Global Impoverishment in Sierra Popoluca

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Abstract

In this paper I present a subanalysis of verbal argument encoding
morphology in the Meso-American language Sierra Popoluca. The goal
is to account for all instances of syncretism (marker homonymy) that
can be found. The approach is based on Distributed Morphology;
and it makes crucial use of fission and post-syntactic impoverishment
operations. As for the latter, I will argue that impoverishment can be
global, in the sense that the domain in which it applies can be bigger
than the minimal functional morpheme.

1. Introduction

The present paper develops an analysis of verbal argument encoding mor-
phology in Sierra Popoluca, a Mixe-Zoque language spoken in Mexico,[1]
by less than 30.000 speakers. The grammatical descriptions underlying the
present approach are Elson (1960a,b), Elson & Pickett (1964), and to some
extent Lind (1964) and Marlett (1986).

The most important feature of the analysis that I will propose is that
seemingly primitive multi-segmental markers are to be decomposed into
combinations of smaller markers of segmental size. Such an approach is
already envisaged as a possibility (under the label 'subanalysis') in Elson
(1960b). Elson immediately rejects a subanalysis approach; and it is indeed
hard to see how it could be reconciled with with theoretical frameworks
that were available then. However, things turn out to be different under
more recent theories of inflectional morphology. In particular, a simple sub-
analysis of argument encoding in Sierra Popoluca is possible in Distributed

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[1]More specifically, in the area around Veracruz, Soteapan, on the Isthmus of Tehuan-
tepec; the language is sometimes referred to as 'Soteapan Zoque'.

Morphology, assuming (i) underspecification of inflection markers (as vocabulary items); (ii) decomposition of person features and case features; (iii) fission of functional morphemes; (iv) impoverishment (by deletion, as in Halle & Marantz (1993, 1994)), rather than by the interaction of feature co-occurrence restrictions and feature hierarchies, as in Noyer (1992)); and (v) the possibility of local domains for impoverishment that are bigger than the minimal functional morpheme (Q-morpheme) into which vocabulary insertion takes place.

I will proceed as follows. In section 2, I address the syntax of argument encoding in Sierra Popoluca, and specify the functional heads into which argument encoding markers are inserted. In section 3, I turn to the morphology of argument encoding in Sierra Popoluca; I discuss an optimality-theoretic approach to marker co-occurrence restrictions, and then introduce the idea that subanalysis might be involved. Finally, section 4 develops a Distributed Morphology analysis that relies on underspecification, feature decomposition, and impoverishment (global and local).

2.   The Syntax of Argument Encoding in Sierra Popoluca

The encoding of primary arguments in Sierra Popoluca does not proceed by dependent-marking (case-markers on DPs); it proceeds by head-marking (agreement markers on verbs; see Nichols (1986)). The prefixal agreement morphology on the verb is sensitive to the distinction between external and internal arguments; i.e., there is case marking on the verb, in addition to person marking (see Elson (1960a, 29-30), Elson (1960b, 207-208)). Overtly realized argument DPs are optional throughout, as is typically the case with languages in which argument encoding proceeds by head-marking.

I assume that the argument encoding prefixes of Sierra Popoluca are morphological realizations of person and case feature bundles on the functional categories T and v (see Chomsky (1995, ch. 10)) that agree with DP arguments merged in vP/VP; they are not incorporated pronouns (as assumed in Jelinek (1984)). Furthermore, the DP arguments that the person and case feature bundles on T and v agree with may either be phonologically empty pronouns throughout, or they may alternatively be either empty pronouns or (where present) overtly realized DPs (see Baker (1996), Phillips (1993), Bruening (2001) for some of the options that arise).

The encoding of primary arguments in Sierra Popoluca follows an ergative marking pattern: The external argument of a transitive verb is singled

out and marked with special verbal markers (ergative); all other verbal arguments are encoded by other verbal markers (absolutive).[2]

Some examples illustrating the occurrence of verbal prefixes encoding both absolutive and person are given in (1).

(1) *Absolutive markers in intransitive contexts*:

    a.   A-nɨk-pa
            1.ABS-go-INC
            'I am going.'   (Marlett (1986, 364))

    b.   A-pɨːšiñ
            1.ABS-man
            'I am a man.'

    c.   Ta-hoːy-pa
            1.INCL.ABS-take.a.walk-INC
            'You and I take a walk.'

    d.   Ø-Wiʔk-pa
            3.ABS-eat-INC
            'He eats.'

    e.   Ø-Nɨk-pa   šiwan
            3.ABS-go-INC John
            'John is going.'

    f.   Ø-Koʔc-taː-p   šiwan
            3.ABS-hit-PASS-INC John
            'John is being hit.'   (Elson (1960b, 208))

(2) lists some transitive contexts, with a co-occurrence of ergative and absolutive markers.

(2) *Absolutive and ergative markers in transitive contexts*:

    a.   A-Ø-koʔc-pa
            1.ABS-3.ERG-hit-INC
            'He hits me.'

    b.   Ø-Aŋ-koʔc-pa
             3.ABS-1.ERG-hit-INC
            'I hit him.'

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[2]Elson (1960b) calls the two kinds of markers ASSOCIATE and PARTICIPANT. Marlett (1986) explicitly identifies the underlying encoding pattern as an ergative-absolutive pattern; he calls the two kinds of markers A and B. Following much recent work on Mesoamerican languages (see, e.g., Bickel & Nichols (2001) and references cited there), I use the labels ERGATIVE and ABSOLUTIVE.

c.   M-aŋ-koʔc-pa
     2.ABS-1.ERG-hit-INC
     'I hit you.'

d.   Ø-I-koʔc-pa
     3.ABS-3.ERG-hit-INC
     'He hits him.'   (Elson (1960b, 208))

e.   Ø-I-koʔc-yah-pa
     3.ABS-3.ERG-hit-3.PL-INC
     'They hit him.'/'He hits them.'/'They hit them.'

                                                       (Elson (1960b, 209))

Following much recent work in the minimalist program, ergative case and absolutive case can be viewed as features on functional heads (v, T) that value (or match with) corresponding features on argument DPs under Agree (see Chomsky (2000, 2001)). The question then arises of which case is located on which functional head. I assume here without argument that ergative case is located on v, whereas absolutive case is located on T (see Murasugi (1992), Müller (2004)). Hence, ergative is the inner, governed case (on a par with accusative in nominative-accusative patterns), and absolutive is the outer, default-like case (on a par with nominative in accusative-nominative patterns). Thus, in an ergative-absolutive pattern, the inner case shows up on the external argument DP, and the outer case shows up on the internal argument DP, in transitive contexts. In addition, both functional heads bear person features that are valued (or matched) under Agree with the DP arguments. In intransitive contexts, v does not bear a case feature (and not a person feature either), and all arguments (external or internal) bear absolutive case regulated by T.[3] Head movement of V to v, and of v+V to T yields a complex word T+v+V.[4]

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[3]See Chomsky (1993), Bobaljik (1993), Laka (1993), Rezac (2003), Bittner & Hale (1996) for other options of locating ergative and accusative on functional heads that arise within the minimalist program.

[4]Note that the ergative markers also show up in two other contexts: as possessive markers in DPs, as in (i) (see Benveniste (1974), Abney (1987), Anderson (1992)), and with with the distribution of a nominative marker in a nominative-accusative system in certain types of embedded clauses – in temporal adjunct clauses that do not have a Spanish adverb, and to some extent in clauses embedded under intransitive verbs, as in (ii) (i.e., there is clause-type based split ergativity).

(i)   *Ergative markers as possessive markers*:
   a.   an-tɨk
        1.ERG-house

The relevant part of the syntactic structure of an example like (2-b) under present assumptions (and after head movement of V to v, and of v to T) is given in (3).

(3)   *Syntactic structure of ergative/absolutive marking*:
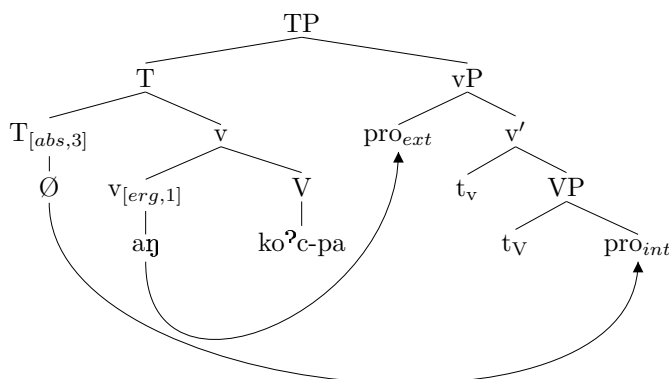
As shown by the general schema for the order of verbal affixes in Sierra Popoluca in (4), head movement by right-adjunction captures the right order of absolutive and ergative prefixes.

(4)   *Order of verbal affixes in Sierra Popoluca*:
     PERS.ABS − PERS.ERG − V − NUM − PASS − ASP

The number, passive, and aspect suffixes are ignored in (3). As for number marking, it turns out to be of secondary importance in Sierra Popoluca (on nouns as well as on verbs; see Elson (1960b, 209, 219), Noyer (1992, 211-215)), and it is not involved in argument encoding (i.e., number markers are not sensitive to the absolutive or ergative status of the number-marked argument; see, e.g., (2-e)). As for passive and aspect markers, they may

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      'my house'
   b.   M-an-haːtuŋ
      2.ABS-1.ERG-father
      'You are my father.'   (Elson (1960b, 208))

(ii)   *Ergative markers in adjunct clauses*:
     mu an-nɨk
     als   1.ERG-go   'when I went' (Elson (1960b, 208), Marlett (1986, 364))

I have nothing to say about the syntax of these instances of marker reuse; but it is worth bearing in mind that ergative markers show up in a pure form here, since they are not accompanied by absolutive markers. See below.

either show up on V (under Agree with relevant features in v and T, respectively), or may be suffixal realizations of the relevant features in v and T (which might then argue for autonomous morphological structure; see Noyer (1992)).[5]

3.   The Morphology of Argument Encoding in Sierra Popoluca

The fusional (case/person) morphological markers for argument encoding in Sierra Popoluca are listed in (5) in the form in which they are identified in Elson (1960a,b).[6]

(5)   *Fusional case/person markers in Sierra Popoluca*

	ABS	ERG
1.	a	an
1.incl	ta	tan
2.	mi	iñ
3.	Ø	i

	ABS ← ERG
1 → 2	man
2 → 1	an

There are two general difficulties for head-marking systems of argument encoding that dependent-marking systems do not face, and (5) reflects them both. First, there is no reliable encoding of arguments in contexts where both arguments are 3. person. Some languages solve this problem by employing strategies like gender (class) agreement or obligatory passivization (see, e.g., Nichols (1986, 112-113) and Aissen (2002)); other languages don't. Sierra Popoluca belongs in this latter class; ambiguities in 3. person/3. person contexts remain unresolved. Second, informally speaking, there is less space in a word than there is in a clause. Consequently, in transitive contexts where a priori two markers would be expected to co-occur, it often happens that portmanteau markers are created (which merge the expected markers into a single marker), or that one of the two markers simply fails to show up (i.e., there is *participant reduction*).[7] Both situations can be found in

[5]Of course, yet another possibility would be to assume that passive and aspect markers are realizations of further functional heads like Voice and Aspect that are targeted by head movement via left-adjunction.

[6]As indicated in (5), Sierra Popolocua distinguishes between 1. person and 1. person inclusive. In "x → y", x is the external argument, and y the internal argument.

[7]This is also known as a *neutralization* effect; see Noyer (1992).

Sierra Popoluca. (6) summarizes the effects that may take place when an absolutive (ABS) marker and an ergative (ERG) marker co-occur: If 1./2. person and 3. person markers would be expected to co-occur, one of the two markers cannot be realized (with the decisive factor being person, not case) (see (6-a)); and if 1. and 2. person markers co-occur, they are merged into one complex marker (see (6-b)).

(6) *Marker clash in Sierra Popoluca*:
   a. If local person (1./2.) and 3. person co-occur, only the marker for local person shows up, irrespective of its status as ABS or ERG.
   b. If 1. and 2. person co-occur, complex markers arise via /i/ deletion; the order is ABS-ERG:
      (i) 2.ABS ← 1.ERG = mi-an > man
      (ii) 1.ABS ← 2.ERG = a-iñ > an

This raises the question of what happens in contexts that are not covered by (6). In cases where both markers are 1. person or 2. person – more generally, in reflexive contexts, there is only one argument encoding prefix, and reflexivity is marked by a special suffix on the verb (the unmarked situation for reflexivization, given the approach in Reinhart & Reuland (1993)). That leaves cases where two 3. person arguments co-occur (non-reflexively). In these contexts, nothing happens (but recall that an absolutive 3. person argument is encoded by a null marker anyway).

Participant reduction effects like the one at hand can be accounted for straightforwardly by invoking optimality theory (see Prince & Smolensky (2004); and cf. in particular Trommer's (2003) optimality-theoretic account of the ban on simultaneous realization of a 1. person subject argument and a 2. person object argument in Ainu). To derive the pattern in (6), one might come up with the ranked set of constraints in (7).

(7) PARSE-1./2. ≫ ALIGN(PERS)-LEFT ≫ PARSE-3, PARSE-CASE

ALIGN(PERS)-LEFT states that a person marker must be the leftmost item in a word; thereby, it essentially demands that there can be only one prefix marker (with two markers, one of them must fail to be leftmost in the word). PARSE-X, in contrast, requires a realization of all pieces of X-information of an argument (where X ranges over person and case, in the context that is relevant here). Given the ranking in (7), 1. and 2. person markers must always be realized, in minimal violation of ALIGN(PERS)-LEFT in transitive structures. However, a realization of a 3. person argument is successfully blocked by ALIGN(PERS)-LEFT in a transitive structure if the other argument is 1./2. person; and the low ranking of PARSE-CASE constraints (for ergative and absolutive) correctly predicts that case is not the decisive fac-

tor in deciding which one of two markers competing for one position has to
go.

There are two problems with this kind of analysis. First, it does not have
anything insightful to say about the fact that the markers *m-an* and *a-n* for
1./2. and 2./1. contexts (see (6-b)) both have lost an *i* after concatenation
(morphologically, the markers should be realized as such, given the high
ranking of Parse-1./2., so the phenomenon would have to be assumed to
be purely phonological.) Second, and more importantly, such an optimality-
theoretic approach takes the markers in (5) as given and ignores the fact
that they consist of very few recurring building blocks that are combined
in various ways, viz., the segments /n/, /a/, /i/, /m/, and /t/. I would like
to conclude from this that a maximally simple approach that accounts for
all instances of syncretism within the inventory of case/person markers in
Sierra Popoluca must involve a subanalysis of the markers in (5). As we will
see, such a subanalysis of the markers in (5) automatically accounts for the
participant reduction effects.

As noted above, the possibility of a subanalysis of the argument encod-
ing markers of Sierra Popoluca is envisaged in Ben Elson's work already.
However, after granting the initial plausibility of such an approach, he de-
cides against adopting it. Compare the following remarks, taken from the
syntax/morphology textbook Elson & Pickett (1964, 51-52) (also see Elson
(1960b, fn. 7)):

> *Morpheme cutting may sometimes be extended beyond the point of
> diminishing returns, when further analysis makes the results more
> complicated than they might be otherwise. Analysis beyond this point
> is called subanalysis. Sierra Popoluca has nine prefixes marking per-
> son of subject and object which occur with transitive verbs [...] Clearly,
> there are some further morpheme cuts that can be made [in (5)]: t-
> adds the second person to the first; a- always involves the first per-
> son; man- (I–you) can be dissolved into mi- + an-, and an- 'you–me'
> into a- + iñ; but further cuts become more difficult. The best solu-
> tion seems to be to leave the nine forms as a set for describing the
> grammar of Sierra Popoluca, and perhaps mention in a footnote that
> some subanalysis is possible.*

The next section will show that these objects to subanalysis lose their
force if an approach is adopted that incorporates underspecification, feature
decomposition, and impoverishment.

4.   A Distributed Morphology Approach

4.1.   Background Assumptions

Let me begin with some background assumptions. First, inflection is (post-syntactic, i.e., 'late') vocabulary insertion: First, functional morphemes like v and T contain fully specified bundles of morpho-syntactic features in syntax; however, they do not yet contain phonological material. Second, inflection markers are vocabulary items that pair phonological and (often underspecified) morpho-syntactic features; they are inserted post-syntactically in accordance with the Subset Principle. The latter can be defined as in (8) (see Halle (1997), among many others).

(8)   *Subset Principle*:
      A vocabulary item V is inserted into a functional morpheme M iff (i) and (ii) hold:
      (i)   The morpho-syntactic features of V are a subset of the morpho-syntactic features of M.
      (ii) V is the most specific vocabulary item that satisfies (i).

Specificity is defined as in (9), as incorporating a notion of feature (class) hierarchy in addition to number of features (see Lumsden (1992), Noyer (1992), Wiese (1999)). Deviating from some of the literature just cited, I assume that feature quality is inherently more important than feature quantity in determining specificity. The definition of specificity therefore resembles the definition of optimality in optimality theory (see Prince & Smolensky (2004)).

(9)   *Specificity of vocabulary items*:
      A vocabulary item V_i is more specific than a vocabulary item V_j iff there is a class of features $\mathbb{F}$ such that (i) and (ii) hold.
      (i) V_i bears more features belonging to $\mathbb{F}$ than V_j does.
      (ii)   There is no higher-ranked class of features $\mathbb{F}'$ such that V_i and V_j have a different number of features in $\mathbb{F}'$.

Next, I assume morpho-syntactic features can be deleted post-syntactically in syntactic structures before vocabulary insertion takes place; such *impoverishment* effects a "retreat to the general case" (see Bonet (1991), Halle & Marantz (1993, 1994), Bobaljik (2002), Frampton (2002), and Harley (2004), among others). Impoverishment implies a systematic underspecification (not of vocabulary items, but) of syntactic contexts.

Finally, I adopt the idea that certain functional morphemes in syntax may be subject to fission, as defined in (10). Note that this is the notion of fission adopted (though not yet under that label) in Noyer (1992), and also in Frampton (2002); (10) does *not* correspond to Halle & Marantz's (1993) concept of fission (which, unlike (10), involves the creation of two functional morphemes on the basis of one functional morpheme).

(10)   *Fission*:
       If insertion of a vocabulary item V with the morpho-syntactic features β takes place into a fissioned morpheme M with the morpho-syntactic features α, then α is split up into β and α–β, such that (a) and (b) hold:
       a. α–β is available for further vocabulary insertion.
       b. β is not available for further vocabulary insertion.

The definition of fission in (10) paraphrases the concept of feature discharge: Insertion of an underspecified vocabulary item (in accordance with the Subset Principle) discharges the features in the functional morpheme that the vocabulary item bears, but the remaining features are available for further insertion operations, and so forth, until all features in the functional morpheme have been discharged or there is no remaining vocabulary item left that can be inserted in accordance with the Subset Principle. Crucially, I take T and v in Sierra Popoluca to be fissioned morphemes; this assumption lies at the heart of the subanalysis approach to be developed in what follows.

4.2.   Case and Person Features

Suppose that cases and persons are decomposed into combinations or more primitive binary features. Underspecification with respect to these features encodes natural classes (of cases and of persons) that vocabulary items and impoverishment operations can refer to. The decomposition of case features in (11) follows Bierwisch (1967) (with [gov] standing for "governed by the verb", which by assumption holds for the ergative (or accusative), but not for the absolutive (or nominative)).[8]

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[8]To be sure, with just two cases, feature decomposition as in (11) will not generate new natural classes of cases. Still, as will become clear below, the postulation of two case features [+gov] and [–gov] (i.e., features that differ only with respect to the feature value + or –) becomes important for one of the two impoverishment rules that I will suggest.

(11) *Case*:
  a. ERG = [+gov]
  b. ABS = [–gov]

The decomposition of person features in (12) is based on Noyer (1992), Wiese (1994), and Frampton (2002). According to (12), 1. and 3. person form a natural class ([–2]), and so do 2. and 3. person ([–1]); furthermore, 1. person and 1. person inclusive form a natural class ([+1]), and 2. person and 1. person inclusive, too ([+2]). The latter two natural classes clearly suggest themselves on the basis of what it means to be 1. person inclusive; and natural classes comprising 1./3. person and 2./3. person are well established for various inflection systems.[9]

(12) *Person*:
  a. 1   = [+1,–2]
  b. 1$_{\mathrm{incl}}$ = [+1,+2]
  c. 2   = [–1,+2]
  d. 3   = [–1,–2]

Finally, recall that the specificity of vocabulary items can to a large extent be derived from a feature hierarchy. I adopt the hierarchy in (13).

(13) *Feature hierarchy*:
  [±gov] ≫ [±1] ≫ [±2]

4.3. Subanalysis of Sierra Popoluca Argument Encoding Morphology

The complete set of argument encoding markers in Sierra Popoluca can now be assumed to be (14). Note that if (14) is tenable, all syncretisms are re-

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[9]For instance, in Icelandic verb inflection, 1. and 3. person markers are indistinguishable in past singular contexts (as they are in all Germanic languages); and 2. and 3. person markers are indistinguishable in present singular contexts. Both syncretisms are independent of particular inflection classes. In a Distributed Morphology approach, their system-defining nature is therefore best derived by invoking two impoverishment rules. One rule that deletes [±1] in past singular contexts (thereby rendering 1. and 3. person indistinguishable: [–2]); see Frampton (2002). A second rule deletes [±2] in present singular contexts, so that 2. and 3. person become indistinguishable: [–1]; see Müller (2006). – That said, there is also good evidence from the distribution of syncretism for treating 1. and 2. person as a natural class in other languages (see the comprehensive survey in Cysouw (2003)), and this may plausibly be taken to indicate that [±3] is another possible primitive person feature; see Trommer (2006) and references cited there.

solved, and we end up with the result that identity of form implies identity of function: Each marker has a single (underspecified) set of morpho-syntactic features associated with it.

(14) *Vocabulary items*:
   a. /n/ ↔ [+gov]
   b. /a/ ↔ [+1]
   c. /i/ ↔ [−1]
   d. /m/ ↔ [+2] ([−gov])
   e. /t/ ↔ [+2] ([+1])

On this view, /n/ is an ergative marker that does not carry person information. Second, the vocabulary items /a/ and /i/ are markers for 1. and non-1. person, respectively. Third, /m/ and /t/ are both markers for [+2]; their feature specifications include contextual features in brackets. This captures the phenomenon of multiple exponence (see Matthews (1972)) – i.e., a situation where features are realized by more than one exponent –, by invoking a difference between primary exponence and secondary exponence (see, e.g., Wunderlich (1996, 1997), Noyer (1992, ch. 1)). Features in brackets may have been targetted by earlier insertion operations (so 'discharge' as a consequence of vocabulary insertion may not actually delete features; it merely renders them inaccessible).

   Importantly, the markers in (14) do not necessarily find fully specified syntactic contexts anymore when they are to be inserted, the reason being that two post-syntactic impoverishment rules have deleted morpho-syntactic features before vocabulary insertion takes place. The first impoverishment rule (rule [A]) is given in (15).

(15) *Impoverishment rule [A]* (local):
      $[\alpha\mathrm{gov}] \rightarrow \emptyset/[-\alpha 1, -\alpha 2]\underline{\quad}$

As indicated, (15) is a rule with a local (i.e., standard) domain: the functional morpheme (T or v). However, there still is something slightly out of the ordinary with this rule: The formulation of (16) relies on the use of variables over feature values (α is a variable ranging over ±).[10] Thus, (15) has the same effects as the two impoverishment rules in (16) together: It deletes the ergative feature in 3. person contexts, and it brings about

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[10]See Chomsky (1965), Chomsky & Halle (1968), Halle (1992), Noyer (1992), Harley (1994), Johnston (1996), Alexiadou & Müller (2005), and several papers in the present volume.

the complementary deletion of the absolute feature in 1. person inclusive contexts.

(16) a. $[+\text{gov}] \rightarrow \varnothing/[-1,-2]\underline{\quad}$
     b. $[-\text{gov}] \rightarrow \varnothing/[+1,+2]\underline{\quad}$

Consider next the second impoverishment rule (rule [B]) in (17).

(17) *Impoverishment rule [B]* (global):
     $[-1,-2] \rightarrow \varnothing/[-\text{gov}]\underline{\quad}$

The formulation of the rule as such is simple enough: 3. person is deleted in absolute contexts. However, things get slightly more complicated because the application domain of rule [B] is global rather than local. By this I mean that it applies in the *maximal* functional morpheme, and (after head movement) that is T including v (and V) in the case at hand.[11] A final important assumption is that impoverishment rules do not apply iteratively: They apply either once or not at all in their respective domain. This assumption turns out to be necessary to avoid unwanted massive deletion by the global rule [B].

At this point, all assumptions are in place, and the system of argument encoding morphology in Sierra Popoluca can be derived. However, before I show this, a remark may be in order concerning an alternative concept of impoverishment that is proposed by Noyer (1992). Noyer suggests that impoverishment is produced by feature co-occurrence restrictions plus feature hiearchies, and not by rules. It is worth pointing out that the co-existence of rules [A] and [B] is hardly compatible with this tenet. The reason is that [A] and [B] together closely resemble the scenario in (18). Noyer's (1992) approach rules out such a scenario because impoverishment must here be triggered by a filter $*[\alpha,\beta]$ in interaction with a universal hierarchy of features. But what could this hierarchy look like? Either α outranks β (so that β is deleted), or vice versa (so that α is deleted), but the two statements cannot hold simultaneously.

(18) *Noyer's impossible scenario*:
     a. $\alpha \rightarrow \varnothing/\beta$
     b. $\beta \rightarrow \varnothing/\alpha$

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[11] Alternatively, the application domain could be the phase (see Chomsky (2001, 2005) for the concept), as suggested by Alec Marantz in recent work. After head movement, V, v, and T all are part of the CP phase.

Rules [A] and [B] look almost like (18); to be compatible with Noyer's approach, one would have to make the implausible assumption that we have a 'discontinuous' hierarchy, with person features and case features alternating: $[+1,+2] \succ [-\text{gov}] \succ [-1,-2] \succ [+\text{gov}]$. This hierarchy looks arbirtray, and, more importantly, it is incompatible with the hierarchy in (13), which is needed to predict the correct order of subanalyzed markers in T and v. To see this, consider finally the results of cyclic vocabulary insertion into impoverished T and v morphemes.

(19) illustrates impoverishment and vocabulary insertion in intransitive contexts, where only T bears case and person features (viz., $[-\text{gov}]$, $[\pm 1, \pm 2]$). Note that rule [A] has deleted $[-\text{gov}]$ in 1. person inclusive environments; therefore, /t/ rather than the more specific /m/ (which requires the presence of $[-\text{gov}]$) is inserted in (19-b). Note also that $[-1,-2]$ has been deleted by rule [B]; this accounts for the absence of any marker here – in particular, it accounts for the fact that the vocabulary item /i/ does not show up, which would otherwise be expected in (19-d). Furthermore, (19-bc) illustrate subanalysis by fission: First, a marker for $[\pm 1]$ is inserted, in accordance with (13) (and in the absence of a marker for $[-\text{gov}]$), which is /a/ in one case, and /i/ in the other. After that, a marker for $[\pm 2]$ is inserted. Given Strict Cyclicty, the latter marker has to attach outside of the string generated so far; this derives the correct orders /t-a/ and /m-i/.

(19) ABS *contexts*:

a.	$[+1,-2,-\text{gov}]$	$\rightarrow$	/a/
b.	$[+1,+2,\text{—gov—}]$	$\rightarrow$	/t-a/
c.	$[-1,+2,-\text{gov}]$	$\rightarrow$	/m-i/
d.	$[\text{—1,—2,}-\text{gov}]$	$\rightarrow$	Ø

Impoverishment and vocabulary insertion in pure ergative contexts is shown in (20).[12] Only one impoverishment rule applies, viz., rule [A], which deletes $[+\text{gov}]$ in 3. person contexts. This rule accounts for the fact that the ergative marker /n/ does not show up in (20-d). Furthermore, note that 1. person inclusive ergative contexts involve an insertion of three vocabulary items: First, /n/ is inserted, discharging the highest-ranked feature $[+\text{gov}]$; next,

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[12]Recall from footnote 4 that ergative markers show up independently of absolutive markers as DP-internal possessive markers and as argument encoding markers in certain kinds of embedded clauses in Sierra Popoluca.

/a/ is inserted, discharging the next-ranked feature [+1]; and third, /t/ is inserted, discharging the lowest-ranked feature [+2].[13]

(20) ERG *contexts*:

a.	[+1,–2,+gov] →	/a-n/
b.	[+1,+2,+gov] →	/t-a-n/
c.	[–1,+2,+gov] →	/i-n/
d.	[–1,–2,~~+gov~~] →	/i/

Consider finally transitive contexts as in (21), where a combined ergative/absolutive specification is present on v/T. It remains to be shown that participant reduction and portmanteau marker creation follow from the assumptions made so far. This is ensured by rule [B] with its global application domain. (21-a) is a case in point: The marker for 1. person absolutive is /a/, and the marker for 2. person ergative is /i-n/ (see (19), (20)). However, the two functional heads (T, v) in (21-a) *together* provide a [–1,–2] specification; this specification triggers rule [B], and both [–2] (in T) and [–1] (in v) are deleted. Consequently, /i/ cannot be inserted anymore: The '3. person' information that rule [B] needs to apply has been provided compositionally, by two morphemes, and not by genuine 3. person information in a single morpheme. As a result, /n/ is inserted in v (discharging [+gov]), and then (given Strict Cyclicity), /a/ is inserted in T (discharging [+1]).[14]

(21) ABS-ERG *contexts*:

a.	[+1,~~–2,~~–gov] [~~–1,~~+2,+gov] (2 → 1)	/a-n/
b.	[~~–1,~~+2,–gov] [+1,~~–2,~~+gov] (1 → 2)	/m-a-n/
c.	[~~–1, 2,~~–gov] [–1,–2,~~+gov~~] (3 → 3)	/i/
d.	[~~–1, 2,~~–gov] [+1,–2,+gov] (1 → 3)	/a-n/
e.	[~~–1, 2,~~–gov] [–1,+2,+gov] (2 → 3)	/i-n/
f.	[+1,–2,–gov] [~~–1, 2, +gov~~] (3 → 1)	/a/
g.	[–1,+2,–gov] [~~–1, 2, +gov~~] (3 → 2)	/m-i/

The global impoverishment rule [B] also applies in all other contexts in (21) (with crucial reference to the global domain in (21-b), (21-f), and (21-g)), and it is systematically responsible the absence of /i/ in cases where one

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[13]An underlying assumption here is that contextual features are inherently lower-ranked than primary features.

[14]Note that a marker like /m/ or /t/ cannot be inserted here because it is only rule [B] whose application domain is global: I assume that contextual features always encode local information, i.e., information that is present in the minimal functional morpheme.

would otherwise expect this [–1] marker to show up. Thus, (21-b) has /m-a-n/ instead of /m-i-a-n/; (21-c) has /i/ instead of /i-i/; (21-d) has /a-n/ instead of /i-a-n/; (21-e) has /i-n/ instead of /i-i-n/; (21-f) has /a/ instead of /a-i/; and (21-g) has /m-i/ instead of /i-m-i/.

(21) also illustrates that the two impoverishment rules interact. Again, Strict Cyclicity predicts the order of application: First, the more local rule [A] must apply, and then global rule [B] applies; the reversed order of application moves from a larger, more inclusive domain to a smaller one, in violation of Strict Cyclicity. Thus, in (21-f), [+gov] is first deleted in v in the (local) context [–1,–2]; and then [–1,–2] is deleted in the (global) context [–gov] (provided by the sister morpheme, T).

The effects of the two impoverishment rules are summarized in (22).

(22) a. *Effects of rule [A]*:
     (i) Occurrence of /t/ instead of /m/ in the context 1_{incl}.ABS.
     (ii) Absence of /n/ in the context 3.ERG.
   b. *Effects of rule [B]*:
     (i) Absence of a marker in a simple context 3.ABS.
     (ii) Absence of a marker for 3. person if the other argument is also 3. person.
     (iii) Absence of a marker for 3. person if the other argument is 1. or 2. person.
     (iv) Absence of /i/ in the transitive contexts $1 \to 2$, $2 \to 1$.

To sum up: The system of argument encoding morphology in Sierra Popoluca can be given a maximally simple analysis that accounts for all instances of syncretism in a systematic way and derives both the inventory of inflection markers, and the participant reduction and portmanteau marker creation effects in transitive contexts. The following concepts proved necessary: underspecification of case/person markers; fission; and impoverishment, including a feature deletion rule that is *global*.[15]

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[15] At first sight, one might think that global impoverishment could be avoided by assuming *fusion* of v and T (Halle & Marantz (1993)), which would create a complex v-T morpheme without internal structure. However, this is not the case. Vocabulary insertion must be restricted to the simple v and T morphemes throughout, and cannot combine features from v and T to provide a single insertion context; the analysis crucially relies on the simultaneous presence of two domains for morphological rules that have a different size.

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