n > S_{n-1} > \dots > S_1$ **iff**:
 for every pair of bundles $B_i, B_j, i > j$:
 If $B_j > B_i$ for scale S_p
 then $B_i \geq B_j$ for scale $S_o, o > p$

By this definition, a feature bundle can only be higher on a complex scale under two circumstances: If all of its (explicit or implicit) features are higher on the base scales, then it is higher independently of the scale ranking (e.g. 2plA > 3sgP by (10) under any ranking). If any of its features are lower on a base scale, this has to be licensed by a feature on a higher ranked scale being higher (e.g. 1sg > 3pl by (10) only if PERSON > NUMBER). *Scale Composition* thus only allows for sub-differentiation of atomic points on a higher ranked scale through the categories of a lower scale. It is restricted to only yield possibilities for more fine-grained complex scales that inherit all the restrictions of the base scales in precedence of their ranking.

Coming back to the Karuk pronominal agreement, the scale composition principle is now used to combine the simple scales from (10). As agreement in Karuk strictly obeys the person scale which is ‘stretched’ via the number scale, the following ranking is assumed:

- (13) *Ranking of scales*
 PERSON > NUMBER > GRAMMATICAL FUNCTION

This licenses the construction of the following scale:

- (14) *Complex scale for Karuk hierarchical agreement*
 1 > 2pl > 2sg > 3plA > 3plP > 3sgA > 3sgP

Reinvestigating the complex agreement characteristics in (9), hierarchical agreement now only occurs, if two arguments differ by at least two positions on (14). That means, the hierarchy mismatch of first person and second person plural is too small to trigger a hierarchy effect (hence defaults come into play), but the distance between first person and second person singular does (therefore their differential behavior when the other argument is first person). So the distribution of the agreement prefixes can finally be captured by the requirement, that they switch from *default object marking* to *hierarchical agreement* if one argument outranks the other by at least *two steps* on (14). Hence the pronominal prefixes display a more restricted instance of hierarchical agreement which only comes into effect, if the hierarchy mismatch is big enough.

OT Implementation

The sketched interaction of constant single argument agreement for person, weighted hierarchical agreement and default agreement may straightforwardly be implemented in optimality theory: Therefore, I assume that sequences of post-syntactically inserted markers are evaluated by a later grammatical component with the limited potential to delete or keep entire markers on the basis of a constraint ranking to be established.¹¹ The candidate set for this evaluation thus consists of the one maximal faithful candidate containing all inserted markers paired with their feature specifications plus all possible subsequences generated by obliteration of entire markers from that candidate. Hence the agreement operation is fully syntactic but optimized by a later morphosyntactic component ruled by markedness and faithfulness requirements.

¹¹Note that the weighted complex scale approach developed here can also be used to directly affect the choice of competing markers at the time of their insertion, or derive the deletion of features prior to the insertion. The mode used here allows to focus narrowly on the hierarchical person agreement and also facilitates the comparison with Nevins & Sandalo's (to appear) analysis below.

The driving force triggering the obligatory choice between either subject or object agreement for person is introduced by an undominated instance of (15), a markedness constraint completely banning the occurrence of more than one person marker.¹²

- (15) COHERENCE(X)
 Count a constraint violation for every output
 with more than one marker that realizes features of type X.

The forced choice is determined by the competition of two faithfulness constraints with potentially conflicting demands on the person agreement marker occurring in the output: (16a) induces weighted hierarchical agreement, demanding agreement with the higher argument on the established complex scale in case there is a two step mismatch, while (16b) unconditionally demands object agreement.

- (16) a. AGREE(π)-X \searrow X
 If one transitive argument outranks the other one
 by two (or more) steps on the following scale in the input
 $1 > 2pl > 2sg > 3plA > 3plP > 3sgA > 3sgP$
 count a constraint violation for every output
 without a marker that realizes the person feature of the higher one.
- b. AGREE(π)-P
 Count a constraint violation for every output
 without a marker that realizes the person feature of the tr. object.

By being unconditioned, the scope of (16b) includes the one of (16a), so the latter specific constraint must dominate the general former to be active (exclude candidates) in the evaluation. This yields the constraint ranking in (17).

- (17) COHERENCE(π) \gg AGREE(π)-X \searrow X \gg AGREE(π)-P

This implements single argument agreement for person, the hierarchical agreement with significant mismatches, as well as the fall-back to object agreement. The following evaluations illustrate these effects:¹³

¹² This constraint resembles the COHERENCE constraints of Trommer (2008) which – apart from bringing about one argument agreement restrictions – also have an effect on affix order that is irrelevant for the present analysis.

¹³ For the sake of convenience, all example evaluations are taken from the positive order.

Each tableau represents a transitive configuration of subject and object features (a paradigm cell) and contains four candidates: (i) is the maximally faithful candidate with the pronominal prefixes for both subject and object, (ii) omits agreement marker for the subject, (iii) the marker for the object, and candidate (iv) obliterates both.¹⁴

(18) **Input:** [3sgA] [2plP]

	COH(π)	AGR(π)- X \searrow x	AGR(π)-P
i. $\mathcal{U}_{[3]} ki \cdot k_{[2pl]}$	*!		
ii. $\mathcal{U}_{[3]}$		*!	*
iii. $ki \cdot k_{[2pl]}$			
iv.		*!	*

As can be seen from (18) to (24), candidate (i) containing two person markers is always blocked by the undominated COHERENCE(π) constraint. The maximally unfaithful candidate (iv) also never wins because the candidate with object agreement (iii) is always more harmonic – it *harmonically bounds* (iv) (Prince & Smolensky 2004): If the object agreement candidate (iii) violates the hierarchical agreement constraint AGREE(π)-X \searrow x, this automatically entails a violation for the empty candidate (iv). In case of such a tie, (iv) is always less harmonic than (iii) due to their different violation profile for the object agreement constraint AGREE(π)-P, as seen for example in (19) and (20). In sum, there is always person agreement with either the subject *or* the object.

(19) **Input:** [2sgA] [3sgP]

	COH(π)	AGR(π)- X \searrow x	AGR(π)-P
i. $\mathcal{U}_{[2sg]} \mathcal{U}_{[3]}$	*!		
ii. $\mathcal{U}_{[2sg]}$			*
iii. $\mathcal{U}_{[3]}$		*!	
iv.		*!	*

¹⁴Note that intransitives trivially satisfy all constraints and thus are not subject to obliteration.

(20) **Input:** [3plA] [2sgP]

	COH(π)	AGR(π)- X ↘ x	AGR(π)-P
i. <i>kun</i> _[3plA] <i>?i</i> _[2sg]	*!		
ii. <i>kun</i> _[3plA]			*!
iii. <i>?i</i> _[2sg]			
iv.			*!

As these evaluations show, there is always agreement with second person singular when combined with a third person (*?i*-): Either this is due to the presence of a two-step hierarchy mismatch (19), or to default object agreement (20). These two requirements may of course also converge, as in any combination of third person subjects with first person (21) or second person plural (18) objects. Taken together, agreement is always with a local person argument, when combined with third person.

(21) **Input:** [3plA] [1plP]

	COH(π)	AGR(π)- X ↘ x	AGR(π)-P
i. <i>kun</i> _[3plA] <i>kin</i> _[1]	*!		
ii. <i>kun</i> _[3plA]		*!	*
iii. <i>kin</i> _[1]			
iv.		*!	*

The next tableau exemplifies the fall-back to object agreement that comes into effect, if arguments from the two highest scale positions (1 > 2pl > 2sg > ...) are combined. Note also, that first person subject with second person singular object is the only combination of two local persons, where the evaluation yields subject agreement (two-step mismatch).

(22) **Input:** [2plA] [1plP]

	COH(π)	AGR(π)- X $\not\rightarrow$ X	AGR(π)- P
i. <i>ku</i> _[2plA] <i>ka-ná</i> _{[plA]-[1sg]}	*!		
ii. <i>ku</i> _[2plA]			*!
☞ iii. <i>ka-ná</i> _{[plA]-[1sg]}			
iv.			*!

Finally, in transitives with two third persons, (23) is the only case with a two-step mismatch on the scale (... > 3plA > 3plP > 3sgA > 3sgP) yielding hierarchical agreement. For the other cases the inactive hierarchical agreement constraint leads to object agreement (24).

(23) **Input:** [3plA] [3sgP]

	COH(π)	AGR(π)- X $\not\rightarrow$ X	AGR(π)-P
i. <i>kun</i> _[3plA] <i>ʔu</i> _[3]	*!		
☞ ii. <i>kun</i> _[3plA]			*
iii. <i>ʔu</i> _[3]		*!	
iv.		*!	*

(24) **Input:** [3sgA] [3sgP]

	COH(π)	AGR(π)- X $\not\rightarrow$ X	AGR(π)-P
i. <i>ʔu</i> _[3] <i>ʔu</i> _[3]	*!		
☞ ii(i). <i>ʔu</i> _[3]			
iv.			*!

2.3. Inverse Marking

Further evidence for the current approach combining the construction of complex scales and the measurement of hierarchy mismatches on them is found in the hitherto undiscussed distribution of the suffix *-ap*. Reconsidering the paradigms in (4), there are overall six instances of this marker that are

stable throughout all three orders – all sharing the property of occurring with second person objects. In the negative order, additional instances of *-ap* occur in almost all cases of a second or third person subject if at least one of the arguments is plural.¹⁵ The following investigation will be limited to the former, more regular occurrences of *-ap* given schematically in (25), while the latter may be attributed simply to homonymy or a contextually restricted generalization process in the negative order (see Trommer this volume).

- (25) *Inverse marking -ap for second person objects (occurrences in bold)*
- | | | | |
|-------------------|-------------------|-------------------|-------------------|
| a. 1sg→2sg | b. 1pl→2sg | e. 1sg→2pl | f. 1pl→2pl |
| c. 3sg→2sg | d. 3pl→2sg | g. 3sg→2pl | h. 3pl→2pl |

In her analysis, Macaulay (1992) identifies these instances of *-ap* as an inverse marker reflecting the general hierarchy (26), she proposes for Karuk.

- (26) *Karuk person hierarchy*
 2pl > 1 > 2sg > 3

(Macaulay 1992: 188)

While this correctly captures the occurrences of the suffix in (25), it also predicts *-ap* for all transitive 2sg→1 and 3→1 contexts – the latter being a rather canonical inverse case on her hierarchy: In these cases, the object is higher on (26) than the subject. As there is no inverse marking for these cases in Karuk, she has to admit that *-ap* has a defective distribution – though the pattern has been stable over a sixty-year period for which there are written records.

In the current approach, to account for the differential behavior of second person singular (25a-d) vs. plural objects (25e-h) and also capture the difference between first (25a,b) and third person subjects (25c,d), it is again crucial to employ a complex scale. Contrary to Macaulay (1992), the scale will be constructed via *Scale Composition* and thus reflect the restrictions of the base scales (10) – repeated as (27) – in precedence of their ranking (13) – repeated as (28).

¹⁵The one exceptional case to this generalization is the non-occurrence of negative *-ap* for 2sg→3pl. This may be a side-effect of the general omission of agreement markers observable for 2sg→3 in the optative and negative order, or follow from the restrictions on single argument agreement worked out: As there is no object agreement in this case – see (9) –, the plural feature of the object can be seen as being unavailable for the insertion of *-ap* as well.

- (27) *Base scales for composition*
 a. $\{1, 2\} > 3$ b. $\text{pl} > \text{sg}$ c. $A > P$
- (28) *Ranking of scales*
 PERSON > NUMBER > GRAMMATICAL FUNCTION

Since first and second person are not strictly ordered under (27a), *Scale Composition* licenses to construct (29) from (27) and (28).

- (29) *Complex scale for Karuk inverse marking*
 $2\text{pl} > 2\text{sg} > 1 > 3$

Using the measuring of hierarchy mismatches, the stable occurrences of *-ap* can then be analyzed as a more restricted – though fully regular – instance of inverse marking: It only occurs if the object is not only higher, but two (or more) steps higher on this scale than the subject. Hence Karuk only displays inverse marking, if the strength of the inverse relation between subject and object is big enough.

OT Implementation

This requirement is again easily implemented in terms of optimality theoretic constraints:

- (30) a. INVERSE!-A \nearrow P
 If the features of the object outrank the features of the subject by two (or more) steps on the following scale in the input,
 $2\text{pl} > 2\text{sg} > 1 > 3$
 count a constraint violation for every output,
 without an inverse marker (*-ap*).
- b. *STRUCT_{INV}
 Count a constraint violation for every output
 with an inverse marker (*-ap*).

(30a) represents the restricted inverse marking, demanding its overt expression if there is a two step inverse relation on the established complex scale, while (30b) unconditionally penalizes overt inverse marking due to its markedness. The distribution of *-ap* as an inverse marker is then fully captured by ranking

the contextualized constraint that demands inverse marking over the general constraint that penalizes it:

$$(31) \quad \text{INVERSE!-A} \not\rightarrow \text{P} \gg * \text{STRUCT}_{\text{INV}}$$

The following evaluations finally exemplify the differential behavior of second person singular objects, when combined with first (no inverse marking) and third person subjects (inverse marking):

$$(32) \quad \text{a.} \quad \text{Input: [1sgA] [2sgP]}$$

	INV!- A $\not\rightarrow$ P	*STRUCT _{INV}
i. <i>ap</i>		*!
☞ ii.		

$$\text{b.} \quad \text{Input: [3sgA] [2sgP]}$$

	INV!- A $\not\rightarrow$ P	*STRUCT _{INV}
☞ i. <i>ap</i>		*
ii.	*!	

3. Hierarchical Agreement in Kadiwéu

Nevins & Sandalo (to appear) argue against the employment of complex markedness hierarchies for the agreement pattern found in Kadiwéu, which is identical to the Karuk pattern in crucial respects: Single argument agreement again follows the well-known {1, 2} > 3 person hierarchy, but in the ‘you and me’ forms number distinctions and agreement by grammatical function get decisive. Observing the differential behavior of first person singular vs. plural and second person subject vs. object, they refuse to employ a more differentiated scale and attribute the pattern to general markedness interacting with the properties of individual markers and restrictions on their combinability instead.

3.1. Data & Observations

The following table gives the full paradigm of the transitive agreement markers – subject features shown in the rows, object features in the columns:

(33) *Kadiwéu agreement affixes transitive paradigm*

A→P	1sg	1pl	2sg	2pl	3sg	3pl
1sg	–	–	<i>Gad:-i</i>	<i>Gad:-i</i>	<i>j-</i>	<i>j-</i>
1pl	–	–	<i>Gad:-i</i>	<i>Gad:-i</i>	<i>j- aGa</i>	<i>j- aGa</i>
2sg	<i>ad:-i</i>	<i>God:-</i>	–	–	<i>a- i</i>	<i>a- i</i>
2pl	<i>ad:-i</i>	<i>God:-</i>	–	–	<i>a- i</i>	<i>a- i</i>
3sg	<i>id:-</i>	<i>God:-</i>	<i>Gad:-i</i>	<i>Gad:-i</i>	<i>y-</i>	<i>y-</i>
3pl	<i>id:-</i>	<i>God:-</i>	<i>Gad:-i</i>	<i>Gad:-i</i>	<i>oy-</i>	<i>oy-</i>

(Nevins & Sandalo to appear)¹⁶

As shown in (34), the transitive subject markers (unshaded cells) are the same as the markers for the single argument of unergatives (35a), and the main object markers (lightly shaded cells) are the same as the markers for the single argument of unaccusatives (35b).¹⁷

(34) *Kadiweu transitive agreement affixes without the d:- prefix*

A→P	1sg	1pl	2sg	2pl	3sg	3pl
1sg	–	–	<i>Ga- i</i>	<i>Ga- i</i>	<i>j-</i>	<i>j-</i>
1pl	–	–	<i>Ga- i</i>	<i>Ga- i</i>	<i>j- aGa</i>	<i>j- aGa</i>
2sg	<i>a- i</i>	<i>Go-</i>	–	–	<i>a- i</i>	<i>a- i</i>
2pl	<i>a- i</i>	<i>Go-</i>	–	–	<i>a- i</i>	<i>a- i</i>
3sg	<i>i-</i>	<i>Go-</i>	<i>Ga- i</i>	<i>Ga- i</i>	<i>y-</i>	<i>y-</i>
3pl	<i>i-</i>	<i>Go-</i>	<i>Ga- i</i>	<i>Ga- i</i>	<i>o-y-</i>	<i>o-y-</i>

These consistent syncretisms clearly reveal the exact pattern of the hierarchical agreement in transitives (e.g. object marking in the 3→1/2 paradigm part).

(35) a. *Unergative paradigm* b. *Unaccusative paradigm*

	sg	pl		sg	pl
1	<i>j-</i>	<i>j- aGa</i>	1	<i>i-</i>	<i>Go-</i>
2	<i>a- i</i>	<i>a- i</i>	2	<i>Ga- i</i>	<i>Ga- i</i>
3	<i>y-</i>	<i>n- aGa</i>	3	∅	<i>n- aGa</i>

(Nevins & Sandalo to appear)

As seen in (33), there is one additional transitive object marker *d:-* for local person not stemming from intransitives. While person is always overtly

¹⁶As Nevins & Sandalo (to appear) don't offer a transitive affix paradigm, (33) has been compiled in accordance to their paradigms, glosses, and VI-list for the verb forms of *eman* 'to love'.

¹⁷Note that in both types of intransitives in (35), third person plural is marked equally (strongly shaded cells) but different from transitives (34), which employ an additional *o-* prefix for the plural marking with third person subjects.

expressed, there is a strong tendency to neutralize number distinctions. In the second person this has been fully applied: As a result the second person is always plural in Kadiwéu (honorification) – visible by the plural suffix *-i*.

Again, examining the transitive combinations of local with non-local person(s), (34) is a perfect instance of hierarchical agreement governed by the person scale (36a): There is always agreement with the local person. In the third person only configurations, there is subject agreement, which can be attributed to (36c).

(36) *Basic scales governing Kadiwéu agreement*

- a. {1, 2} > 3 b. pl > sg c. A > P

The pattern for two local persons however again deviates from this simple picture:

(37) *Agreement for 1→2 and 2→1 forms (agreed-with argument in bold)*

- a. 1sg→2(pl) b. 2(pl)→1sg c. 1pl→2(pl) d. 2(pl)→1pl

In transitives with a second person and a first person singular argument, there is always agreement with the second person (37a,b) – as would be predicted by a 2 > 1 > 3 hierarchy (or pl > sg as there is no second person singular). However, in contexts with a second person and a first person plural argument there is (default) object agreement. Thus, with second person subjects, (34) displays different agreement for first person singular and plural objects.

3.2. Discussion

In Nevins & Sandalo (to appear), the post-insertion obliteration of entire exponents is driven by the following constraint ranking for Kadiwéu:

(38) PARSE [+PART] >> PARSE [+PL]/[+PART] >> COHERENCE >> *[+AUTH]
(Nevins & Sandalo to appear)¹⁸

The first two constraints can be seen to reflect the markedness conditions already sketched: Undominated PARSE [+PART] causes the agreement competition to always prefer first or second person agreement when combined

¹⁸Nevins & Sandalo use the following person feature decomposition: 1 = [+author,+participant], 2 = [-auth(or),+part(icipant)], 3 = [-auth,-part]. Note that I undid their reduction of the labels ±auth and ±part to ±a and ±p to avoid confusion with A and P (transitive subject/object).

with a third person argument ($\{1, 2\} > 3$), as the former share the feature [+part(icipant)], the latter is missing. Because this faithfulness constraint is satisfied as soon as there is one marker in the output that realizes a [+part] feature from the input, it doesn't resolve a competition between first and second person arguments – or force them to be both expressed faithfully: It is only active if there is a mismatch – i.e. one argument bears the preserved feature and the other doesn't ([+participant] > [-participant]). PARSE [+PL]/[+PART] plays a similar role for mismatches in the number feature [+pl], but is contextualized to only preserve this feature for first or second person:¹⁹ If both arguments are local and only one of them is [+pl], the agreement competition chooses this argument ($\{1pl, 2pl\} > \{1sg, 2sg\}$). This resolves the hierarchical agreement cases from (37) (1sg→2pl, 2pl→1sg).

The primary effect of COHERENCE is to introduce the pressure towards single argument agreement by penalizing argument index changes between agreement markers of the same category (person, number) – which never occur, if there is only agreement with a single argument. In Nevins & Sandalo's analysis, there is also a secondary effect emerging from the interaction with the general local person object marker *d:-* seen in transitives: They assume that *d:-* is inserted at a prior insertion cycle of the agreement system and cannot be deleted at the stage of morphosyntactic optimization they lay out for single argument agreement. Thus, in all cases with the *d:-* object marker (first and second person objects) COHERENCE by requiring single argument agreement entails a ban on subject marking, as there is no choice to obliterate the object marker. So for the remaining cases not resolved by PARSE [+PART] or PARSE [+PL]/[+PART], the ranking yields object agreement (1pl→2pl and 2pl→1pl).

To summarize: Subject agreement in direct and object agreement in inverse configurations is derived from faithfulness to the [+part] feature. In the local paradigm part, there is agreement with a [+pl] argument, if the other one is singular, else there is object agreement because of *d:-* in combination with COHERENCE. In the non-local paradigm, there is subject agreement finally because there are only subject-marking VIs and thus no competitors.

¹⁹In fact, this restriction to [+participant] contexts is redundant in Nevins & Sandalo's analysis: In evaluations with local and third person arguments, the winner is already determined by PARSE [+PART] and in third person only contexts there simply is no agreement competition because for third person there are only subject markers. Thus, PARSE [+PL]/[+PART] is still solely active for combinations of two local person arguments when simplified to PARSE [+PL].

Yet, there is still one case left, where the ranking can't fully resolve, which markers are to be deleted. It is the single case where the person/number markers from (34) cross-reference a different argument than the local person object *d*:-marker (notice that this is multi-argument agreement globally):

- (39) *a-* *d*:- *emaan -i*
 [-auth,+part]_A [+part]_P love [+pl]_A
 'You love me.' (2→1sg)

(Nevins & Sandalo to appear)

Consequently, this is also the only configuration, where (non-)occurrence of *d*:- is actually distinctive within the transitive paradigm (*a-d*:- *-i* vs. *a-* *-i*). Here, the circumfixal subject agreement is required by PARSE [+PL]/[+PART], while object marking is due to the non-deletability of the *d*:- 1/2 object marker. At this stage, COHERENCE can't decide on the (non-)obliteration of an additional first person object prefix (*i-*) because the relevant argument index change between subject and object marking is there, independently of this obliteration: The person prefix sequences *a*-_{2A} *d*:-_{1P} and *a*-_{2A} *i*-_{1P} *d*:-_{1/2P} both have one argument index change and thus the same violation profile for COHERENCE.²⁰ In this case, the nonoccurrence of an additional *i-* first person singular object prefix in the data is finally captured by adding a general ban against first person marking in form of the lowest ranked constraint *[+AUTH].

The main benefit of this analysis lies in the secondary effect of the COHERENCE constraint: The general tendency towards object agreement in local person only contexts is deduced from the presence of the *d*:- object marker and its non-deletability – i.e. there is no need to state some kind of default agreement. On the other hand, this interference of the transitive-only marker *d*:- in the optimization of the general person/number markers also brings about the problematic multi-agreement case (39) for which a general first person ban has to be introduced. If the optimization for the general person/number markers in (34) is in contrast adjusted to be *locally* determined, the generalization of their constant single argument agreement can be preserved and directly implemented

²⁰Note that this is also the only case, where the optimal candidate violates the COHERENCE constraint. Thus this is, where it actually matters, how the single argument demanding constraint judges different forms of multi-argument-agreement: The prediction from Nevins & Sandalo's formulation of COHERENCE would be, that there should be no subject person marker between the two object person markers *i-* and *d*:-. Unfortunately, this prediction can't be tested because the optimal candidate obliterates the former marker.

as unviolated (and thus undominated) single argument agreement COHERENCE. Together with a default object agreement constraint now needed and the two constraints implementing the markedness conditions, the agreement pattern then can be implemented by the following ranking:

- (40) COHERENCE >> PARSE [+PART] >> PARSE [+PL] >> AGREE-P

3.3. Extension to Karuk

Looking again at the Karuk data in (4), it is quite clear, that there is no way of deducing the general preference of object marking from another agreement marker as there simply is no such general object marker in the paradigm.

However, it is possible to deduce the choice of person agreement with the subject vs. object (shaded cells) for one marker from the presence of another marker:

- (41) *Karuk transitive agreement (4a) repeated (object agreement highlighted)*

pos	1sg	1pl	2sg	2pl	3sg	3pl
1sg	–	–	<i>nu-</i>	<i>ki-k- -ap</i>	<i>ni-</i>	<i>ni-</i>
1pl	–	–	<i>nu-</i>	<i>ki-k- -ap</i>	<i>nu-</i>	<i>nu-</i>
2sg	<i>ná-</i>	<i>kín-</i>	–	–	<i>ʔi-</i>	<i>ʔi-</i>
2pl	<i>kaná-</i>	<i>kín-</i>	–	–	<i>ku-</i>	<i>ku-</i>
3sg	<i>ná-</i>	<i>kín-</i>	<i>ʔi- -ap</i>	<i>ki-k- -ap</i>	<i>ʔu-</i>	<i>ʔu-</i>
3pl	<i>kaná-</i>	<i>kín-</i>	<i>ʔi- -ap</i>	<i>ki-k- -ap</i>	<i>kun-</i>	<i>kín-</i>

Employing the simple person hierarchy in (42) for the prefix agreement and leaving open the details of third person only cases, the one deviant case – object agreement in 1→2pl – could be deduced from a prior insertion of the *-ap* (object marking) suffix analogously to Nevins & Sandalo’s analysis.

- (42) 1 > 2 > 3

In this way, the prefix analysis would inherit the differentiation between second person singular and plural already present in the complex scale used for the inverse suffix. On the other hand, one could also use the outcome of a complex scale prefix analysis to simplify the analysis of the *-ap* suffix: In this way, *-ap* can be analyzed as a regular second person object marker, that doesn’t occur in 1→2sg contexts, because the already inserted first person subject marker *nú-* blocks object marking (the inverse interpretation of *-ap* is of course

lost/dispensable then). Yet, the strongest predictions are made by an analysis, where single argument person agreement is implemented by feature deletion prior to any marker insertion: In this way, the syncretism and agreement patterns that are stable throughout all possible parts of the agreement system are implemented – as suggested by (9).

Nevins & Sandalo's rejection of a complex scale finally can't be extended to an analysis of the Karuk agreement pattern. This reveals that the Kadiwéu pattern – although superficially analogous –²¹ is less complex than the Karuk pattern: The latter can't be captured without the use of markedness or faithfulness statements that combine person and number, while the former can. Because the second person is always plural in Kadiwéu, the competition between first and second person can be reduced to an atomic number hierarchy (pl > sg) plus default agreement if no mismatch is present. For Karuk, starting out with a ranking like (43), to implement the unexpected subject agreement for 1→2sg, the remaining constraint has to refer at least to a feature set that combines person and number.

- (43) *Ranking implementing {1, 2} > 3 and default object agreement*
 COHERENCE(π) >> PARSE [+PART] >> _____ >> AGREE-P

Leaving aside the third person only cases, the Karuk pattern may be captured by inserting a relativized faithfulness constraint favoring first person over second person singular (44a) or at least a general markedness constraint banning second person singular (44b).

- (44) a. PARSE [1]/[2sg] b. *[2sg]

In the end, the markedness conditions from (43) and (44a) can straightforwardly be subsumed under the complex hierarchy (45)

- (45) {1, 2pl} > 2sg > 3

Finally then, (45) follows the *Scale Composition Principle* and the basic scales and scale ranking developed for Karuk. In fact, it is simply an intermediate approximation to the complex scale that was developed in section 2.

²¹Compare the agreement pattern of (34) with (41): In nonlocal-local combinations there is always agreement with the local person. In combinations of one local person with the other, there is always object agreement except for *first person singular* objects in Kadiwéu and *second person singular* objects for Karuk.

3.4. Analysis

While it has been shown, that it is not possible to derive the Karuk agreement patterns in terms of markedness hierarchies without using complex scales or equivalent combined features, the Kadiwéu pattern can straightforwardly be captured by complex scales. In such an approach, the similarity of the two patterns is highlighted by the fact, that they can be implemented using quite similar complex scales constructed from identical base scales and scale rankings. Thus, for Kadiwéu, the base scales (36) – repeated as (46) – can be combined by the established ranking to construct the complex scale in (47).

(46) *Base scales for composition*

a. $\{1, 2\} > 3$ b. $pl > sg$ c. $A > P$

(47) *Complex scale for Kadiwéu hierarchical agreement*

$2 > 1pl > 1sg > 3A > 3P$

As in Karuk, hierarchical agreement then only occurs if there is a two step mismatch on (47)– otherwise there is object agreement.²²

However, it has also been shown, that the Kadiwéu pattern is simpler: There is no need to differentiate specific person/number combinations for first and second person. In fact, they can remain unordered, as their competition follows from the number hierarchy and the fact, that second person is always plural. In the complex scale approach, this is reflected by the fact, that the pattern can be fully derived from the following scale on which first and second person are not intrinsically differentiated:

(48) *Complex scale with equally ranked first and second person*

$\{1pl, 2pl\} > \{1sg, 2sg\} > 3A > 3P$

As the second person singular position has to be considered inactive (greyed out parts), it nevertheless introduces the needed mismatch between second person and first person singular:

(49) *Complex scale simplified by obligatory plural in second person*

$\{1pl, 2\} > 1sg > 3A > 3P$

²²As there are no third person object markers in the transitive paradigm, there is no agreement competition in the third person only combinations and thus no need to further differentiate the third person positions on (47).

With this scale, there is crucially no need to measure hierarchy mismatches in form of steps: Agreement is simply with the higher argument on this scale or rather with the object, if the arguments are equally ranked.

Thus, the difference between Karuk and Kadiwéu is, that only the former displays the more complex two-step hierarchy effect, while the agreement pattern of the latter is regular hierarchical agreement arising from mismatches on (49) – agreement with the higher argument. In Kadiwéu, the differential behavior of first person singular vs. plural is then just an epiphenomenon of the obligatory honorification, while in Karuk, the differential behavior of second person singular vs. plural is due to a weighted hierarchy effect on a complex scale.

4. Summary

Markedness hierarchies regulate the expression of morphosyntactic information in many languages. This can often be attributed to economy of expression: The more important information is, the higher the probability of its overt expression – inferable defaults on the contrary receive less (articulatory, systemic) effort of formal and distinct marking. Often, the markedness conditions that are the base of such optimizations are quite simple, and can be traced back to universally valuable asymmetries like the distinction between speech act participants and non-participants ($\{1, 2\} > 3$) or animate beings and inanimates. However, as these distinctions rarely occur in isolation but are marked in combination with other grammatical categories with inherent asymmetries, languages have different options of how to resolve such potentially conflicting pressures. The impact of markedness hierarchies then is typically best visible in cases with clear canonical asymmetries, where one hierarchy can be considered the most important one, or different pressures converge. For the remaining cases, languages have a much wider range of possible variation on how to exactly grammaticalize the details of this resolution. These are cases, where languages (like Karuk) exhibit complex patterns, that can't be described by simple markedness statements for one morphosyntactic category.

In the approach I developed here, the possibility for language specific category combining markedness scales was chosen to be directly implemented as a primitive of explanation. In obeying a ranking of simplex base hierarchies, the *Scale Composition Principle* carefully restricts the range of language specific

variation to the place where we actually face it: Cases, where there is no mismatch on the main (higher ranked) scale. Thus the hierarchical explanation of restrictions from pervasive asymmetries like $\{1, 2\} > 3$ is fully retained, while opening possibilities for language-specific variation in cases lacking canonical mismatches. As the resulting complex markedness hierarchies are more fine-grained, it is not surprising, when there needs to be a certain amount of mismatch on them to trigger a hierarchy effect in a language. This again reminds us of the important distinction between canonical and non-canonical mismatches observed and their difference in terms of possible language-variation.

The extension to the Kadiwéu data makes clear that complex scales and weighted mismatches are more than just a new notation for hierarchy effects: It not only allows to represent the agreement pattern of both languages – contrary to Nevins & Sandalo (to appear) –, but also sheds light on the similarity and most notably the differences in the underlying properties creating superficially equivalent agreement patterns.

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