Decomposing Morphological Number in Local Contexts

John Gluckman

1. Introduction

Based on a cross-linguistic pattern where number morphology on a transitive verb appears to express the combined number of the subject and object, I propose that morphological number is composed of discrete elements, and does not rely on dedicated number features, e.g., ±plural, ±singular, Group, Minimal, etc. The empirical scope of the paper is on what I call Local Effects: instances of "irregular" agreement morphology in the contexts of 1st and 2nd person (which are "local" to the speech act). It is argued here that such irregularities should be treated as instances of portmanteau morphology, expressing the ϕ-features of both the subject and the object (Bobaljik & Branigan, 2006; Georgi, 2012; Woolford, 2012; Oxford, 2014). The importance of the languages discussed here is that the exponent employed in Local Effects in each language is syncretic with what is otherwise a nonsingular morpheme. I propose that the nonsingular morphology is made up of discrete INDIVIDUAL (IND) features, which can be mapped in sets to an exponent. Simply, two (or more) IND features correspond to plural. By decomposing number into discrete elements, a bundle of ϕ-features expressing more than one argument, whether reflecting a "true" plural, or expressing a portmanteaux, will contain more than one IND feature, and will be functionally equivalent to a plural.

I'll show that this view of ϕ-features allows for a more natural account of the distribution of Local Effects. It further offers an important counterargument to the dominant view in Distributed Morphology that such irregularities in agreement must be due to post-syntactic processes such as Impoverishment and Feature Insertion (Bonet, 1991; Noyer, 1992, 1998; Harbour, 2003, 2008, 2011), which I argue to be both empirically and conceptually deficient.

2. Main proposal: Number morphology is decompositional

The core proposal in this paper is that number morphology is not the spell-out of dedicated number features (e.g., ±plural, ±augmented, Group, etc). Rather, every discrete "atomic" entity is represented in the morphological component by a feature INDIVIDUAL (IND). Bundles of more than one IND feature map to a nonsingular category.

(1) [IND] ⟷ singular

(2) [IND IND] ⟷ plural

The entity *Mary* has a single IND associated it, and corresponds to (1), but combinations of IND features, as in *Mary and Sue*, results in a bundle like in (2). In languages which make a distinction between singular, dual, and plural, the correspondence in (2) will be realized as a dual category, while and a further correspondence using three IND features will map to plural.

As each IND feature corresponds to a unique individual, they can be further restricted by person features PARTICIPANT and SPEAKER. Following Harley & Ritter (2002), 1st and 2nd person both bear

*John Gluckman, University of California, Los Angeles, johnglu@ucla.edu. Thanks to Anoop Mahajan, Carson Schütze, Jessica Rett, Dave Embick, Jonathan Bobaljik, and particularly Michael Diercks, as well as audiences at WCCFL 33 and MorphologyFest 2014 at Indiana University, Bloomington for helpful discussion of these issues.

Cascadilla Proceedings Project
Completed September 3, 2015

a PARTICIPANT (PART) feature, and 1st person is further restricted with a SPEAKER (SPKR) feature.[1] Thus, a language which makes two number distinctions and three person distinctions (e.g., English) will have the following pronominal feature specifications.

(3) $\begin{bmatrix} \text{IND} \\ \text{PART} \\ \text{SPKR} \end{bmatrix} \longleftrightarrow$ 1sg (4) $\begin{bmatrix} \text{IND} \\ \text{PART} \end{bmatrix} \longleftrightarrow$ 2sg (5) $\begin{bmatrix} \text{IND} \end{bmatrix} \longleftrightarrow$ 3sg

(6) $\begin{bmatrix} \text{IND IND} \\ \text{PART} \\ \text{SPKR} \end{bmatrix} \longleftrightarrow$ 1pl (7) $\begin{bmatrix} \text{IND IND} \\ \text{PART} \end{bmatrix} \longleftrightarrow$ 2pl (8) $\begin{bmatrix} \text{IND IND} \end{bmatrix} \longleftrightarrow$ 3pl

It is important to note that these feature bundles are the necessary distinctions for spelling out the six categories in English, but these bundles are assumed to operate under the Subset Principle (Halle, 1997). That is, in English, a group with *Mary, Jane, and Sue* will be featurally represented with [IND, IND, IND], but will be subject to the correspondence in (8). Likewise, a group of *you and me* will be featurally represented as,

(9) $\begin{bmatrix} \text{IND IND} \\ \text{PART PART} \\ \text{SPKR} \end{bmatrix}$

but will still be realized *we* using the feature bundle in (6). Note that in a language which makes an inclusive/exclusive distinction, such a bundle with two PART features and a SPKR feature will be realized as an 1st person inclusive, while (6) will be 1pl exclusive. (I return to clusivity later.)

This view of number morphology differs radically from current models which all employ some sort of dedicated number feature(s).[2] Singular categories are the result of a feature which denotes singular, while nonsingular are the result of (a) feature(s) which denote(s) nonsingular (Noyer, 1992; Corbett, 2000; Harley & Ritter, 2002; Harbour, 2008). After reviewing the empirical domain of Local Effects, it will be argued that re-conceiving number in the fashion outlined above allows for a natural explanation of "mismatches" in number features and morphology. In short, many of the morphosyntactic mechanisms such as Impoverishment, Redundancy Rules, Feature Insertion, etc, that have been proposed to operate over ϕ-features, can be discarded in favor of this decompositional approach and an adequate theory of agreement. Moreover, such a view of morphological number directly reflects a standard semantic analysis, which composes pluralities out of atoms (Link, 1983; Schwarzschild, 1992). Thus, the present proposal applies to both morphological as well as semantic theories.

3. Local Effects

As documented in Heath (1991, 1998), many languages exhibit "irregularities" in Local Contexts, that is, when 1st person acts on 2nd, and/or 2nd acts on 1st. While many languages employ "opaque" portmanteaux morphemes in such contexts, in that the morpheme used doesn't appear anywhere else, a number of languages recruit a morpheme from another cell in the agreement paradigm. In particular, many languages use a morpheme otherwise used to reference a (1st person) nonsingular category. A collection of such languages is given in Table 1.[3]

[1] I remain agnostic as to whether there is a dedicated 2nd person feature like ADDRESSEE. It will not be necessary in the discussion below, but the proposal here does not rule it out.

[2] Although see Trommer (2006, 2010) for a similar proposal.

[3] Table 1 is not exhaustive. These are the languages I feel confident enough in to report on. Moreover, some languages are representative of languages families, where syncretisms are prevalent (Tibeto-Burman, Austronesian). For additional languages, see Heath (1991, 1998); Liao (2010) and further examples in Trommer (2010). I also do not include Georgi (2012)'s examples of inclusive morphology, which should be included in the pattern above. I discuss these briefly later. I use the convention that X→Y signifies subject on left, object on right. A two sided arrow (↔) represents both contexts.

language	*morpheme used when 1→2*	*use outside of 1→2*	*source*
Nocte (Tibeto-Burman)	*-e*	1pl	(Gupta, 1971)
Karuk (Hokan)	*kín-/nú/nuʴ*	1pl	(Macaulay, 1992)
Yimas (Papuan)	*ka-mpa-n*	1sg-3dl-2/3sg	(Foley, 1991)
Wayampi (Tupí-Guaraní)	*oro=*	1pl.excl	(Jensen, 1990)
Mapudungun (S.A. isolate)	*-u/-iñ*	dl/pl	(Smeets, 2008)
Bolinao (Austronesian)	*=ta*	1dl	(Liao, 2010)
Tongva (Uto-Aztecan)	*re=*	1pl	(Pam Munro, p.c.)
Anindilyakwa (Australian)	*ngarra-*	1pl.incl	(Leeding, 1989)
Colloquial Ainu (Ishikari dialect)	*as-/an-*	1pl.excl/1pl.incl	(Shibatani, 1990)

Table 1: Number syncretisms in Local Contexts

In this paper, I'll use Nocte (Tibeto-Burman, data from Gupta (1971)) to examine the pattern. In Nocte, the morpheme *-e* appears to reference 1pl on intransitive verbs. It also appears whenever 1→2. The paradigm is represented in Table 2; the irregularities are framed.

A/S↓,O→	1sg	1pl	2sg	2pl	3/intrans
1sg	–	–	**-e**	**-e**	-ang
1pl	–	–	**-e**	**-e**	**-e**
2sg	-ang	**-e**	–	–	-o
2pl	-ang	**-e**	–	–	-an
3	-ang	**-e**	-o	-an	∅

Table 2: Nocte agreement (Gupta, 1971)

Descriptively, Nocte's agreement is governed by a person hierarchy, such that 1>2>3. Given any two arguments, the agreement morphology can be determined by appealing to this hierarchy. If the object outranks the subject, then an "inverse" marker *-h* is used. I exemplify this with 1st and 3rd person arguments.[4]

(10) **1sg, intransitive**

nga roantang rang- ka ***-ang***
1sg always ASP- go -**1sg**

'I always go' (G16)

(11) {**1sg, 3sg**} ⇝ **1sg**

nga -ma ate hetho ***-ang***
1sg -ERG 3sg teach -**1sg**

'I shall teach him' (G21)

(12) {**1sg, 3sg**} ⇝ **1sg**

ate -ma nga -nang hetho -h ***-ang***
3sg -ERG 1sg -ACC teach -INV -**1sg**

'He shall teach me' (G21)

The system is irregular in precisely one context, when 1sg→2. We expect *ang* to surface, since that's the morpheme associated with 1sg. Instead, *-e* appears, the morpheme otherwise associated with 1pl in all other contexts.[5]

[4]Page numbers are given after the examples. 1/2/3 = 1/2/3 person; sg = singular; dl = dual; pl = plural; incl = inclusive; excl = exclusive; ASP = aspect; ERG = ergative; ACC = accusative; NOM = nominative; INV = inverse; IND = indicative; IDO = internal direct object; SPKR = Speaker; PART = Participant; IND =individual

[5]It's actually unclear whether 1pl→2 is irregular as well. The analysis later suggests that this is a portmanteaux.

(13) **1pl, intransitive**

*ni roantang rang- ka -**e***
1pl always ASP- go -**1pl**

'We always go' (G16)

(14) **1sg→2sg ⇝ 1pl?**

*nga -ma nang hetho -**e***
1sg -NOM 2sg teach -**1pl?**

'I shall teach you' (G21)

The pattern for Nocte is repeated, with some variation, in all the languages in Table 1. Descriptively, the languages cited above all share the characteristic that when 1→2[6] the morphology on the verb expresses nonsingular. But there is actually a deeper generalization which emerges when we look at other languages in Table 1. In Mapudungun (South American isolate, data from (Smeets, 2008)), normally, a number suffix on the verb tracks the higher ranking argument on 1>2>3 person hierarchy.[7] However, when 1sg→2sg, dual morphology appears. And in all other cases of 1→2 where the total number of participants is greater than two, plural morphology appears.

(15) a. *kellu-e-y-**u***
help-IDO-IND-**dual**
'I helped you (sg)' (S160)

b. *kellu-w-y-**iñ***
help-1A-IND-**plural**
'I helped you (dl/pl)'
'We (dl/pl) helped you (sg/dl/pl)' (S159)

Thus, the generalization is that solely in the context of 1→2, the number suffix reflects *the combined total number of speech act participants*. Indeed, this same generalization holds in Nocte and all the languages in Table 1. Purely descriptively, the 1pl plural marker *-e* can be taken to reflect the combined total number of speech act participants. It just happens that Nocte is a language that only makes a singular/plural distinction and so a "dual category" is functionally plural.

4. Local Effects are portmanteaux

The types of patterns reported in Table 1 have been foundational in the development of Distributed Morphology (DM) (Bonet, 1991; Halle & Marantz, 1993). In DM, local interaction of feature bundles derives the surface patterns by post-syntactic constraints on feature co-occurrences and rules such as Impoverishment. The gist of these analyses is that because we see a surface syncretism that cannot be explained by appealing to some (subset of) features shared by the affixes, then an additional process is invoked to alter the feature content of one (or both) of the bundles. So for Nocte, the interaction of the features of the 1st subject and 2nd object *changes the feature content of the agreement affix*, inserting (or perhaps deleting) the relevant features to derive a bundle that looks like the bundle which spells-out plural.

While I too assume the basic architecture of DM, where syntactic structures and morphological primitives receive phonological material late, I argue that by adopting the feature system proposed in §2, the post-syntactic operations are not needed. Specifically, by treating the irregularities in Local Contexts as instances of agreement portmanteaux (Bobaljik & Branigan, 2006; Woolford, 2012; Georgi, 2012; Oxford, 2014), then the nonsingular exponence is the result of multiple IND features being realized in one feature bundle. That is, combining the features of a 1st and 2nd argument results in a bundle that is sufficiently equivalent to a 1pl bundle.

(16) $\begin{bmatrix} \text{IND} & \text{IND} \\ \text{PART} & \text{PART} \\ \text{SPKR} & \end{bmatrix} = \begin{bmatrix} \text{IND} \\ \text{PART} \\ \text{SPKR} \end{bmatrix} + \begin{bmatrix} \text{IND} \\ \text{PART} \end{bmatrix}$

[6] And sometimes when 2→1.

[7] With two 3rd person arguments, the number suffix tracks whichever is topicalized.

In Nocte, the combined bundle in (16) will be subject to the spell-out rule in (17) via the Subset Principle.

(17) $\begin{bmatrix} \text{IND} & \text{IND} \\ \text{PART} & \\ \text{SPKR} & \end{bmatrix} \longleftrightarrow$ */-e/*

Crucially, this same bundle in (17) will also realize "normal" agreement with 1pl argument. Assuming that the agreement system can build the bundle in (16) (the topic of §5), such an analysis does away with post-syntactic processes which delete, insert, or otherwise alter the features of a bundle.

To be more precise, to derive the morphology in Nocte with dedicated number features like ±singular, ±augmented, Group, etc, we would need some way to transform [+1, +sg] and [+2, +sg] into a feature bundle that can correspond to [+1, +pl].[8] One analysis which has been substantially fleshed out is Harbour (2008)'s account of Kiowa (Tanoan) which uses both Impoverishment as well as Feature Insertion. The idea is that in certain morphosyntactic contexts, a constraint is activated which deletes certain features, and then an unmarked feature is inserted. In Nocte, we would say that when $[+1, +\text{sg}]_{subj}[+2, +\text{sg}]_{obj}$ exits the syntax, an Impoverishment rule is triggered such that the subject's number feature is deleted. Subsequently, a rule of Feature Insertion is invoked, which inserts −sg into a feature bundle lacking a number feature. (Feature Insertion only inserts the least marked feature, and −sg is assumed to be the least marked (number) feature.)[9]

While descriptively correct, such processes are merely a restatement of the surface patterns: We see nonsingular morphology, and there are no nonsingular features introduced into the derivation, so we stipulate that the grammar adds a feature. But such post-syntactic processes are extremely powerful, and they must be strictly constrained so that they do not overgenerate. The constraints on when post-syntactic rules can apply typically appeal to theories of markedness, as well as (morphosyntactic) locality. The account offered in this paper gives a unifying reason for the appearance of nonsingular exponence: these are ϕ-feature portmanteaux, and so they are the morphological expression of more than one individual. This solution avoids the use of stipulative post-syntactic processes, and moreover, constrains the typological predictions to the agreement mechanism, discussed in §5. In sum, no additional processes are needed to derive the patterns in Table 1, given a theory of agreement, late insertion of phonological material, and decompositional morphological number.

4.1. Opaque portmanteaux and clusivity

While the combined bundle in (16) is nearly identical to a 1pl category, it is exactly identical to a 1pl *inclusive* category.[10] Indeed, as observed in Georgi (2012), some languages which make clusivity distinctions in the agreement paradigm choose the 1incl marker for Local Contexts. Consider Surinam Carib (Cariban), as reported in Hoff & Kiban (2009). The prefix *k-* is used to reference 1incl subjects outside of Local Contexts (i.e., intransitive subjects, transitive subjects with 3rd objects, transitive objects), and also when 1↔2.

(18) *k- amo -ya*
12- weep.for -ASP
'He weeps for the two of us'
'I weep for you'
'You weep for me' (H&K343)

[8]The processes invoked will depend on the features selected, although any system that uses dedicated number system requires some extra operation. Note that an underspecification approach to *-e* will not work (without additional impoverishments) as there is no proper subset of features of 1pl and 1st singular+2nd singular that wouldn't apply to some other morpheme. I put aside an analysis that this is accidental homophony due to the fact that we see the exact same pattern in a number of different languages, suggesting that there is a deeper constraint here.

[9]Presumably, there is another rule of Impoverishment "of the node" which deletes the 2nd person bundle.

[10]An inclusive category is defined as "me and you (and someone else)", while exclusive is "me and not you (and someone else)."

Under the proposed analysis, *k-* realizes the feature bundle in (16), which can reflect agreement with a single argument ("He weeps for the two of us") or agreement with two arguments ("I weep for you" and "You weep for me".)

Indeed, Georgi treats all instances of Local Effects as realizations of inclusive morphology in languages which lack such a distinction. I concur with the spirit of this analysis. In a language which uses an opaque portmanteau morpheme in Local Contexts, (16) is realized as essentially a "derived" inclusive morpheme.

However, treating all instances of portmanteaux in Local Contexts as inclusive would be difficult given the patterns in Table 1. For instance, in Nocte, we would have to say that there are two homophonous *-e* morphemes, one realizing 1incl, and the other realizing just 1pl. Clearly, this is not ideal. Moreover, there are languages which make inclusive/exclusive distinctions in the agreement paradigm, but choose the *exclusive* morpheme in Local Contexts, as in Wayampi (Tupí-Guaraní) (data from (Jensen, 1990)).

(19) Wayampi (Tupí-Guaraní)

a. *tataterno rape* ***oro-*** *inũ remẽ*
airplane path **1.EXCL**- make when
'When we made the airstrip' (J135)

b. ***oro-*** *esa remẽ*
1:2sg- meet when
'When I meet you(sg)' (J135)

Thus, the inclusive data discussed by Georgi forms a subset of the possible outcomes of Local Contexts.[11]

The traditional DM view relying on post-syntactic processes fairs poorly with the clusivity data. The appearance of an inclusive morpheme in Local Contexts would require a highly stipulative rule of Impoverishment and/or Insertion. In contrast, by treating number as composed of discrete IND features which can be further restricted by person features, the various agreement patterns in Local Contexts including opaque portmanteaux, inclusives, and nonsingulars, can be analyzed not as instances of post-syntactic mechanisms, but rather purely as consequences of agreement, to which I turn next.

5. Agreement

The intuitive idea behind the agreement mechanism proposed here is that verbs have a semantic need to find someone/thing to perform the action of the verb – that is, they are looking for individuals. Some languages further restrict the kinds of individuals that the verb wants to find.

Formally, I adopt Agree (Chomsky, 2000, 2001). I assume that Agree consists of two processes: Match and Value (Béjar, 2003; Bhatt & Walkow, 2013). Match is *type identity*, and as IND defines a type of feature (namely, a ϕ-feature), Match occurs when an uninterpretable/unvalued uIND on the probe locates an interpretable/valued counterpart, IND. Value is *feature copying*, where corresponding features on the goal are copied/valued on the probe, deactivating those features on the probe. In its simplest version, uIND on T finds IND on DP, and a single IND feature is copied to the probe/head, which is then spelled out accordingly.

I further assume that probes can be relativized to look for certain (subsets of) features (Béjar, 2003; Preminger, 2011). Thus a probe relativized to look for $\begin{bmatrix} u\text{IND} \\ u\text{PART} \end{bmatrix}$ will preferentially agree with a speech act participant, i.e., 1st or 2nd person. I stipulate that Value with a relativized probe can only occur when the goal bears some feature dependent on IND. So the probe just mentioned will fail to copy any features from a 3rd person argument, which bears only IND. Such a stipulation captures the fact that 3rd person is often "invisible" to agreement (cf, Alexiadou & Anagnostopoulou (2006), among others).

Lastly, I assume that probing can act cyclically (Béjar, 2003; Řezáč, 2003; Béjar & Řezáč, 2009). A probe which fails to fully value its features under downward search (under c-command) can expand

[11] To derive the patterns in Wayampi under the present analysis, we would need to make sure that that the agreement bundle does not bear an extra PART feature when 1→2sg. This is achieved during the agreement process. Space limitations keep me from elaborating on how this would work, but see Gluckman (2014) for discussion.

its search domain to include a specifier. I will elaborate on each of these assumptions in the discussion in the next section, but the intuitive idea is that a probe which is properly relativized will agree twice in certain contexts, copying features from multiple syntactically distinct arguments, building a "plural" feature bundle.

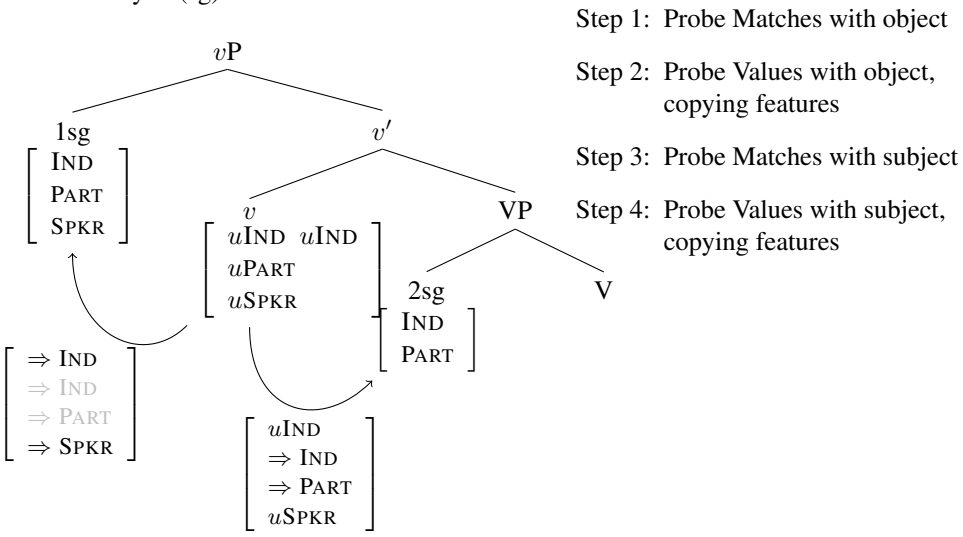
6. Applying the analysis

With these assumptions in place, we can derive the patterns in Nocte. I propose that the probe is relativized as in (20).[12]

(20) $\begin{bmatrix} u\text{IND} & u\text{IND} \\ u\text{PART} & \\ u\text{SPKR} & \end{bmatrix}$

Such a probe will correctly agree with both a 2nd person object and a 1st person subject. In the first step, the probe Matches with the 2nd object since uIND finds IND. Value can then take place, because the object bears features other than IND which can be checked on the probe. However, since the probe still has unchecked uIND and uSPKR features, it continues searching and repeats the process with the subject.[13]

(21) *nga-ma nang hetho -e*
'I shall teach you (sg)'



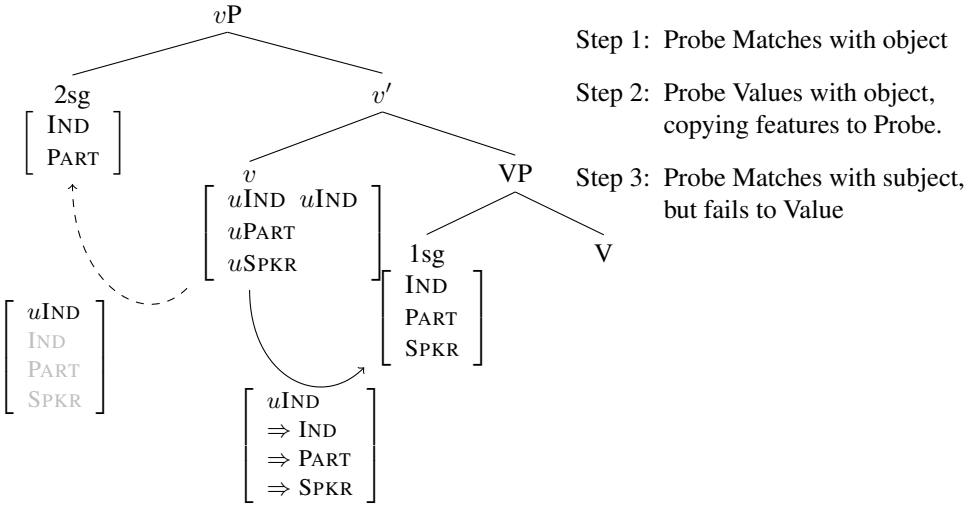
By successfully agreeing with two arguments, the resulting feature bundle will contain minimally two IND features, as well as a PART and SPKR feature. It is thus a "derived" 1pl morpheme, and will be spelled out accordingly.

Moreover, in all other contexts, the probe will not be able to copy features form two distinct arguments. For instance, in the opposite configuration of ϕ-features, where 2→1, the probe will lack the ability to copy features from the subject after agreeing with the object.

[12] Despite the rather arbitrary nature of specifying that the probe is looking for a 1pl argument, I suggest that the two uIND features reflect the fact that the probe is looking for two different individuals, as we'd expect with a transitive verb. It just happens to be that this need is combined on one probe. I call this "probe bundling", by analogy to Voice bundling.

[13] I make the assumption that successful Value copies all the feature of the goal onto the probe. Thus, even though the probe only bears unchecked uIND and uSPKR features when it probes the subject, the uPART feature will be copied to the probe anyway. This assumption isn't necessary in Nocte, but is when we expand the empirical domain to include Georgi's inclusives.

(22) *nang -ma nga hetho -h -ang*
'You shall teach me'



The crucial difference is that although the probe still has an unchecked uIND feature, because it does not have a feature to Value, it cannot copy any features from the subject.

Note that the probe will always fail to Value with a 3rd person argument, and so a multiply agreeing probe will not be possible in such contexts. And in contexts where 3→3, the probe will entirely fail to Value, and default (null) morphology will surface on the verb in these contexts.[14]

6.1. Caveat

At the risk of undermining the theory of agreement proposed here, I feel it is important to note that the agreement system used above is largely independent of the theory of morphological number proposed here. To the extent that other theories of agreement can derive the portmanteaux morphology in Local Contexts, then they are also compatible with the theory of number proposed above. The benefit of the Agree approach is that, i) it utilizes independently proposed mechanisms; ii) it can account for the fact that the irregularities are sensitive to syntactic structure (i.e., in Nocte they appear in 1→2 but not 2→1); and iii) it is fairly constrained in its typological predictions. I'll concede though that to account for some of languages in Table 1, some additional theoretical tools are needed. Reasons of space limit the discussion to just the simple case here.

7. Extensions

While INDIVIDUAL features can successfully account for the irregularities in Local Contexts, the biggest pay-off for the proposed theory of number can be seen when we look elsewhere. We now have a surprisingly simply analysis of phenomena that have been given a large amount of literature. For instance, consider Resolved Agreement, where coordinated singular elements trigger nonsingular agreement (cf, Givón (1970))

(23) John and Mary **are** eating rice.

Morphosyntactically, the appearance of the plural form of the copula is non-trivial, as only singular features have been merged in the structure.[15] But nothing extra needs to be said about why the coordinated bundle should trigger plural agreement when there are IND features. Plural morphology is predicted as there are in fact more than one IND feature, which will trigger the resolved agreement.

[14] I assume that failure to agree does not lead to a crash (Preminger, 2011).

[15] Allowing *and* to come with a "default" [+plural] feature will fail in languages with more than one number. Furthermore, there are instances in English when coordinated elements fail to trigger plural, e.g., *Coffee and tea is being served in the den*. Under the proposal here, *coffee and tea* comes out of the lexicon as a unit.

Second, consider plural features on bound pronouns with split antecedents, as discussed in Heim (2008); Sudo (2012).

(24) Each student$_i$ told each teacher$_j$ that their$_{i+j}$ meeting was fun.

Under both Heim's and Sudo's analysis, the bound pronoun is passed ϕ-features from each of its binders. However, with a feature like +sg (or equivalent), the plural morphology would still not be predicted on the pronoun without further processes that converted [+sg, +sg] into [+pl] (or equivalent). With IND features, again, nothing more needs to be said, as the pronoun will bear a feature bundle with minimally [IND, IND]. Indeed, any context where number morphology reflects the combined features from two (or more) distinct sources has a natural explanation here.

Moreover, the proposed theory of morphological number extends to (morpho)semantics as well. A bundle like [IND, IND] will be both morphologically interpretable, as it has a correspondence to an exponent, as well as semantically interpretable, as it will correspond to a point in a lattice (under a Linkian view of number). Notice that the bundle of IND features also correctly predicts that nonsingular categories range over atomic elements (Sauerland et al., 2005), and do not denote simple cardinalities (*contra* Harbour (2003) *et seq*).

8. Conclusion: typological matters

One advantage that alternative feature systems have is that they can account for typological generalizations about which number categories we see. Indeed, most features systems have been designed with precisely this criterion in mind: how do we account for distributional properties? The answer typically comes down to the combinatorial space, where the possible combinations of the features yield all and only the attested paradigms. (See in particular Harley & Ritter (2002); Cysouw (2011); Harbour (2014).)

The current proposal is admittedly on shakier ground with respect to cross-linguistic generalizations. For instance, how could we account for the fact that there seems to be a limit on how many number categories a language can have, with the cap at roughly five (singular, dual, trial, quadral, and plural) (Corbett, 2000). But the proposed theory does not explicitly rule out having a quadral, "quintal", or even a "decal" number exponent, as these would merely correspond to four, five, and ten IND features, respectively, being mapped to a phonological form.

Typological issues cannot be fully addressed here. However, I suggest that cognitive limitations during the acquisition process are responsible for what we see. There is a large amount of experimental evidence from cognitive science that children have an innate ability to deal with small sets, limited initially to one and two, and then later three and possibly four. (See in particular Wynn (1992); Dehaene (1997); Wynn et al. (2002).) If this is the case, during acquisition, a bundle of 5(+) IND features will simply be too large for the child to map to anything. In this way, we can tie typological universals to innate cognitive limitations. This line of reasoning suggests that future research into the validity of the morphological theory of number proposed here will center on experimental methods, as opposed to purely theoretically oriented studies.

References

Alexiadou, Artemis & Elena Anagnostopoulou (2006). From Hierarchies to Features: person splits and direct-inverse alternations. Boeckx, Cedric (ed.), *Agreement Systems*, John Benjamins.

Béjar, Susana (2003). *Phi-Syntax: A Theory of Agreement*. Ph.D. thesis, University of Toronto.

Béjar, Susana & Milan Řezáč (2009). Cyclic Agree. *Linguistic Inquiry* 40:1, 35–73.

Bhatt, Rajesh & Martin Walkow (2013). Locatin agreement in grammar: An argument from agreement in conjunctions. *Natural Language & Linguistics Theory* 31:4, 951–1013.

Bobaljik, Jonathon David & Phil Branigan (2006). Eccentric Agreement and Multiple Case Checking. *Ergativity*, Springer, 47–77.

Bonet, Eulalia (1991). *Morphology after syntax: Pronominal clitics in Romance*. Ph.D. thesis, MIT.

Chomsky, Noam (2000). Minimalist Inquiries: The Framework. Martin, Roger, David Michaels & Juan Uriagereka (eds.), *Step by Step: Essays on Minimalist Syntax in Honor of Howard Lasnik*, MIT Press, Cambridge, 89–155.

Chomsky, Noam (2001). Derivation by Phase. Kenstowicz, M. (ed.), *Ken Hale: A Life in Language*, MIT press, 1–52.

Corbett, Greville (2000). *Number*. Cambridge University Press.
Cysouw, Michael (2011). The Expression of Person and Number: a typologist's perspective. *Morphology* 21, 419–443.
Dehaene, Stanislas (1997). *The Number Sense: How the mind creates mathematics*. Oxford University Press.
Foley, William A. (1991). *The Yimas Language of New Guinea*. Stanford University Press.
Georgi, Doreen (2012). A Relativized Probing Approach to Person Encoding in Local Scenarios. *Linguistic Variation* 2:218, 153–210.
Givón, Talmy (1970). The resolution of gender conflicts in bantu conjunction: when syntax and semantics clash. *Papers from the sixth regional meeting of the Chicago Linguistics Society*, 250–261.
Gluckman, John (2014). *Getting Rid of Number Features*. Master's thesis, UCLA.
Gupta, D (1971). *An Introduction to the Nocte Language*. Northeast Frontier Agency.
Halle, Morris (1997). Distributed morphology: Impoverishment and fission. *MIT Working Papers in Linguistics 30: Papers at the Interface*, MITWPL.
Halle, Morris & Alec Marantz (1993). Distributed morphology and the pieces of inflection. Kenneth Hale, S. Jay Keyser (ed.), *The View from Building 20*, MIT Press, Cambridge, MA, vol. 20, 111–176.
Harbour, Daniel (2003). *Elements of Number Theory*. Ph.D. thesis, Massachusetts Institute of Technology.
Harbour, Daniel (2008). Discontinuous Agreement and the Syntax-Morphology Interface. Harbour, Daniel, David Adger & Susana Béjar (eds.), *Phi Theory: Phi features across Modules and Interfaces*, Oxford University Press, chap. 7, 185–220.
Harbour, Daniel (2011). Valence and Atomic Number. *Linguistic Inquiry* 42:4, 561–594.
Harbour, Daniel (2014). Paucity, abundance, and the theory of number. *Language* 90:1, 185–229.
Harley, Heidi & Elizabeth Ritter (2002). Person and number in pronouns: A feature geometric analysis. *Language* 78, 482–526.
Heath, Jeffrey (1991). Pragmatic Disguise in Pronominal-Affix Paradigms. Plank, Frans (ed.), *Paradigms: The Economy of Inflection*, Mouton de Gruyter, vol. 9 of *Empirical Approaches to Language Typology*.
Heath, Jeffrey (1998). Skewing in 1 $\leftrightarrow$ 2 pronominal combinations in native american languages. *International Journal of American Linguistics* 64:2, 83–104.
Heim, Irene (2008). Features on Bound Pronouns. Harbour, Daniel, David Adger & Susana Béjar (eds.), *Phi Theory: Phi features across Modules and Interfaces*, Oxford University Press.
Hoff, Berend Jacob & Robert Kiban (2009). Two Particles of the Carib Language of Surinam, with Their Nominal, Verbal, and Adjectival Properties. *International Journal of American Linguistics* 75:3, 337–364.
Jensen, Cheryl (1990). Cross-referencing changes in some Tupí-Guaraní languages. *Amazonion linguistics: Studies in lowland South American languages* 117–158.
Leeding, Velma Joan (1989). *Anindilyakwa Phonology and Morphology*. Ph.D. thesis, University of Sydney.
Liao, Hsiu-chuan (2010). Morphosyntactic Irregularities in Local Pronouns in Some Western Austronesian Languages. handout from Workshop on Local Pronouns, Nijmegen, Netherlans.
Link, Godehard (1983). The Logical Analysis of Plurals and Mass Terms: A lattice-theoretical approach. Bäurle, R& Ȧvon Stechow (eds.), *Meaning, Use, and Interpretation of Language*, Walter de Gruyter, 302–323.
Macaulay, Monica (1992). Inverse Marking in Karuk: The Function of the Suffix *-ap*. *International Journal of American Linguistics* 58:2, 182–201.
Noyer, Rolf (1998). Impoverishment Theory and Morphosyntactic Markedness. *Morphology and its Relation to Phonology and Syntax*, CSLI Publications.
Noyer, Robert Rolf (1992). *Features, Positions and Affixes in Autonomous Morphological Structure*. Ph.D. thesis, Massachusetts Institute of Technology.
Oxford, William Robert (2014). *Microparameters of agreement: A diachronic perspective on Algonquian verb inflection*. Ph.D. thesis, University of Toronto.
Preminger, Omer (2011). *Agreement as a Fallible Operation*. Ph.D. thesis, Massachusetts Institute of Technology.
Řezáč, Milan (2003). The Fine Structure of Cyclic Agree. *Syntax* 6:2, 156–182.
Sauerland, Uli, Jan Anderssen & Kazuko Yatsushiro (2005). The Plural is Semantically Unmarked. *Linguistc Evidence* 413–434.
Schwarzschild, Roger (1992). Types of Plural Iindividuals. *Linguistics and Philosophy* 15:6, 641–675.
Shibatani, Masayoshi (1990). *The Languages of Japan*. Cambridge University Press.
Smeets, Ineke (2008). *A Grammar of Mapuche*. Mouton de Gruyter.
Sudo, Yasutada (2012). *On the Semantics of Phi Features on Pronouns*. Ph.D. thesis, Massachusetts Institute of Technology.
Trommer, Jochen (2006). Plural Insertion is Constructed Plural. Müller, Gereon & Jochen Trommer (eds.), *Subanalysis od Argument Encoding in Distributed Morphology*, Universität Leipzig, vol. 84 of *Linguistiche Arbeiten*.
Trommer, Jochen (2010). The Typology of Portmanteau Agreement. slides presented as DGfS-CNRS Summer School on Linguistic Typology.
Woolford, Ellen (2012). Two Types of Portmanteau Agreement: Syntactic and Morphological. *Optimality Theory Workshop, Nov 9-10*.
Wynn, Karen (1992). Addition and subtraction by human infants. *Nature* 358:6389, 749–750.
Wynn, Karen, Paul Bloom & Wen Chi Chiang (2002). Enumeration of collective entities by 5-month-old infants. *Cognition* 83:3, B55–B62.