Inflectional Morphology in a Minimalist Grammar

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Chapter 1

Introduction

1.1 Basic Assumptions

Central questions:

1. To what extent can marker homonymies in inflectional paradigms be derived systematically?

2. What should a theory of inflectional morphology look like that is compatible with basic tenets of the minimalist program?

Central claims:

(1) Syngretism Principle (meta-grammatical):

Identity of form implies identity of function (within a certain domain, and unless there is evidence to the contrary).

(2) Inflectional morphology in a minimalist grammar:

   a. is lexical-realizational (DM, PFM)
   b. employs underspecification and specificity-based competition (DM, PFM, MM)
   c. relies on decomposition of features for grammatical categories (case, person, number, gender, inflection class) (DM, PFM, MM)
   d. is pre-syntactic (MM)

1.2 Morphology/Syntax Mismatches

Morpho-syntactic features between morphology and syntax
Morphology
Inventory of inflection markers

Syntax:
Distribution of inflection markers

Syntactic structure
Paradigm 1: Pronominal inflection in German

\[
\begin{array}{c|c|c|c|c|c|c}
 & [+\text{masc}] & [+\text{neut}] & [+\text{fem}] & [+\text{masc}] & [+\text{neut}] & [+\text{fem}] \\
\hline
\text{nom} & -e & -e & -e & -e & -e & -e \\
\text{acc} & -e & -e & -e & -e & -e & -e \\
\text{dat} & -e & -e & -e & -e & -e & -e \\
\text{gen} & -e & -e & -e & -e & -e & -e \\
\end{array}
\]

(3) class Fritz this Mann traut that Fritz\textsubscript{nom} this man\textsubscript{dat} trusts

(4)

\[
\begin{array}{c}
\text{C} \\
\text{class} \\
\text{NP} \\
\text{Fritz} \\
\text{VP} \\
\text{V'} \\
\end{array}
\]

\[
\begin{array}{c}
\text{N} \\
\text{traut} \\
\text{Mann} \\
\end{array}
\]

Observation:
Here it looks as though one could assume that the morpho-syntactic features that are relevant in the morphological component (inventory) and the morpho-syntactic features that are relevant in the syntax (distribution) are identical.

Asymmetries
Problem:
There are asymmetries between morphology and syntax with respect to morpho-syntactic features. Two examples:
(i) Inflection class features are relevant in morphology, but irrelevant in syntax.
(ii) Underspecification is relevant in morphology, but (typically) not in syntax.

Necessity of inflection classes
Independently motivated features (morpho-syntactic features like gender, phonological features like soft or hard stem ending, semantic features like animacy) do not suffice to correctly predict the inflection class for a given stem in all cases. It seems that specific inflection class features on stems are unavoidable.

Paradigm 2: Russian noun inflection, inflection class \([1]\), singular: \([+\text{masc}]\)

\[
\begin{array}{|c|c|c|}
\hline
\text{nom/sg} & \text{zavod-} & \text{student-} \\
\text{akk/sg} & \text{zavod-} & \text{student-} \\
\text{dat/sg} & \text{zavod-u} & \text{student-u} \\
\text{gen/sg} & \text{zavod-a} & \text{student-a} \\
\text{inst/sg} & \text{zavod-em} & \text{student-em} \\
\text{prep/sg} & \text{zavod-e} & \text{student-e} \\
\hline
\end{array}
\]

Paradigm 3: Russian noun inflection, inflection class \([2]\), singular: \([+\text{fem}], [+\text{masc}]\)

\[
\begin{array}{|c|c|c|c|}
\hline
\text{nom/sg} & \text{konmat-a} & \text{učitel'nic-} & \text{nedel'-} \\
\text{akk/sg} & \text{konmat-} & \text{učitel'nic-} & \text{nedel-ja} \\
\text{dat/sg} & \text{konmat-e} & \text{učitel'nic-} & \text{nedel-e} \\
\text{gen/sg} & \text{konmat-y} & \text{učitel'nic-} & \text{nedel-i} \\
\text{inst/sg} & \text{konmat-oj(u)} & \text{učitel'nic-oj(u)} & \text{nedel-oj(u)} \\
\text{prep/sg} & \text{konmat-e} & \text{učitel'nic-} & \text{nedel-e} \\
\hline
\end{array}
\]

Necessity of inflection classes
Observation:
Most of the variation concerns the choice of the plural marker. However, in the singular, too, inflection class features must be postulated in order to capture the assignment of stems to inflection classes: strong vs. weak masculine nouns. Again, independently motivated features of stems do not suffice here. (Cf., e.g., [+animate] \(\rightarrow\) see Dirigent ‘conductor’ vs. Planet ‘planet’).

Syncretism and underspecification
Observation:
There are many homonyms of inflection markers: syncretism. (There is a narrow notion of syncretism: one marker for more than one case. There is also a more general interpretation: formal identity of different cells in any given paradigm. I adopt the latter notion.) It is not a priori clear to what extent syncretism can be viewed as systematic, and to what extent it might be accidental. However, it is uncontroversial that at least some instances of syncretism are not accidental. Consequently, the question arises of how to account for the phenomenon.

Example and Analysis
Example:
There are 24 different paradigm cells in paradigm 1, but there are only 5 distinct markers: \(-e, -er, -en, -es, -em\). Thus, there is only one marker for the morpho-syntactic feature specifications \([+\text{dat}, +\text{masc}, -\text{pl}]\) and \([+\text{dat}, +\text{neut}, -\text{pl}]\): \(-em\); and this marker is
Paradigm 4: Russian noun inflection, inflection class [3], singular: [+fem]

<table>
<thead>
<tr>
<th>nom/sg</th>
<th>tetrad’j (‘notebook’)</th>
<th>mys’j (‘mouse’)</th>
<th>doc’j (‘daughter’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>akk/sg</td>
<td>tetrad’-O</td>
<td>mys’-O</td>
<td>doc’-O</td>
</tr>
<tr>
<td>dat/sg</td>
<td>tetrad-i</td>
<td>mys-i</td>
<td>doc-er-i</td>
</tr>
<tr>
<td>gen/sg</td>
<td>tetrad-i</td>
<td>mys-i</td>
<td>doc-er-i</td>
</tr>
<tr>
<td>inst/sg</td>
<td>tetrad’-ju</td>
<td>mys’-ju</td>
<td>doc-er-ju</td>
</tr>
<tr>
<td>prep/sg</td>
<td>tetrad-i</td>
<td>mys-i</td>
<td>doc-er-i</td>
</tr>
</tbody>
</table>

Paradigm 5: noun inflection in Russian (simplified)

<table>
<thead>
<tr>
<th></th>
<th>[−pl]</th>
<th>[+pl]</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>-0</td>
<td>-0</td>
</tr>
<tr>
<td>acc</td>
<td>-2</td>
<td>-2</td>
</tr>
<tr>
<td>gen</td>
<td>-4</td>
<td>-4</td>
</tr>
<tr>
<td>ins</td>
<td>-0u</td>
<td>-0</td>
</tr>
<tr>
<td>prep</td>
<td>-e</td>
<td>-e</td>
</tr>
</tbody>
</table>

different from all the other markers in paradigm 1.

Analysis: natural classes and underspecification:
A common basis of the instances of a given syncretism is sought - a property that the different contexts exhibiting an identical marker have in common. This property characterizes a natural class of morpho-syntactic specifications. In the case at hand, [+dat,+masc,−pl] and [+dat,−neut,+pl] contexts differ only with respect to gender information. Assumption: [+masc] and [+neut] form a natural class. Natural classes can be derived from a decomposition of the standard morpho-syntactic features into combinations of more abstract primitive features.

(5) Decomposition of gender features in German:
 a. masculine = [+masc,+fem]
 b. feminine = [+masc,+fem]
 c. neuter = −[masc,+fem]
 d. [ ] = [+masc,+fem]

Underspecification:
The idea then is that inflection markers do not have to be characterized by fully specified morpho-syntactic features; they can also be characterized by underspecified morpho-syntactic information. For instance:
The marker -em is not characterized as [+dat,+masc,−fem,−pl] or as [+dat,−masc,−fem,−pl]. Rather, this marker is characterized by a feature specific-

Paradigm 6: German noun inflection, inflection classes [1]−[4]

<table>
<thead>
<tr>
<th></th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
<th>[4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>Hund-0</td>
<td>Schaf-0</td>
<td>Baum-0</td>
<td>Mann-0</td>
</tr>
<tr>
<td>acc/sg</td>
<td>Hund-0</td>
<td>Schaf-0</td>
<td>Baum-0</td>
<td>Mann-0</td>
</tr>
<tr>
<td>dat/sg</td>
<td>Hund-0</td>
<td>Schaf-0</td>
<td>Baum-0</td>
<td>Mann-0</td>
</tr>
<tr>
<td>gen/sg</td>
<td>Schaf-es</td>
<td>Baum-es</td>
<td>Mann-es</td>
<td>Strahl-es</td>
</tr>
<tr>
<td>nom/pl</td>
<td>Hund-e</td>
<td>Schaf-e</td>
<td>Räum-e</td>
<td>Bürcher-er</td>
</tr>
<tr>
<td>acc/pl</td>
<td>Hund-e</td>
<td>Schaf-e</td>
<td>Räum-e</td>
<td>Bürcher-er</td>
</tr>
</tbody>
</table>

Paradigm 7: German noun inflection, inflection classes [5]−[8]

<table>
<thead>
<tr>
<th></th>
<th>[5]</th>
<th>[6]</th>
<th>[7]</th>
<th>[8]</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>Planet-0</td>
<td>Ziege-0</td>
<td>Maus-0</td>
<td>Drangsal-0</td>
</tr>
<tr>
<td>acc/sg</td>
<td>Planet-en</td>
<td>Ziege-en</td>
<td>Maus-en</td>
<td>Drangsal-en</td>
</tr>
<tr>
<td>dat/sg</td>
<td>Planet-en</td>
<td>Ziege-en</td>
<td>Maus-en</td>
<td>Drangsal-en</td>
</tr>
<tr>
<td>gen/sg</td>
<td>Planet-en</td>
<td>Ziege-en</td>
<td>Maus-en</td>
<td>Drangsal-en</td>
</tr>
<tr>
<td>nom/pl</td>
<td>Planet-en</td>
<td>Ziege-n</td>
<td>Maus-en</td>
<td>Drangsal-n</td>
</tr>
<tr>
<td>acc/pl</td>
<td>Planet-en</td>
<td>Ziege-n</td>
<td>Maus-en</td>
<td>Drangsal-n</td>
</tr>
<tr>
<td>dat/pl</td>
<td>Planet-en</td>
<td>Ziege-n</td>
<td>Maus-en</td>
<td>Drangsal-n</td>
</tr>
<tr>
<td>gen/pl</td>
<td>Planet-en</td>
<td>Ziege-n</td>
<td>Maus-en</td>
<td>Drangsal-n</td>
</tr>
</tbody>
</table>

Reconstruction case system of Proto-Indo-European, singular only

<table>
<thead>
<tr>
<th></th>
<th>*e/o stems</th>
<th>*e/o stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASC/FEM</td>
<td>NEUT</td>
<td>MASC/FEM</td>
</tr>
<tr>
<td>NOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VOC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The syncretism with -e in nominative feminine and accusative feminine contexts in German looks systematic in the same way (the same may also hold for the plural).
Paradigm 8: Noun inflection in German (simplified)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom[-n]</td>
<td>-3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>acc[-p]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dat[-p]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>gen[-p]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Analysis (Jakobson 1962a,b, Bierwisch 1967):
The cases are decomposed into combinations of primitive features.

(7) Decomposition of case features in German:
   a. nominative = [-obj, -obl]
   b. accusative = [+obj, -obl]
   c. dative = [+obj, +obl]
   d. genitive = [-obj, +obl]

Consequence:
Nominitive and accusative form a natural class.
Genitive and dative form a natural class.
Accusative and dative form a natural class.
Nominitive and genitive form a natural class.
Nominitive and dative do not form a natural class.
Accusative and genitive do not form a natural class.

Alternative accounts of syncretism

Side remark:
Derived syncretism by (feature decomposition and) underspecification is a well-established research strategy. However, there are also other theoretical approaches to syncretism, including those in (8) (none of these alternative approaches is inherently incompatible with underspecification).

(8) Alternative approaches
   a. Paradigm geometry
      The main idea is that syncretism are deriveable from an appropriate placement of the various paradigm cells (e.g., adjacency of paradigm cells in appropriately revised or designed paradigms).
   b. Rules of referral


1.2 Morphology/Syntax Mismatches

Rules of referral state the identity of markers but make no further attempt to actually derive it.

(c) Impoverishment rules
   Impoverishment rules are a central building block of Distributed Morphology. Impoverishment rules reduce morpho-syntactic feature specifications on the way from syntax to morphology; morphology then operates on simplified structures, and a retreat to the general case results.

Consequence of underspecification:
Underspecification typically has the effect of producing a competition of different markers for one and the same morpho-syntactic contexts.

1. Such a competition can be resolved by invoking an extrinsic ordering of inflection markers (alternatively, of rules that introduce these markers).

2. An alternative (and conceptually far more attractive) concept relies on the notion of specificity. Cf. the Subset Principle (accompanied by a notion of specificity), the Elsewhere Principle, the Blocking Principle, Panini’s Principle, the Proper Inclusion Principle, etc.

A simple approach employing underspecification

Preliminary assumption:
Assume as given (a) a stem and (b) the smallest set of fully specified morpho-syntactic feature structures for this stem encoding the range of possible word forms. This set includes both features that are inherent to the stem, like (for nouns) inflection class and gender, and features that are variable and non-inherent, like (for nouns) case and number. This information creates a paradigm whose cells need to be filled. For each pair of (a) and (b), the correct word form or filled paradigm cell is determined by choosing a compatible inflection marker according to the Subset Principle.

Subset Principle (and Specificity)

(9) Subset Principle:
   An inflection marker $F$ is merged with a stem $S$ for a fully specified feature structure $M_{\text{iff}}$ (i) and (ii) hold:
   (i) The morpho-syntactic features of $F$ are a subset of the morpho-syntactic features of $M$.
   (ii) $F$ is the most specific inflection marker among those that satisfy (i).

Specificity of Inflection Markers:

(10) Specificity of Inflection Markers:
An inflection marker $F_i$ is more specific than an inflection marker $F_j$ iff $F_i$ has more (relevant) morpho-syntactic features than $F_j$.

**Theories of Inflection**

Stump (2001) devises a useful taxonomy of theories of inflection.

1. **Incremental analysis**
   - Inflection markers add morpho-syntactic features that would otherwise not be present on a word form.

2. **Realizational analysis**
   - Inflection markers do not add morpho-syntactic features; all pieces of morpho-syntactic information are independently available.

3. **Lexical analysis**
   - Inflection markers are associated with (possibly abstract) morphemes that exist independently, as separate objects in the mental lexicon.

4. **Inferential analysis**
   - Inflection markers do not have morpheme status and do not exist independently, as separate objects.

**Some theories**

(12) a. lexical-incremental:

b. lexical-realizational:
   - Halle & Marantz (1993, 1994) (Distributed Morphology)

c. inferential-incremental:
   - hardly attested

d. inferential-realizational:
   - Stump (2001), Blevins (2004) (word (or stem) and paradigm approaches)

**Differences**

Abstracting away from underspecification, (13) shows different treatments.

(13) a. Lexical approaches (incremental or realizational):
    - \( \text{studentu} \mid [+N,+dat,+masc,-pl] \)
      \( \Leftarrow \) /student/ \( [+N,+masc,\text{class}[1]] + /\text{it}/ [+\text{dat},+\text{masc},-\text{pl},\text{class}[1]] \)

b. Inferential-realizational approaches:
    - \( \text{diesen} \mid [+N,+dat,+masc,-pl] \)
      \( \Leftarrow \) /dies/ \( [+\text{D}] + /\text{em}/ [+\text{dat},+\text{masc},-\text{pl}] \)

**1.3 Distributed Morphology**

Lit.: Halle & Marantz (1994, 1993)

**1.3.1 Halle & Marantz (1994) on clitic object pronouns in Spanish**

**Goal**

Halle and Marantz set out to introduce some basic assumptions of Distributed Morphology on the basis of the system of clitic object pronouns in Spanish.

**Question:**
Where does the name Distributed Morphology come from?

**Answer** (Halle & Marantz, 1993, 111-112&171):

"We have called our approach Distributed Morphology (hereafter DM) to highlight the fact that the machinery of what traditionally has been called morphology is not concentrated in a single component of the grammar, but rather is distributed among several different components."

"The term Distributed Morphology and the general view that it incorporates resulted from discussions with David Pesetsky."

**Assumption:**
The basic element of morphology is the *vocabulary item*. A vocabulary item pairs phonological features on the one hand with morpho-syntactic (and semantic) features on the other. The latter features encode the possible context of insertion of the vocabulary item; the former is also sometimes called *signal*.

(14) **Structure of vocabulary items:**
   \( \text{/phonological features/} \rightarrow \text{[morpho-syntactic features]} \)

Three central assumptions of Distributed Morphology:

(i) *late insertion*
(ii) *underspecification*
(iii) *syntactic hierarchical structure all the way down*
1.3.1.1 Late Insertion

Late Insertion:
Morphology follows syntax; morphology realizes abstract syntactic structures. The syntax itself merely deals with abstract categories that are bundles of morpho-syntactic and semantic features: so-called f-morphemes (functional morphemes) and so-called l-morphemes (lexical morphemes).

At least, late insertion holds for f-morphemes; as for l-morphemes, proponents of Distributed Morphology do not necessarily agree, and both options have been pursued in Distributed Morphology.

Syntactic X^1 categories (i.e., morphemes) are morphologically realized by insertion of vocabulary items (vocabulary insertion, VI). This way, (f-) morphemes get phonological features.

Consequences of late insertion

Remark:
A crucial assumption is the distinction between (abstract) morphemes and (concrete) vocabulary items (inflection markers, inflectional exponents). This difference is not recognized in (standard) theories that rely on early insertion.

Observation:
In contrast to early insertion, late insertion leaves room for possible modifications of syntactic structures with their morpho-syntactic features before morphological realization (vocabulary insertion) takes place. One such operation that changes syntactic structures before morphology applies is impoverishment.

1.3.1.2 Underspecification

Underspecification:
The morpho-syntactic features (which make up the ‘context of insertion’) of vocabulary items are often underspecified. Such an underspecification makes a simpler, more economical description of inflectional systems possible, and it significantly contributes to an account of instances of syncretism.

Remark:
As a consequence of underspecification, constraints are needed that regulate the correct insertion of vocabulary items and decide the competition between different vocabulary items in the case of conflict: Subset Principle, Specificity.

1.3.1.3 Syntactic Hierarchical Structure All the Way Down

Syntactic Hierarchical Structure All the Way Down:
Morphological insertion is sensitive to syntactic operations that manipulate (f- or l-) morphemes and create word forms: head movement, syntactic lowering.

1.3.1.4 Structure of the Grammar

Structure of the grammar:
Syntax ———— Logical Form (Semantics)
    ↓ Morphology (Morpheme/feature insertion, merger, fusion, fission, impoverishment)
    ↓ vocabulary insertion
    ↓ Phonology

1.3.1.5 Impoverishment

An important concept: impoverishment:

Impoverishment rules reduce morpho-syntactic feature bundles between syntax and morphology; rules of the morphological component (like vocabulary insertion) then operate on impoverished (simplified) structures, and this affects a retreat to the general case.

Note:
The classical concept of impoverishment fully corresponds to (and in a way complements) underspecification of vocabulary items:
(i) underspecification of vocabulary items: “underspecification”
(ii) underspecification of syntactic categories: “impoverishment”
1.3.1.6 Syntax vs. Morphology

Observation:
(i) Normally, underspecification of morpho-syntactic features does not play any role whatsoever in the syntax.
(ii) Therefore, impoverishment of syntactic structures can only apply after syntax has done its work.
(iii) Hence, impoverishment (or, more generally, underspecification of syntactic structures) is possible only in theories that rely on late insertion.

1.3.1.7 Examples

(19) An abstract example (Halle & Marantz (1994)):
   a. Category X:
      (i) $P_A \leftrightarrow [F_1,F_2]$
      (vocabulary item A)
      (ii) $P_B \leftrightarrow [F_1]$
      (vocabulary item B)
   b. $[x F_1,F_2,F_3]$
      ($\alpha$-morphism)
   c. $F_2 \rightarrow 0 / [X] / Y$
      (impoveryishment)
   d. $[x F_1,F_2,F_3]$
      ($\alpha$-morphism after impoverishment, before insertion)
   e. Insertion applies to $P_B$, not to $P_A$ (even though the latter is more specific).

(20) A concrete example: Adjectival markers in Norwegian (Harley & Noyer (2003), Sauerland (1996)):
   a. Vocabulary items
      (i) $\langle /t/ \rangle \leftrightarrow [-pl,+neut] /Ad]$
      (ii) $\langle 0 \rangle \leftrightarrow [-pl,-neut] /Ad]$
      (iii) $\langle /e/ \rangle \leftrightarrow [ ] /Ad]$
      (impoveryishment)
   b. Strong:
      $[-neut] \rightarrow 0$ in syntactic contexts with weak inflection

Paradigm 9: Adjectival markers in Norwegian

<table>
<thead>
<tr>
<th>STRONG</th>
<th>$[-neut]$</th>
<th>$[+neut]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[-pl]$</td>
<td>0</td>
<td>/t/</td>
</tr>
<tr>
<td>$[+pl]$</td>
<td>/e/</td>
<td>/e/</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WEAK</th>
<th>$[-neut]$</th>
<th>$[+neut]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[-pl]$</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>$[+pl]$</td>
<td>/e/</td>
<td>/e/</td>
</tr>
</tbody>
</table>

1.3.1.8 Clitic Object Pronouns in Spanish

(21) Structure of object clitics (as with nouns):
   [Det [n Det Theme | Number]]

1.3.2 Distributed Morphology

Assumption:
Vocabulary insertion applies cyclically, from left to right (from the stem to the edge), according to the Subset Principle.

Subset Principle and Specificity

(22) Subset Principle (Halle (1997)):
   A vocabulary item $V$ is inserted into a functional morpheme $M$ if (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 of vocabulary items

A vocabulary item $V_i$ is more specific than a vocabulary item $V_j$ if $V_i$ has more morpho-syntactic features than $V_j$.

Vocabulary Insertion 1: Det markers

(24) Det markers (stems):

   /n/[i] $\rightarrow$ [1.Pers] /[-:pl]
   /m/[iii] $\rightarrow$ [1.Pers] /[-:pl]
   /o/ $\rightarrow$ [2.Pers] /[-:pl]
   /l/ $\rightarrow$ [ ] /[-:case]
   /s/[iii] $\rightarrow$ [ ]

Assumption:
After insertion of the stems, but before insertion of theme vowels and number markers, the two redundancy rules in (25-a) and (25-b) apply, in this order.

(25) Redundancy rules

   a. [ ] $\rightarrow$ [III] /[-dat]
   b. [ ] $\rightarrow$ [III] /[-:fem]

Remark:
At least redundancy rule (25-a) should possibly be understood in such a way that it applies only in the context [3.Pers]:
   [ ] $\rightarrow$ [III] /[-dat],3.Pers]
Otherwise, it seems that wrong predictions would be made for [2.Pers]-clative contexts. But see below.

Vocabulary Insertion 2: Theme vowels

(26) Theme vowels and inflection class features

   /e/ $\leftrightarrow$ [III]
   /a/ $\leftrightarrow$ [III]
   /o/ $\leftrightarrow$ [ ]
Vocabulary Insertion 3: Number markers

(27) Number markers:

\[ /s/ \leftrightarrow [+pl] \]
\[ (\emptyset) \leftrightarrow [ \ ] \]

All Vocabulary Items

(28) Det markers ('stems'):

\[ /\text{n}[/] \leftrightarrow [1.Pers] [\text{l}\text{+pl}] \]
\[ /\text{m}[/] \leftrightarrow [1.Pers] \]
\[ /\emptyset/ \leftrightarrow [2.Pers] [\text{l}\text{+pl}] \]
\[ /t[/] \leftrightarrow [2.Pers] \]
\[ /l/ \leftrightarrow [ ] [\text{case}] \]
\[ /s[/] \leftrightarrow [ ] \]

Redundancy rules:

a. \[ [ ] \rightarrow [\text{III}] /\text{dat,3.Pers} \]

b. \[ [ ] \rightarrow [\text{III}] /\text{+fem} \]

Theme vowels and inflection class features:

\[ /e/ \rightarrow [\text{III}] \]
\[ /a/ \rightarrow [\text{II}] \]
\[ /o/ \rightarrow [ ] \]

Number markers:

\[ /s/ \leftrightarrow [+pl] \]
\[ (\emptyset) \leftrightarrow [ ] \]

Paradigm 10: Clitic object pronouns in Spanish

<table>
<thead>
<tr>
<th>[+pl]</th>
<th>[3.Pers]</th>
<th>[2.Pers]</th>
<th>[1.Pers]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc</td>
<td>/-o/-o/</td>
<td>/-m/-a/-o</td>
<td>/t/-m/-o/-o</td>
</tr>
<tr>
<td>Dat</td>
<td>/m/-m/-o/-o</td>
<td>/m/-m/-o/-o</td>
<td>/t/-m/-o/-o</td>
</tr>
<tr>
<td>Refl</td>
<td>/s/-m/-o/-o</td>
<td>/s/-m/-o/-o</td>
<td>/t/-m/-o/-o</td>
</tr>
<tr>
<td>[-pl]</td>
<td>[mas]</td>
<td>[-fem]</td>
<td>[mas]</td>
</tr>
<tr>
<td>Acc</td>
<td>/-o/-s/</td>
<td>/-m/-a/-s/</td>
<td>/-o/-s/</td>
</tr>
<tr>
<td>Dat</td>
<td>/m/-m/-o/-s/</td>
<td>/m/-m/-o/-s/</td>
<td>/-o/-s/</td>
</tr>
<tr>
<td>Refl</td>
<td>/s/-m/-o/-s/</td>
<td>/s/-m/-o/-s/</td>
<td>/-o/-s/</td>
</tr>
</tbody>
</table>

1.3 Distributed Morphology

1.3.1.9 Comments

Remark:
The inflection class features set in boldface in paradigm 10 do not come from inflection markers, but from the two redundancy rules.

Problem: How can the distribution of number markers be derived in the Refl-Plural domain?

Questions

- What is the theory-internal reason for the (few) differences between accusative and dative marking? And what is the reason for the (few) gender-related differences? Not a single inflection marker (vocabulary item) bears case features; case features are only mentioned in redundancy rule (25-a). Similarly for gender features and (25-b).

- The analysis involves a highly specific zero marker for stem positions. This assumption may not be completely unproblematic (from the point of view of iconicity at least). What is the theory-internal task of this zero marker? And why can problem not be avoided by a slightly different specification of the context of insertion of some marker? How would the whole system have to be changed so as to be able to dispense with the highly specific zero marker?

The zero marker blocks /\text{l}/. /\text{l}/ could in principle be restricted to singular contexts; but then /\text{l}/ or /\text{s}/ would have to be inserted instead. Consequently, these latter markers would also have to be classified as incompatible with 2.Pers. 
Such an approach might eventually be viable, but it contradicts the assumption that one marker is usually radically underspecified. (We will come back to this issue.)

Questions 2

- Inflection class [I] is the default class; the vocabulary item /\text{o}/ in (26) does not depend on the presence of this feature for insertion. Why, then, is the stem marker /\text{n}/ equipped with this feature in order to trigger subsequent /\text{o}/ insertion (in contrast to /\text{l}/ and /\text{O}/). Perhaps this assumption can simply be dispensed with? A problem can only arise if a redundancy rule can apply in this context that instantiates a different inflection class feature. By assumption, [+fem] is irrelevant for [1.Pers]; therefore, the only problem would be created by the dative-related rule (25-a). However, as noted above, this rule may only hold for [3.Pers] contexts, /\text{o}/ would also need class information ([I]). Thus, the sole remaining scenario under which [I] would be needed for /\text{n}/ would be one where (25-a) holds for [1.Pers] [3.Pers], but not for [2.Pers].

- Why do vocabulary insertion and the redundancy rules have to apply cyclically, from the center to the periphery?

Insertion of a stem marker and the two redundancy rules create the context for theme vowel insertion. Among the redundancy rules, the order of application is
crucial; and similarly, the fact that both rules only apply after insertion of stem markers is very important.

1.3.1.10 Observations

First observation:
In American varieties of Spanish, the clitic pronoun /os/ for 2. person plural contexts is missing.

Analysis
This can be traced back to impoverishment rule.

(32) **Impoveryishment rule for f2.Pers:**
\[ [2.\text{Pers}] \rightarrow \emptyset /+[pl] \]

Consequence:
There is a **retreat to the general case**: In the plural, the [2.Pers] features is deleted. Therefore, \( \emptyset \) cannot be inserted, and the same goes for /t/. As a result, the most specific remaining stem marker is /t/. Consequently, /les/ shows up in the context [2.Pers,±pl,Acc]. Still, to ensure that the output form is /les/ and not /los/ in [2.Pers,±pl,Dat] contexts, (25-a) needs to be able to apply before theme vowel insertion. (In this context, Halle & Marantz (1994, 283) state: “Note also that like other 3. Person clitics and unlike its singular counterpart, the erstwhile 2. Person Plural clitic is subject to Case distinctions.”) This means that the redundancy rule at hand cannot be confined to 3. Person. No problem arises if [3.Pers] is characterized by an absence of features.

Second observation:
"Spurious se": se shows up if a clitic 3. Person Dative pronoun is adjacent to a clitic 3. Person Accusative pronoun.

Analysis
Again, an impoverishment rule is at work.

(33) **Impoveryishment rule for [Dat]:**
\[ [\text{Dat}] \rightarrow \emptyset /+[\text{Acc}] \]

Consequence:
In Acc-Dat contexts, /u/ is blocked for the dative position because there is no case feature left. Therefore, the maximally nonspecific form /s/ is used.

Spurious 'se'

(34) **Spurious se** (based on Bonet (1995)):
\[ a. \text{ el premio, lo dieron a Pedro ayer} \]
\[ \text{the price [3.Acc] gave[3.PL] to Pedro yesterday} \]

1.3 Distributed Morphology

b. A Pedro, le dieron el premio ayer
c. A Pedro, el premio se lo dieron ayer (*le lo, *lo le)
to Pedro the price  se  [3.acc] gave[3.PL] yesterday
‘Yesterday, they gave Pedro the price.’

**Interaction of impoverishment rules**

**Prediction:**
The two impoverishment rules just discussed can interact in varieties of American Spanish.

(35) \[ [2.\text{Pers,Dat}]+\text{Theme}+ [+pl] & [3.\text{Pers,Acc}]+\text{Theme}+ [-pl] \]
\[ \rightarrow [ ] +\text{Theme}+ [+pl] & [3.\text{Pers,Acc}]+\text{Theme}+ [-pl] \]

a. **European Spanish**
Os lo di
‘I gave it to you.’

b. **American Spanish**
Se lo di
‘I gave it to you.’

**Syntactic structure all the way down:**
So far, we have evidence for (i) late insertion (because of impoverishment) and (ii) underspecification (motivated by syncretism). What’s still missing is evidence for (iii) syntactic hierarchical structure all the way down. The argument can be provided on the basis of Spanish *imperativos*, which may co-occur with clitic object pronouns.

(36) **2. Pers. Plural imperatives with clitic pronouns, Spanish mit klitischen Pronomina, Standard-Spanish:**

a. d-e n- l- o- s
give IMP.2.PL 3. ACC THEME PL
‘You give them (to someone),’

b. d-e n- m- e- l- o
give IMP.2.PL 1.DAT THEME 3.ACC THEME
‘You give it to me!!’

(37) **2. Pers. Plural imperatives with clitic pronouns, Carribean Spanish:**

a. d-e n- l- o- s
give IMP.2.PL 3. ACC THEME PL
‘You give them (to someone),’

b. d-e m- e- l- o- n
give IMP.1.DAT THEME 3.ACC THEME 2.PL
‘You give it to me!!’

**Generalization:**
In Carribean Spanish (or, more precisely, a version thereof), clitic pronouns that have no plural suffix end up in the middle of the imperative verb - after the imperative marker, but before the plural suffix of the verb.
Analysis
The clitic cluster is a D(eterminer) category. Post-syntactically (but pre-vocabulary insertion), it is left-adjointed to Agr by means of the operation of merger, and therefore comes to be part of the verb.

1.3.1.11 Structures

(38) Structure in Standard Spanish:

```
  Agr
    T   D
      me
     lo
```

(39) Structure in Caribbean Spanish:

```
  Agr
    T   D
      me
     lo
```

Comment
This operation illustrates that inflectional morphology is sensitive to subtleties of syntactic phrase structure. The observable effect cannot possibly be purely phonological in nature because there are cases where /n/ is a part of the imperative verb but not a plural suffix and these cases do not trigger a reordering of the clitic pronouns.

(40) No reordering with other kinds of /n/:
   a. pen-me(-lo)  *You put (it) for me!
   b. *po-me(-lo)-n  You put (it) for me!

Consequence for Other Theories
Claim:
This systematic morphological effect cannot be captured in other, classical theories of inflection (e.g., in word and paradigm approaches) because the account presupposes that (a) highly articulate syntactic structure is needed for morphology, and (b) syntactic structure needs to be modifiable before morphology.

The Trigger for Impoverishment

1.3 Distributed Morphology

What triggers impoverishment is that (in Caribbean Spanish) abstract morphemes with person and case features need to show up to the left of an abstract morpheme with a plural feature. Therefore, there is no reordering if the clitic pronoun itself is plural:

(41) a. d-e-n- lo-s  *de-lo-n-s, *de-lo-s-n
    b. d-e-n- n-o-s  *de-no-n-s, *de-no-s-n

Like other kinds of merger, this merger operation satisfies a general peripherality condition: If (e.g.) me in (42) comes to show up to the left of an abstract morpheme with a plural feature, it cannot satisfy the condition by merger, "since it does not fall at the right periphery of the relevant domain" (p. 287). (On the other hand, there is no reason for such a movement because me already is located to the left of a plural morpheme.)

(42) a. d-e- m-e-  e- l-o-s
geben IMP 2.PL 1.DAT THEME 3. ACC THEME PL
   'You give them to me!'
   b. *d-e- m-e- n- l-o-s
geben IMP 1.DAT THEME 2.PL 3. ACC THEME PL
   'You give them to me!'

Concluding remark: Data such as (37-b) argue against the existence of paradigms as genuine objects of grammar (rather, they are epiphenomena). Here is why: If the set of possible word forms for a verb were to be fully characterized by a paradigm, this would also mean that, e.g., the combinations of all possible clitic pronouns with verbs would have to be part of this paradigm. Such an approach would be implausible.

1.3.2 Halle & Marantz (1993): Fusion and Fission

Fusion vs Merger

Background:
Fusion vs. merger:
(i) Merger leads to independently available morphemes that separately trigger vocabulary insertion.
(ii) In contrast, fusion combines two morphemes in such a way that only one vocabulary item can be inserted after the operation has taken place.
(iii) Thus: Merger is not (as in nuclear physics) the same thing as fusion.

Fusion: Definition

(43) Fusion (Halle & Marantz 1993, 116):
   a. Fusion takes two terminal nodes (morphemes) M_1 and M_2 that are sisters, and fuses them into a single terminal node M_0.
   b. M_0 has the features of both M_1 and M_2.
   c. At this point, only one vocabulary item V can be inserted in M_0; insertion is regulated by the Subset Principle.

Assumption:
In the syntax, there is a functional head *Case* and a functional head *Number* in nominal domains. In the case of fusional noun inflection in Indo-European languages, there is post-syntactic fusion of the two heads into a single morpheme.

**Fission**

(44) *Fission*; based on Halle & Marantz (1993, 166ff):

a. Fission separates a feature bundle $\beta$ from a terminal node (morpheme) $M_0$, such that two terminal nodes $M_1$ and $M_2$ come into existence.

b. $M_1$ has the features $\beta$; $M_2$ has the features of $M_0$.$\beta$.

Note:
For Halle and Marantz, fission is the opposite of fusion: It takes a single morpheme and creates two morphemes by splitting of features.

*Side remark:*
The concept of *fission* in Noyer (1992) is different. (Noyer’s version may be a bit more widely adopted in the recent literature.)

The two concepts of fission

(45) *Fission$_a$* (Halle & Marantz 1993):

a. Fission separates a feature bundle $\beta$ from a terminal node (morpheme) $M_0$, such that two terminal nodes $M_1$ and $M_2$ come into existence.

b. $M_1$ has the features $\beta$; $M_2$ has the features of $M_0$.$\beta$.

(46) *Fission$_b$* (Noyer 1992): If insertion of a vocabulary item $V$ with the morphosyntactic features $\beta$ takes place into a fissioned morpheme $M$ with the morphosyntactic features $\alpha$, then $\alpha$ is split up into $\beta$ and $\alpha$-$\beta$, such that (a) and (b) hold:

a. $\alpha$-$\beta$ is available for further vocabulary insertion.

b. $\beta$ is not available for further vocabulary insertion.

### 1.3.3 Verb Agreement in Georgian

**Example:**

Agreement markers on the verb in Georgian (based on Anderson (1992); also see Stump (2001)). Halle & Marantz (1993, 166ff) analyse the agreement marking on the verb by presupposing functional clitic morphemes that have undergone fusion.

(47) *Paradigm*

**With a 3.Pers object** – X paints 3.Pers:

a. x-xatav $\rightarrow$ *I paint him."

b. x-xatav-t $\rightarrow$ *We paint him."

c. 0-xatav $\rightarrow$ *You$_sg$ paint him."

d. 0-xatav-t $\rightarrow$ *You$_pl$ paint him."

### 1.3 Distributed Morphology

- e. x-xatav-s $\rightarrow$ *He paints him."

- f. x-xatav-en $\rightarrow$ *They paint him."


- g. m-xatav-s $\rightarrow$ *He paints me."

- h. g-xatav $\rightarrow$ *He paints us."

- i. g-xatav-s $\rightarrow$ *He paints you$_sg$."

- j. g-xatav-[t] $\rightarrow$ *He paints you$_pl$."

- k. xatav-s $\rightarrow$ *He paints them."

- l. xatav $\rightarrow$ *He paints them."

**Fusion → fission → insertion**

**Assumptions about fusion:**

(i) The clitic cluster incorporates, under a single head, all pronominal 1.Pers and 2.Pers arguments (normally, this does not hold for 3.person arguments; there are exceptions that will be ignored here).

(ii) The terminal nodes in the clitic cluster fuse into a single terminal node.

(iii) After fusion, the rule of fission in (48) applies.

(iv) Finally, vocabulary insertion takes place.

(48) *Fission of clitic clusters in Georgian:*

$$ [c_1 \ldots [+pl] \ldots ] + stem \rightarrow [+pl] + C1 + stem, \text{ where}$$

- a. linear order is irrelevant; and

- b. fission does not apply if [+pl] is part of an argument bearing the features [+i, [DAT]].

**Further assumptions:**

1. A fused T/Agr-head (tense/agreement head) follows the clitic cluster and the verb stem. This head agrees with a [NOM]-marked argument with respect to person and number. The vocabulary items that are inserted in T/Agr are organised according to so-called ‘creesves’.

("Creesves": loanword from Georgian; specific conjugation patterns that are roughly comparable to tenses.)

2. A (phonologically oriented) realignment rule applying after vocabulary insertion deletes an /-s/ with 3.Pers.$sg$ before a plural /-t/.

3. An impoverishment rule deletes a terminal plural-node if the latter follows some T/Agr-node with the features [+3, [+pl]].
Vocabulary items

(49) Vocabulary items for clitic positions:
   a. /g/-/ → [+1],[DAT],[+pl]
   b. /ms/-/ → [+1],[DAT]
   c. /g/-/ → [+2],[DAT]
   d. /v/-/ → [+1]
   e. /∅ → [+2]

(5) Vocabulary items for plural:
   f. /-t/ → [+pl]

(50) Vocabulary items for T/Agr in the examples above:
   a. /∅ → [+1] or [+2]
   b. /s/-/ → [+3],[−pl]
   c. /-en/ → [+3],[+pl]

Specificity problems

Question:
It is really clear whether the competition of vocabulary items in (49) can always be resolved by specificity. As noted by Halle and Marantz, additional assumptions may be called for for cases like (49), for the choice of (b) vs. (c) (in other contexts, where “both sets [in a clitic cluster] in principle might be DAT”, Halle & Marantz (1993, 120)). A similar reasoning applies in the case of (d) vs. (e). Halle and Marantz consider two options.

1. Specificity is sensitive to appropriate feature hierarchies, here:
   [+1] > [+2].

2. There is an extrinsic ordering of vocabulary items.

Stump’s Critique

Side Remark:
Stump (2001, 281, fn.3) claims that Halle & Marantz (1993) need an extrinsic ordering in their analysis of verb agreement in Georgian: “The ordering of /g/-/ before /v/-/ [...] is just stipulated.” This does not have to be the case: the vocabulary item /g/-/ in (49) has more features in its context of insertion than the vocabulary item /v/-/ in (49).

An indeterminacy with respect to specificity could only arise if an element α can only be more specific than another element β if the features of α are a proper superset of the features of β. Something along these lines has indeed been proposed, but it is not the case under present assumptions.

Syntax

(51) Syntactic structure for vocabulary insertion

| 1 | [CI {PERS,CASE,NUM} {PERS,CASE,NUM}] |
| 2 | T/Agr |
| 3 | [+pl] |
1.3.4 Fission

Refs.: Frampton (2002)

1.3.4.1 Basic Assumptions

Central claims
(i) Person features as they are standardly assumed (1, 2, 3) for verbal conjugations must be decomposed into combinations of more primitive features \([\pm 1], [\pm 2]\). Vocabulary items can be underspecified with respect to these features. This captures instances of person syncretism.

(ii) The analysis requires post-syntactic operations: impoverishment and fission. As far as it can count as successful, it therefore provides an argument for Distributed Morphology.

(52) **Impoverishment:**

Impoverishment rules reduce morpho-syntactic feature bundles on the way from syntax to morphology; morphology then operates on simplified, “impoverished” structures, and we get *a retreat to the general case*.

Remark:
The concept of impoverishment employed here is the standard one. In contrast, fission is defined as in Halle & Marantz (1993) (fissiona), but rather as in Noyer (1992) (also see Trommer (1999a,b)).

(53) **Fissiona** (Halle & Marantz (1993)):

a. Fission separates a feature bundle \( \beta \) from a terminal node (morpheme) \( M_0 \), such that two terminal nodes \( M_1 \) and \( M_2 \) come into existence.

b. \( M_1 \) has the features \( \beta; M_2 \) has the features of \( M_0 - \beta \).

(54) **Fissionb** (Noyer (1992)):

If insertion of a vocabulary item \( V \) with the morpho-
syntactic features \( \beta \) takes place into a fissioned morpheme \( M \) with the morpho-
syntactic features \( \alpha \), then \( \alpha \) is split up into \( \beta \) and \( \alpha - \beta \), such that (a) and (b) hold:

a. \( \alpha - \beta \) is available for further vocabulary insertion.

b. \( \beta \) is not available for further vocabulary insertion.

Note: Fission of a morpheme is recursive; i.e., after insertion of a vocabulary item, a morpheme (assuming that it has morpho-syntactic features left) is again subject to fission, and so on (until no features are left).

(55) **Subset Principle** (Halle (1997)):

A vocabulary item \( V \) is inserted into a functional morpheme \( M \) if (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).

Terminological remark:
Frampton calls this principle the “Principle of Decreasing Specificity” (PDS).

(56) **Specificity of vocabulary items**

A vocabulary item \( V_i \) is more specific than a vocabulary item \( V_j \) if \( V_i \) has more morpho-syntactic features than \( V_j \).

1.3.4.2 Syncretism in English Verb Inflection

(57) a. be

<table>
<thead>
<tr>
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<th>past</th>
</tr>
</thead>
<tbody>
<tr>
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<td>am</td>
<td>was</td>
</tr>
<tr>
<td>2 sg</td>
<td>are</td>
<td>were</td>
</tr>
<tr>
<td>3 sg</td>
<td>is</td>
<td>was</td>
</tr>
<tr>
<td>1 pl</td>
<td>are</td>
<td>were</td>
</tr>
<tr>
<td>2 pl</td>
<td>are</td>
<td>were</td>
</tr>
<tr>
<td>3 pl</td>
<td>are</td>
<td>were</td>
</tr>
</tbody>
</table>

b. work

<table>
<thead>
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<td>2 pl</td>
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<td>were</td>
</tr>
<tr>
<td>3 pl</td>
<td>are</td>
<td>worked</td>
</tr>
</tbody>
</table>

(58) **Generalizations**:

a. In past tense contexts, there is a syncretism of 1.Pers.Sg. and 3.Pers.Sg.

b. In the plural, there are no person distinctions.

Assumption:
These two generalizations are not accidental. Therefore, they should not follow from arbitrary properties of vocabulary items. Rather, they should be derived from impoverishment rules that systematically reduce and simplify syntactic features structures for the purposes of morphological realization. Consequently, certain kinds of syncretism can be classified as system-defining properties.

Observation:
At least the 1/3. syncretism is a fundamental property of all Germanic languages. (It holds in Gothic, German, Icelandic, etc.)

Basic problem:
How can the 1/3. syncretism be derived by invoking the concept of natural classes of persons?

Plank (1999a, 19):
This shows that syncretism can show up without any “similarity in meaning” - the reason would be that 1. and 3.Pers. intuitively do not form a natural class (“no natural class on any plausible criterion”).
Assumption (Wiese (1994)):  
1. and 3. Pers. are indeed a natural class (that can then be referred to by inflection markers via underspecification); the only thing that needs to be done is to decompose inflection markers accordingly.

(59) Decomposition of inflection markers in Wiese’s work:
   a. [±demonstrative]
   b. [±addressing]

(60) Persons in Wiese’s system:
   d. [−d, +a] = - (1. Pers. incl.)

Result:
1. and 3. Person form a natural class: [−addressing]

Note:
Independently, Frampton suggests a similar decomposition (based on work by Noyer (1992)).

(61) Decomposition of person features in Frampton’s analysis:
   a. [±1]
   b. [±2]

Consequently:
(i) [±a] in Wiese’s system = [±2]
(ii) [−a] in Wiese’s system = [−2] in Frampton’s system
(iii) [±d] in Wiese’s system = [±1] in Frampton’s system
(iv) [−d] in Wiese’s system = [±1] in Frampton’s system

Result:
Again, 1. Person and 3. Person form a natural class: [−2].

(62) Persons in Frampton’s system:
   b. [−1, +2] = 2. Pers.
   c. [−1, −2] = 3. Pers.
   d. [+1, +2] = 1. Pers. inkl.

Note:
In Frampton’s analysis, the primitive features are given semantic interpretations; whether [±1, ±2] can be interpreted in a coherent way is assumed to be subject to language-specific parametrization. In (e.g.) Indo-European languages, the combination is not available, due to a lack of semantic coherence.

Side remark:
As will be discussed in chapter 4 below, the system of decomposed person features is not yet adequate to account for all cases of person syncretism that have been observed in the literature (for concreteness, there is good evidence that 1. and 2. Person also form a natural class). We can ignore this complication for the time being.

(63) Vocabulary items be:
   a. /am/ ← [±1, −2, −pl, −past]
   b. /i/ ← [±2, −pl, −past]
   c. /are/ ← [−past]
   d. /was/ ← [±2, −pl, −past]
   e. /were/ ← [±past]

Problem:
The syncretism is now derivable by decomposing person features, but it is analyzed as going back to an arbitrary lexical entry (cf. (63-d)) rather than as a system-wide generalization.

Assumptions about syntactic structure

(64) a. Simplified clause structure before head movement:
   \[ \text{Agp} \text{ Agr} \text{ TP} \text{ T} [\text{VP} \text{ V} \text{ ...}] \]
   b. Result of head movement:
   \[ \text{Agp} \text{ T} \text{ V} \text{ T} \text{ Agr} \]

Note:
This generates the abstract paradigms in (65). (These abstract paradigms are not to be viewed as genuine objects of the grammar; they have the status of generalizations about which fully specified categories need to be filled by vocabulary insertion. In line with virtually all work carried out in Distributed Morphology, Frampton assumes that paradigms are not entities that morphological constraints can refer to.)

(65) Specifications that need to be realized by vocabulary items, version 1:
   a. V + [±past] + \[ [+1, −2, −pl] [+1, −2, +pl] \]
   \[ [+1, −2, −pl] [+1, −2, +pl] \]
   [−1, +2, −pl] [−1, −2, +pl]
   b. V + [±past] + \[ [+1, −2, −pl] [+1, −2, +pl] \]
   \[ [+1, −2, −pl] [+1, −2, +pl] \]
   [−1, +2, −pl] [−1, −2, +pl]

Assumption:
(65) is simplified by impoverishment.

(66) Impoverishment for plural contexts in English:
   \[ [±1, ±2] \rightarrow 0 / [±1, ±2] \]
   \[ [±1, ±2] \rightarrow 0 / [±1, ±2] \]
   \[ [±1, ±2] \rightarrow 0 / [±1, ±2] \]

(67) Specifications that need to be realized by vocabulary items, version 2 (after impoverishment):
Chapter 1. Introduction

1.3 Distributed Morphology

a. \( [+\text{past}] + [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)

b. \( V + [+\text{past}] + [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)

Consequence:

There can be no vocabulary items that are sensitive to person differences in the plural (or if there are, they will never be able to surface).

1.3.4.3 Syncretism in Old English Verb Inflection

(69) Strong verbs: sönan (‘sing’)

<table>
<thead>
<tr>
<th>pres</th>
<th>past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, -2\text{-pl}]</td>
<td>sön-e</td>
</tr>
<tr>
<td>[-1, -2\text{-pl}]</td>
<td>sön-est</td>
</tr>
<tr>
<td>[+1, +2\text{-pl}]</td>
<td>són-e</td>
</tr>
<tr>
<td>[-1, +2\text{-pl}]</td>
<td>són-est</td>
</tr>
<tr>
<td>[+1, +2\text{-pl}]</td>
<td>són-e</td>
</tr>
<tr>
<td>[-1, +2\text{-pl}]</td>
<td>són-est</td>
</tr>
</tbody>
</table>

(70) Suppletive verbs: sindon (‘be’)

<table>
<thead>
<tr>
<th>pres</th>
<th>past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, -2\text{-pl}]</td>
<td>emn</td>
</tr>
<tr>
<td>[-1, -2\text{-pl}]</td>
<td>érn-e</td>
</tr>
<tr>
<td>[+1, +2\text{-pl}]</td>
<td>érn</td>
</tr>
<tr>
<td>[-1, +2\text{-pl}]</td>
<td>érn-e</td>
</tr>
<tr>
<td>[+1, +2\text{-pl}]</td>
<td>érn</td>
</tr>
<tr>
<td>[-1, +2\text{-pl}]</td>
<td>érn-e</td>
</tr>
</tbody>
</table>

Assumption:
The instances of systematic syncretism in the plural, and with 1. and 3. Pers. Sg. in past tense contexts, are to be derived by invoking impoverishment rules.

(71) Impoverishment:

a. \( [+\text{past}] \) becomes a privative feature \([\text{past}]\), \( [-\text{past}] \) is deleted.
   b. \( [+\text{pl}] \) becomes a privative feature \([\text{pl}]\), \( [-\text{pl}] \) is deleted.
   c. \( [+1] \rightarrow 0/\text{[past]} \)
   d. \( [+1, +2] \rightarrow 0/\text{[pl]} \).

Note:

(71-cd) are the important rules.
(It is not fully clear to me whether (71-ab) are needed at all. Frampton introduces these rules as ‘privatization rules’, but is seems that we are dealing with impoverishment rules here.)

Consequence:

From (65), we don’t just get (67); rather, we get the abstract paradigm (72). (72) exhaustively defines the possible insertion contexts for Old English verb inflection markers.

(72) Specifications that need to be realized by vocabulary items, version 3 (after privatization and two applications of impoverishment):

a. \( V + [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)
   \( [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)

b. \( V + [+\text{past}] + [-2\text{-pl}] [+\text{pl}] \)
   \( [-2\text{-pl}] [+\text{pl}] \)

(73) Vocabulary items:

a. /wæs/ \( \rightarrow \text{sindon/}\) [-2\text{-past}]
   b. /war/ \( \rightarrow \text{sindon/}\) [-2\text{-past}]
   c. /o/ \( \rightarrow \text{[past]} /\text{V}_{\text{strong}}\)
   d. /d/ \( \rightarrow \text{[past]} /
   e. /e/ \( \rightarrow [-2\text{-pl}] /\text{V}_{\text{strong}}\) [\text{past}]
   f. /e/ \( \rightarrow [+2\text{-pl}] /\text{V}_{\text{strong}}\) [\text{past}]
   g. /æh/ \( \rightarrow [-1\text{-pl}] /
   h. /æst/ \( \rightarrow [-2\text{-pl}] /
   i. /æ/ \( \rightarrow [+2\text{-pl}] /
   j. /æ/ \( \rightarrow [+2\text{-pl}] /
   k. /æ/ \( \rightarrow [+2\text{-pl}] /

(74) a. \( V + [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, +2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)
   \( [+1, -2\text{-pl}] [+\text{pl}] \)
   \( [-1, -2\text{-pl}] [+\text{pl}] \)
   \(+[\text{pl}\text{[past]}]

Problem:

Why are no inflection markers inserted with suppletive forms of sindon in the present tense?
Solution:
\[ \text{sindon} \rightarrow V \text{ and Agr fuse when they are adjacent (i.e., if } T[\text{past}] \text{ does not intervene).} \]

(75) a. /eam/ \rightarrow \text{sindon}, [+1,-2]
b. /art/ \rightarrow \text{sindon}, [+1,2]
c. /is/ \rightarrow \text{sindon}, [-2]
d. /sindon/ \rightarrow \text{sindon}, [pl]

Complexity.
Frampton notes that, given the Subset Principle, (a) first the vocabulary items have to be determined that fit into a given context, and (b) then the most specific marker (among those that are compatible) must be determined. Assuming impoverishment, both processes are substantially shorter. Therefore (so the idea), a theory that employs impoverishment is attractive, and preferable, from the point of view of complexity (other things being equal).

1.3.4.4 Syncretism in German Verb Inflection

(76) Weak verbs: believe

<table>
<thead>
<tr>
<th></th>
<th>pres</th>
<th>past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1,-2,pl]</td>
<td>glaub-e</td>
<td>glaub-be</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>glaub-st glaub-ke-st</td>
<td></td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>glaub-t glaub-be</td>
<td></td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>glaub-eng glaub-te-n</td>
<td></td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>glaub-t glaub-te-t</td>
<td></td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>glaub-eng glaub-te-n</td>
<td></td>
</tr>
</tbody>
</table>

(77) Strong verbs: sing

<table>
<thead>
<tr>
<th></th>
<th>pres</th>
<th>past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1,-2,pl]</td>
<td>sing-e</td>
<td>sing</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>sing-st sing-st</td>
<td></td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>sing-t sing</td>
<td></td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>sing-on sing-en</td>
<td></td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>sing-t sing-t</td>
<td></td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>sing-on sing-en</td>
<td></td>
</tr>
</tbody>
</table>

(78) Suppletive verbs: be

<table>
<thead>
<tr>
<th></th>
<th>pres</th>
<th>past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1,-2,pl]</td>
<td>bin</td>
<td>war</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>bist</td>
<td>war-st</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>is-t</td>
<td>war</td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>sind</td>
<td>war</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>sind</td>
<td>war-t</td>
</tr>
<tr>
<td>[-1,2,pl]</td>
<td>sind</td>
<td>war-en</td>
</tr>
</tbody>
</table>

(79) Impoverishment rules, German:

1.3 Distributed Morphology

a. \([+\text{past}]\) becomes a private feature \([\text{past}]\), \([-\text{past}]\) is deleted.
b. \([+\text{pl}]\) becomes a private feature feature \([\text{pl}]\), \([-\text{pl}]\) is deleted.
c. \([\pm 1]\) \rightarrow 0/\([\text{past]}\]
d. \([\pm 1]\) \rightarrow 0/\([\text{pl]}\]

(80) Specifications that need to be realized by vocabulary items (after privatization and two applications of impoverishment):

\[
\begin{align*}
\text{a. } V & \rightarrow [-1,2] [-2,pl] \\
\text{b. } V & \rightarrow [\text{past}] \rightarrow [-1,2] [-2,pl] \\
\end{align*}
\]

(81) Vocabulary items:

a. \(0 \rightarrow [\text{past}] / V_{\text{strong}}\)
b. /\(\text{to} / \rightarrow [\text{past}]\)
c. /\(\text{e/} \rightarrow [+1,-2]\)
d. /\(\text{t/} \rightarrow [-1,-2]\)
e. /\(\text{n/} \rightarrow [-2,pl]\)
f. /\(\text{t/} \rightarrow [+2,pl]\)
g. /\(\text{st/} \rightarrow [+2]\)

(82) a. \(V \rightarrow \begin{bmatrix} [+1,-2] [-2,pl] \\
\end{bmatrix} \)
b. \(V + [\text{past}] \rightarrow \begin{bmatrix} [-1,2] [-2,pl] \\
\end{bmatrix} \)

1.3.4.5 Kabyle-Berber

Language: Afro-Asatic, Algeria

Plot:
There is no evidence for impoverishment here in the domain of conjugation, but there is evidence for (i) the decomposition of person features, and (ii) fission.

(83) Fission (Noyer (1992)): If insertion of a vocabulary item \(V\) with the morpho-syntactic features \(\beta\) takes place into a fissioned morpheme \(M\) with the morpho-syntactic features \(\alpha\), then \(\alpha\) is split up into \(\beta\) and \(\alpha-\beta\), such that (a) and (b) hold:

a. \(\alpha-\beta\) is available for further vocabulary insertion.
b. \(\beta\) is not available for further vocabulary insertion.

(84) Complete verbal paradigm:
### 1.4 Paradigm Function Morphology

#### Extension of Frampton's analysis in Müller (2006)

(5) a. Weak verb inflection: *believe*  
   b. verb inflection: *call*

<table>
<thead>
<tr>
<th>Present</th>
<th>Past</th>
<th>Present</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.sg</td>
<td>glaub-e</td>
<td>1.sg</td>
<td>ruf-e</td>
</tr>
<tr>
<td>2.sg</td>
<td>glaub-te</td>
<td>2.sg</td>
<td>ruf-te</td>
</tr>
<tr>
<td>3.sg</td>
<td>glaub-t</td>
<td>3.sg</td>
<td>ruf-t</td>
</tr>
<tr>
<td>1.pl</td>
<td>glaub-en-te-n</td>
<td>1.pl</td>
<td>ruf-en</td>
</tr>
<tr>
<td>2.pl</td>
<td>glaub-te-t</td>
<td>2.pl</td>
<td>ruf-t</td>
</tr>
<tr>
<td>3.pl</td>
<td>glaub-en-te-n</td>
<td>3.pl</td>
<td>ruf-en</td>
</tr>
</tbody>
</table>

### 1.4.1 Inferentiell-Realisationale Morphologie

**Hintergrund** Stump (2001) entwirft eine Taxonomie der Flexionstheorien.

(90) Stumps Erklärung der Flexionstheorien:

- inkrementell
- realisational
- lexikalisch
- inferentiell

1. **Inkrementelle Analyse**:  
   Flexionsmarker tragen morpho-syntaktische Merkmale bei, die ansonsten nicht da sind.
2. Realisatorische Analyse:
Flexionsmarker tragen keine morpho-syntaktischen Merkmale bei; alle morpho-
syntaktische Information ist unabhängig vorhanden.

3. Lexikalische Analyse:
Flexionsmarker sind korreliert mit (möglicherweise abstrakten) Morphemen, die als
eigenständige Objekte im Lexikon existieren.

4. Inferentielle Analyse:
Flexionsmarker haben keinen Morphemstatus und existieren nicht als unabhängige
Objekte.

Einige Theorien

(91) Einige Theorien:
a. lexikalisch-inkrementell:
Lieber (1992), Wunderlich (1996, 1997a) (Minimalistische Morphologie)
b. lexikalisch-realisational:
Halle & Marantz (1993, 1994) (Distributive Morphologie)
c. inferentiell-inkrementell:
kaum attestiert
d. inferentiell-realisational:

Empirische Evidenz für realisatorische Theorien 1: Erweiterte Exponenz

(92) Erweiterte Exponenzen
Die morphosyntaktischen Eigenschaften, die mit einem flektierten Wort (einer
Wortform) assoziiert sind, können die Eigenschaften, die mit dem Wort als ganzen
assoziert sind, unterdeterminieren.

(97) Imperfekt und Aorist im Bulgarenisches: krad (‘stehlen’):

<table>
<thead>
<tr>
<th></th>
<th>Imperfekt</th>
<th>Aorist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg</td>
<td>krad-á-x</td>
<td>krad-o-x</td>
</tr>
<tr>
<td>2sg</td>
<td>krad-o-é</td>
<td>krad-é</td>
</tr>
<tr>
<td>3sg</td>
<td>krad-o-é</td>
<td>krad-é</td>
</tr>
<tr>
<td>1pl</td>
<td>krad-á-x-me</td>
<td>krad-o-x-me</td>
</tr>
<tr>
<td>2pl</td>
<td>krad-á-x-te</td>
<td>krad-o-x-te</td>
</tr>
<tr>
<td>3pl</td>
<td>krad-á-x-a</td>
<td>krad-o-x-a</td>
</tr>
</tbody>
</table>

Problem:
Was stellt in einem inkrementellen Ansatz sicher, dass eine Form wie krad-‘á-x mit der
morphosyntaktischen Eigenschaft 1.Pers.Sg.-Kontranz assoziiert wird?

Standardlösung:
Ein leeres Suffix tut dies (bew. eine Regel, die keine Formveränderung bewirkt).
Konzeptuelle Evidenz für realisatorische Theorien: Inhalt vs. Kontext
Unerwünschte Ambiguität:
Ist eine morphosyntaktische Eigenschaft eines Flexionsmarkers eine Eigenschaft seines
Inhalts oder eine Eigenschaft seines Kontexts?

Evidenz:
Im Bulgarischen gibt es eine Klasse von Verben, die ein besonderes Suffix m in der

Entscheidungsproblem für die Analyse:
(i) Ist m ein Suffix mit den Merkmalen 1.Pers.Sg., das einen Präens-Stamm subkatego-
riert?
(ii) Ist m ein Suffix mit den Merkmalen 1.Pers.Sg.Prä.?

Ausweg:
Kein Problem in inferentiell-realisationalen Theorien, denn:

(98) Exponenz ist die einzige Art der Assozierung von Flexionsmarkierung und
morphosyntaktischen Eigenschaften.

Die Morphologie-Syntax-Schnittstelle

(99) Nullhypothese:
Ein flektiertes Wort X der Kategorie Y, das mit einer Menge σ von morphosyntakti-
Schen Eigenschaften assoziiert ist, wird als Kopf einer Phrase YP in der Syntax
eingesetzt, deren morphosyntaktische Eigenschaften nicht von σ distinkt sind.
Beobachtung:
Es gibt vier mögliche Herausforderungen für diese Sichtweise:
(i) Randeigenschaften
(ii) Formalalternationen
(iii) Superlexeme
(iv) Periphrase

Randeigenschaften
(100) Wenn X mit einer Randeigenschaft (rechts oder links) p assoziiert ist, dann wird X am (rechten oder linken) Rand einer Phrase eingesetzt, die p trägt.

Beispiel:
Ein Wort wie children's muss (a) wg. (100) am rechten Rand einer possessiven NP eingesetzt werden, und (b) wg. (99), als Kopf einer Plural NP eingesetzt werden.

Formalalternationen
(101) Phonologisch bedingte Alternation beim indefiniten Artikel im Englischen:
   a. a bird
   b. an apple

(102) Bretonische Väter:
   a. ho tad 'euer Vater'
   b. e dad 'sein Vater'
   c. va zad 'mein Vater'

(103) Regeln:
   a. Die Form zad wird eingesetzt nach einem Sprantsisierungsauslöser wie va.
   b. Die Form dad wird eingesetzt nach einem Lenisierungsauslöser wie e.
   c. Die Form tad ist der elsewhere case.

Superlexeme
Generalisierung:
Eine morphologische Realisierung, mehrere (adjazente) syntaktische Positionen und morphosyntaktische Eigenschaften.

(104) Verschmelzungsformen:
   a. zu der, zu dem
   b. zur, zum
   c. I would
   d. I'd

(105) Klammernparadox im Sanskrit:
   aum-bhur uru-cauřh
   aum-bhur 'distress'(abl.sg.)
   uru- 'relief'
   cauřh 'causing'  

1.4 Paradigm Function Morphology

a. Syntaktische Struktur:
   [ap [np [xp amhōr ] [n uru- ] cauřh ]
   b. Morphologische Struktur:
   [n amhōr ] [a [n uru- ] [a cauřh ]]

(106) Klammernparadox im Deutschen:
   a. gekochte Schinkenplatte
   b. Gentil vor beliebtheitskurve bei den Wählern

Periphrase
Es gibt in (synthetischen) Paradigmen oft Lücken, die systematisch durch analytische Formen aufgefüllt werden. Hier gilt:

Generalisierung:
Mehrere morphologische Realisierungen, ein morphosyntaktisches Merkmalkombinell (eine syntaktische Position?).

(107) Latinische Verbformen:
   a. amat  Präsen Aktiv: 'Er liebt'
   b. amatur  Präsen Passiv: 'Er wird lieben'
   c. amavit  Perfekt Aktiv: 'Er hat lieben'
   d. amatus est  Perfekt Passiv: 'Es ist liebt worden'

1.4.2 Paradigmenfunktionen

Hintergrundannahmen 1

(108) Grundannahme:
Die Verknüpfung eines Wortes mit einer bestimmten Menge von morphosyntaktischen Eigenschaften determiniert eine Kette von Regelanwendungen, die die Flexionsform des Wortes bestimmen.

(109) Traditionelle Terminologie:

(110) Paradigmen (Bebauptung):
In dieser Theorie sind Paradigmen keine Epiphänomenen; vielmehr „konstituieren sie ein zentrales Prinzip der morphologischen Organisation". Paradigmen sind das Ergebnis von Paradigmefunctionen.

(111) Drei Typen morphologischer Ausdrücke:
   a. Wurzel ('root'): die "ultimative Default-Form" eines Lexems (Wortes).
   b. Stamm ('stem'): ein Ausdruck, an den Flexionsexponenten angefügt werden können (jede Wurzel ist ein Stamm, nicht jeder Stamm ist eine Wurzel).
c. Wortform (‘word’): eine freie, voll flektierte Form, die eine Paradigmen-
   zelle besetzt.

Hintergrundannahmen 2

(112) Realisierungsregeln:
   Paradigmefunktionen werden durch spezifiziertere Realisierungsregeln definiert.

(113) Informelles Beispiel:
   Der Wert der Paradigmefunktion (<Mutter-, {dativ,plural}>) ergibt sich aus
   dem Ergebnis der Anwendung zweier Realisationsregeln – einer, die die Umlaut-
   variante des Stammes wählt, und einer, die -n suffixiert.

Terminologie:
   <Mutter-, {dativ,plural}> ist ein FPSP (‘form/property-set pairing’).

(114) Regelblöcke:
   b. Regeln im selben Blöck konkurrieren miteinander; nur die spezifischste Regel
      kann applizieren (Panini Prinzip; Spezifitätssprinzip).
   c. Regeln in verschiedenen Blöcken konkurrieren nicht; so treten in einer Wort-
      form verschiedene Exponenten hintereinander.

Bemerkung:
   Die Exponenten kommen durch Regeln in eine Wortform und haben keinen eigen-
   ständigen Status. Die Theorie ist also anomorphatisch (vgl. Anderson (1992)).

Slogan: Paradigmefunktionen sind statische Wohlgemässheitsbedingungen für
   Zellen.

Definitionen

(115) Wohlgemachte Menge morphosyntaktischer Eigenschaften:
   Eine Menge τ von morphosyntaktischen Eigenschaften für ein Lexem der Kat-
   egorie C ist wohlgemacht in einer Sprache L nur dann, wenn τ die folgenden
   Bedingungen in L erfüllt.
   a. Für jede Eigenschaft F : v ∈ τ gilt: F : v ist für Lexeme der Kategorie C
      zugänglich und v ist ein erlaubter Wert für F.
   b. Für jedes morphosyntaktische Merkmal F, das v1, v2 als mögliche Werte
      hat, gilt: Wenn v1 ≠ v2 und F : v1 ∈ τ, dann F : v2 ∉ τ.

(116) Extension:
   Falls σ und τ wohlgemachte Mengen morphosyntaktischer Eigenschaften sind, ist
   σ eine Extension von τ gdw. (a) und (b) gelten:
   a. Für jedes atomwerte Merkmal F und jeden erlaubten Wert v für F gilt:
      Wenn F : v ∈ τ, dann F : v ∈ σ.
   b. Für jedes mengenwerte Merkmal F und jeden erlaubten Wert p für F gilt:
      Wenn F : p ∈ τ, dann F : p ∈ σ.

1.4 Paradigm Function Morphology

Wenn F : p ∈ τ, dann F : p′ ∈ τ, wobei p′ eine Extension von p ist.

(117) Unifikation:
   Falls σ und τ wohlgemachte Mengen morphosyntaktischer Merkmale sind, ist die
   Unifikation ρ von σ und τ die kleinste wohlgemachte Menge von morphosyntakt-
   tischen Eigenschaften, so dass ρ eine Extension sowohl von σ, als auch von τ
   ist.

(118) a. \{TNS:pres,AGR:{PER:1,NUM:pl}\} ist Extension von \{AGR:{PER:1,NUM:pl}\},
   \{AGR:{NUM:pl}\}, usw.
   b. \{TNS:pres,MOOD=ind,AGR:{PER:1,NUM:pl}\} ist die Unifikation von
   \{TNS:pres,AGR:{PER:1}\} und \{TNS:pres,MOOD=ind,AGR:{NUM:pl}\}

Definitionen 2

(119) Eigenschaftsmonkeyrestraktionen (bulgarische Verbformen; Ausschnitt): Eine Menge τ von morphosyntaktischen Eigenschaften für ein Lexem der Kategorie
   V ist wohlgemacht nur, wenn τ eine wohlgemachte Eigenschaft σ hat, so dass
   gilt:
   a. σ ist eine Extension von \{VFORM:fin\} gdw. für ein zulässiges α gilt: σ ist
      eine Extension von \{MOOD:α\} (wenn Finheit, dann Modus (Ind oder
      Konj))
   b. Wenn σ eine Extension von \{MOOD=imp\}, dann ist σ eine Extension von
      \{AGR:{PER:2}\} (wenn Imperativ, dann 2. Person)
   c. Für jedes zulässige α gilt: σ ist eine Extension von \{TNS:α\} gdw. σ eine
      Extension von \{MOOD=indic\} oder von \{VFORM:pple\}. (V hat Tempus
      wenn es Ind. oder Partizip ist)
   d. Für jedes zulässige α gilt: σ ist eine Extension von \{AGR:{GEN:α}\} gdw. σ
      eine Extension von \{VFORM:pple\}, und σ ist eine Extension von
      \{AGR:{PERS:α}\} gdw. σ eine Extension von \{VFORM:fin\}. (Wenn Genus,
      dann Partizip, wenn Person, dann Finheit)

(120) Vollständigkeit von Mengen morphosyntaktischer Merkmale:
   Eine Menge σ von morphosyntaktischen Merkmalen für ein Lexem einer Katego-
   rie ist vollständig gdw. (a) und (b) gelten:
   a. σ ist wohlgemacht.
   b. Für jede Menge morphosyntaktischer Merkmal τ (so dass σ nicht eine Ex-
      tension von τ ist) gilt: die Unifikation von τ und σ ist nicht wohlgemacht.

Definitionen 3

Paradigmefunktionen:
   Eine Paradigmefunktion ist eine Funktion in der Menge der FPSPs, die auf einem
   Wurzelpaar <X,σ> appliziert (wobei X die Wurzel eines Lexems L ist und σ eine voll-
   ständige Menge morphosyntaktischer Eigenschaften für L ist) und eine σ-Zelle <Y,σ>
   im Paradigm von L ergibt.
(121) Format von Paradigmenfunktionen:
\[ PF(<X, \sigma>) = <Y, \sigma> \]

Realisierungsregeln (‘realization rules’, ‘rules of expansion’):
Eine Realisierungsregel ist eine Funktion in der Menge der FPSPs. Im Unterschied zu einer Paradigmenfunktion muss aber das Argument nicht unbedingt ein Wurfelpaar sein, und der Wert muss nicht unbedingt eine Paradigmenzelle sein.

(122) Format von Realisierungsregeln:
\[ RR_{n, \tau, C}(<X, \sigma>) = <Y', \sigma> \]

Terminologie:
- \( n \): Blockindex
- \( \tau \): Eigenschaftsindex (die wohlgemachte Menge morphosyntaktischer Eigenschaften, die die Regel durch ihre Anwendung realisiert; \( \sigma \) muss Extension von \( \tau \) sein → Unterspezifikation)
- \( C \): Klassenindex (Klasse der Lexeme, deren Paradigmen die Regel mit definieren kann)
- \( Y' \): im Default Y, aber Möglichkeit der Überschreibung durch morphologische Regeln

Bulgische Verbsyntax

(123) Vier imperfektive Verben im Bulgischen:
- a. KRAD (‘stehlen’): 1. St. = krąd, 2. St. = krăd
- b. KRAJ (‘spielen’): 1. St. = iyraį, 2. St. = iyraį
- c. KOVA (‘füttern’): 1. St. = kove, 2. St. = kova
- d. DAVA (‘geben’): 1. St. = dava, 2. St. = dava

Zwei Stämme:
1. Stamm: Präsens, Imperfekt
2. Stamm: Aorist

Zwei abstrakte binäre Flexionsklassenmerkmale: \([\pm t] (runcating) \), \([\pm c] (sonantal)\):

[-t]: 1./2. Stamm: identisch zur Wurzel
[-c]: 1. Stamm: C, 2. Stamm: V

Auf diese Flexionsklassenmerkmale (auch unterspezifiziert) wird in Realisierungsregeln und morphologischen Regeln Bezug genommen.

(124) a. KRAD: [-t; +c]
b. KRAJ: [+T-; +c]
c. KOVA: [\pm t; \pm c]
d. DAVA: [\pm t; \pm c]

Paradigmen der bulgischen Verbsyntax

(125) Abstrakte Paradigmen des Indikativen ohne morphologische Regeln:

<table>
<thead>
<tr>
<th>Konjugation</th>
<th>KRAD ([-t; +c])</th>
<th>DAVA ([-t; +c])</th>
<th>KRAJ ([-t; +c])</th>
<th>KOVA ([-t; +c])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Präsens</td>
<td>1g. krad-e-x</td>
<td>kov-e-m</td>
<td>igrāj-e-o</td>
<td>igrāj-e-o</td>
</tr>
<tr>
<td></td>
<td>2g. krad-e-s</td>
<td>kov-e-s</td>
<td>igrāj-e-s</td>
<td>igrāj-e-s</td>
</tr>
<tr>
<td></td>
<td>3g. krad-e-c</td>
<td>kov-e-c</td>
<td>igrāj-e-c</td>
<td>igrāj-e-c</td>
</tr>
<tr>
<td></td>
<td>1pl. krad-e-m</td>
<td>kov-e-m</td>
<td>igrāj-e-m</td>
<td>igrāj-e-m</td>
</tr>
<tr>
<td></td>
<td>2pl. krad-e-te</td>
<td>kov-e-te</td>
<td>igrāj-e-te</td>
<td>igrāj-e-te</td>
</tr>
<tr>
<td></td>
<td>3pl. krad-e-sd</td>
<td>kov-e-sd</td>
<td>igrāj-e-sd</td>
<td>igrāj-e-sd</td>
</tr>
<tr>
<td>Imperfekt</td>
<td>1g. krad-(-x)</td>
<td>dava-(-x)</td>
<td>kov-ar-(-x)</td>
<td>kov-ar-(-x)</td>
</tr>
<tr>
<td></td>
<td>2g. krad-(-x)</td>
<td>dava-(-x)</td>
<td>kov-ar-(-x)</td>
<td>kov-ar-(-x)</td>
</tr>
<tr>
<td></td>
<td>3g. krad-(-x)</td>
<td>dava-(-x)</td>
<td>kov-ar-(-x)</td>
<td>kov-ar-(-x)</td>
</tr>
<tr>
<td></td>
<td>1pl. krad-(-x)me</td>
<td>dava-(-x)me</td>
<td>kov-ar-(-x)me</td>
<td>kov-ar-(-x)me</td>
</tr>
<tr>
<td></td>
<td>2pl. krad-(-x)te</td>
<td>dava-(-x)te</td>
<td>kov-ar-(-x)te</td>
<td>kov-ar-(-x)te</td>
</tr>
<tr>
<td></td>
<td>3pl. krad-(-x)sa</td>
<td>dava-(-x)sa</td>
<td>kov-ar-(-x)sa</td>
<td>kov-ar-(-x)sa</td>
</tr>
<tr>
<td>Aorist</td>
<td>1g. krad-o-x</td>
<td>dava-o-x</td>
<td>kova-o-x</td>
<td>kova-o-x</td>
</tr>
<tr>
<td></td>
<td>2g. krad-e-c</td>
<td>dava-e-c</td>
<td>kova-e</td>
<td>kova-e</td>
</tr>
<tr>
<td></td>
<td>3g. krad-e-c</td>
<td>dava-e-c</td>
<td>kova-e</td>
<td>kova-e</td>
</tr>
<tr>
<td></td>
<td>1pl. krad-o-(-me)</td>
<td>dava-o-(-me)</td>
<td>kova-o-(-me)</td>
<td>kova-o-(-me)</td>
</tr>
<tr>
<td></td>
<td>2pl. krad-o-(-te)</td>
<td>dava-o-(-te)</td>
<td>kova-o-(-te)</td>
<td>kova-o-(-te)</td>
</tr>
<tr>
<td></td>
<td>3pl. krad-o-(-sa)</td>
<td>dava-o-(-sa)</td>
<td>kova-o-(-sa)</td>
<td>kova-o-(-sa)</td>
</tr>
</tbody>
</table>

Realisierungsregeln

(126) a. Block A:

A1 \[ RRA_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Y', \sigma> \], wobei Y der 2. Stamm von X ist.

A2 \[ RRA_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Y', \sigma> \], wobei Y der 1. Stamm von X ist.

b. Block B &/ Block C:

B1 \[ RRB_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xo', \sigma> \]

B2 \[ RRB_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xa', \sigma> \]

B3 \[ RRB_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xo', \sigma> \]

B4 / C1 Wenn n = B oder C:

C2 \[ RRC_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xa', \sigma> \]

C2 \[ RRC_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xa', \sigma> \]

c. Block D:

D1 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xo', \sigma> \]

D2 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xo', \sigma> \]

D3 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xs', \sigma> \]

D4 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xe', \sigma> \]

D5 / D6 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xm', \sigma> \]

D6 \[ RRD_{\alpha}(<X, \sigma>), V(<X, \sigma>) = def <Xm', \sigma> \]
Verweisregel (rule of referral; informelle Variante):  
Im Präteritum (Aorist und Imperfekt) richtet sich die 2.Pers.Sg. nach der 3.Pers.Sg.

Regelanwendung 1: Spezifizität

Paninis Prinzip:
Es sei \( \sigma \) eine vollständige Menge von morpho-syntaktischen Eigenschaften für Lexeme der Kategorie V. Dann ist \( \operatorname{PF}(X, \sigma) = \text{def} \neq \sigma \operatorname{Nat}_{D}(\operatorname{Nat}_{C}(\operatorname{Nat}_{D}(X, \sigma))) \)

Nar\(_n\)-Notation:
Falls \( \text{RR}_{n,r,C} \) die engste Regel in Block \( n \) ist, die auf \( X, \sigma \) anwendbar ist, so repräsentiert \( \text{NN}(X, \sigma) \) das Resultat der Anwendung von \( \text{RR}_{n,r,C} \) auf \( X, \sigma \).

Enge und Anwendbarkeit (vereinfacht):

a. \( \text{RR}_{n,r,C} \) ist engster \( \text{RR}_{n,r,C} \) gleicher \( \sigma \) eine Extension von \( \tau \) und \( \sigma \neq \tau \).

b. \( \text{RR}_{n,r,C} \) ist anwendbar auf \( X, \sigma \) gleicher \( \text{RR}_{n,r,C}(X, \sigma) \) definiert.

Regelanwendung 2: Identitätsfunktion

Default der Identitätsfunktion:
\( \text{RR}_{n, \{ 1 \}}(X, \sigma) = \text{def} < X, \sigma > \)

Bemerkung:
Dies ist so etwas wie ein Nullmarker, der als minimal spezifische Regel in jedem Block eingeordnet ist. Wenn \( n \) ist eine Variable über allen Regelblöcken, \( U \) über allen Lexemklassen) zur Verfügung steht und dafür sorgt, dass es immer weiter geht. Beispiel:

\( \text{Example:} \)

a. \( \sigma = \{ \text{VFORM:fin}, \text{VCE:act}, \text{TNS:pres}, \text{PRET:no}, \text{MOOD:ind}, \text{AGR: (PER:1,NUM:pl) } \} \)

b. \( \text{Nat}(X, \sigma) = \text{RR}_{n, \{ 1 \}}(X, \sigma) = < X, \sigma > \)

Regelanwendung 3: Verweisregeln und Synkrethism


Verweisregel (informelle Variante):  
Im Präteritum (Aorist und Imperfekt) richtet sich die 2.Pers.Sg. nach der 3.Pers.Sg.

Jetzt kann die Regel präziser formuliert werden:

Verweisregel (saubere Variante):

Annehmen, \( (a) - (c) \) sind der Fall:

a. \( \tau \) ist eine beliebige vollständige Extension von \{per:yes, agr: (per:2, num:sg)\}.

b. \( n \) ist ein beliebiger Regelausschnitt in A-D.

c. \( \sigma' = \sigma / \{ \text{agr: }\{ \text{per:3} \} \} \)

Dann gilt:
\( \text{RR}_{n,r,C}(X, \sigma) = \text{def} < Y, \sigma > \)

Konkrete Paradigmen des Indikatives inkl. Morphologie

<table>
<thead>
<tr>
<th>Konjugation</th>
<th>Krad</th>
<th>Dava</th>
<th>Graja</th>
<th>Kova</th>
</tr>
</thead>
<tbody>
<tr>
<td>Präsens</td>
<td>krad-( \sigma )</td>
<td>dava-( \sigma )</td>
<td>graja-( \sigma )</td>
<td>kova-( \sigma )</td>
</tr>
<tr>
<td>imperfect</td>
<td>krad-( \sigma )</td>
<td>dava-( \sigma )</td>
<td>graja-( \sigma )</td>
<td>kova-( \sigma )</td>
</tr>
<tr>
<td>Aorist</td>
<td>krad-( \sigma )</td>
<td>dava-( \sigma )</td>
<td>graja-( \sigma )</td>
<td>kova-( \sigma )</td>
</tr>
</tbody>
</table>

Anmerkung:
Für jede Realisierungsregel gibt es eine unendliche Menge \( \Phi \) von morphologischen Regeln, die bei jedem Anwendungen die Evaluation der Realisierungsregel beschränken.
(136) **Regeln** ($\Phi_R$): Falls $\text{RR}_{\text{pred},\tau,C}(<X,\sigma>) =_{\text{def}} <Y',\sigma>$, so gilt:

a. Wenn der L-Index($X$) $\in$ $\{\text{CONJ},\text{C},\text{T}\}$ und $Y = X[V\text{okal}]\text{Z}$, dann fehlt $[\text{Vokal}]$ in $Y'$.

b. Wenn $X = W[V\text{okal}]$ und $Y = X[V\text{okal}]\text{Z}$, dann fehlt $[\text{Vokal}]$ in $Y'$, und $[\text{Vokal}]$ wird betont in $Y'$ gdw. $[\text{Vokal}]$ in $Y$ betont wird.

c. Wenn $X = W[V\text{okal}]$ und $Y = X[V\text{okal}]\text{Z}$, dann fehlt $[\text{Vokal}]$ in $Y'$.

d. Wenn $Y$ umbetont ist, dann wird $Y'$ auf seiner letzten Silbe betont.

e. Wenn $X = \text{WC}$ ($C$ ein Vokal als abvoipaletem Gegenspiel), $Y = \text{XXVZ}$, und $V$ ein vorderer Vokal, dann hat $Y'$ $'C$ anstelle von $C$.

f. Wenn $Y = W.\text{FZ}$, dann hat $Y'$ ein $e$ anstelle von $A$.

g. Wenn $Y = W.\text{JCVZ}$ und $V$ ist ein vorderer Vokal, dann hat $Y'$ ein $e$ anstelle von $\dot{A}$.

h. Wenn $Y = W.\text{AZ}$, dann hat $Y'$ $'A$ (mit Palatalisierung eines unmittelbar vorangehenden Konsonanten) anstelle von $\dot{A}$.

(137) **Metageneneralisierungen:**

a. Für jede Regel $R$ in Block $B$, $C$ oder $D$ gilt: (136-ae) $\in \Phi_R$.

b. Für jede Regel $R$ in Block $B$, $C$ oder $D$ gilt: (136-b) $\in \Phi_R$ gdw. $\rho$ eine Extension von $\{\text{TNS:pres}\}$ realisiert; ansonsten: (136-c) $\in \Phi_R$.

c. Falls $R$ in Block $B$ ist, gilt: (136-d) $\in \Phi_R$.

d. Falls $R$ in Block $D$ ist, gilt: (136-fh) $\in \Phi_R$.

e. (136-g) $\in \Phi_D$, $\Phi_B$.

1.4.3 Wettbewerb

**Argumentkodierung im Georgischen**

**Stand der Dinge bisher:**

Der Wettbewerb zwischen Realisierungsregeln in einem Block wird durch die spezifischste (engste) Regel gewonnen (das Paninische Prinzip). Es stellt sich aber heraus, dass es hiermit Probleme geben kann, so dass noch mehr gesagt werden muss.

Beispiel:

Realisationsregeln für argumentkodierende Präfixe im Georgischen in (138) (Stump (2001, 70)). (Das System der Argumentkodierung im Georgischen ist notoriisch komplex; hier wird nur ein ganz kleiner Ausschnitt abgehandelt.)

(138) a. \text{RR}_{\text{pred},\{\text{AGR}\{\text{act}\}\{\text{PER:1}\}\}}(X,\sigma) =_{\text{def}} <X',\sigma>

b. \text{RR}_{\text{pred},\{\text{AGR}\{\text{ob}\}\{\text{PER:1}\}\}}(X,\sigma) =_{\text{def}} <mX',\sigma>

c. \text{RR}_{\text{pred},\{\text{AGR}\{\text{ob}\}\{\text{PER:1,NUM:pl}\}\}}(X,\sigma) =_{\text{def}} <gX',\sigma>

d. \text{RR}_{\text{pred},\{\text{AGR}\{\text{ob}\}\{\text{PER:2}\}\}}(X,\sigma) =_{\text{def}} <gX',\sigma>

**Problem:**

Was ist die korrekte $V$-Realisierung für "Ich werde dich töten"? Die morphosyntaktischen Merkmalsmengen von (138-a) und (138-d) stehen nicht zueinander in einem Extensionsverhältnis; also sollten beide passen. Empirisch ist aber korrekt, dass (138-d)

angewendet wird und so (138-a) blockiert.

<table>
<thead>
<tr>
<th>Präverb</th>
<th>Präfix</th>
<th>Stamm</th>
<th>Suffix</th>
</tr>
</thead>
<tbody>
<tr>
<td>mo-</td>
<td>ge-</td>
<td>klav</td>
<td>&quot;Ich werde dich töten&quot;</td>
</tr>
<tr>
<td>mo-</td>
<td>v-</td>
<td>klav</td>
<td>&quot;Ich werde dich töten&quot;</td>
</tr>
<tr>
<td>mo-</td>
<td>ge-</td>
<td>klav-t</td>
<td>&quot;Ich werde euch töten&quot;</td>
</tr>
</tbody>
</table>

**Lösungen für das Dämmchen**

(139) *Extrinsische Regelordnung (Anderson (1992))*:

Regeln (138-d) appliziert per Stipulation vor Regel (138-a).

(141) *Expandierter Modus (Stump (2001))*:

Regeln können aufgeblasen werden und sind dann maximal spezifisch.

(142) **Regelformale:**

a. Unexpandierter Modus:

\[ \text{RR}_{\text{pred},\tau,C}(X,\sigma) =_{\text{def}} <Y',\sigma> \]

b. Expandierter Modus:

\[ \text{RR}_{\text{pred},\tau,C}(X,\sigma) =_{\text{def}} <Y',\sigma> \]

"$\tau \rightarrow $" bedeutet vereinfacht, dass $\tau$ maximal erweitert wird.

KONCLUSION: Regel (138-d) im Georgischen arbeitet im expandierten Modus.

(143) \text{RR}_{\text{pred},\{\text{AGR}\{ob\}\{\text{PER:1}\}\}}(X,\sigma) =_{\text{def}} <gX',\sigma>

1.4.4 Synkretismus

**TYPEN VON SYNKRETISMUS**

Erste Unterscheidung:

\text{Ganzwortsynkretismen vs. Blocksynkretismen. Beide sollen erklärt werden (vgl. dazu aber Baerman et al. (2005)).}

Zweite Unterscheidung:

- *unidirektionaler Synkretismus*  
  Verweisregel  
- *bidirektionaler Synkretismus*  
  Bidirektionales Verweisprinzip  
- *unstipulierter Synkretismus*  
  Unterspezifikation  
- *stipuliert (z.B. symmetrischer) Synkretismus*  
  Metaregel für symmetrischen Synkretismus  

**Unidirektionaler Synkretismus**

Der Synkretismus in der 2./3.Pers.Sg. Prät (Aorist und Imperfekt) im Bulgarischen ist unidirektional:

- In allen Tempora können Formen der 3.Pers.Sg. eine Endung -e haben.
• Nur in den Präteritotempora haben Formen der 2. Pers. Sg. eine Endung -e.

(144) **Verweisregel (mit expandiertem Modus):**
Wenn n ein beliebiger Regelblock in A-D ist, dann gilt:
\[ RR_{n,\text{exp}}(X,\sigma) \rightarrow P_{\text{exp}}(Y,\sigma) \]
Nar_{n}(X,\sigma) = def <Y,\sigma>, wobei Nar_{n}(X,\sigma) = <Y,\sigma>

Biddingektoraler Synkretismus 1

Rumänische Verflechtung:

• Alle außer 1. Konjugation: 1.Sg. = 3.Pl. in indikativen Paradigmen.
• Manchmal ist die 3.Pl. der abhängige Teil: a umplea, a sti. (Die u-Form taucht
nur in der 1.Sg. in der 1. Konjugation auf.)
• Manchmal ist die 1.Sg. der abhängige Teil: a fi. (Der Stamm stăt taucht auch
sonst im Plural auf.)

(145) **Präsenz-Indikativ-Formen einiger rumänischer Verben:**

<table>
<thead>
<tr>
<th>Konjugation:</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg</td>
<td>invit</td>
<td>umplea</td>
<td>sti</td>
<td>u</td>
</tr>
<tr>
<td>2sg</td>
<td>invit-ti</td>
<td>umple-ti</td>
<td>sti-ti</td>
<td>eđt-ti</td>
</tr>
<tr>
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<td>eđt-e</td>
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<td>umple-m</td>
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<td>invit-a</td>
<td>umple-ti</td>
<td>sti-ti</td>
<td>sint</td>
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Biddingektoraler Synkretismus 2

Annahmen:

• Jede Verweisregel RR_{n,\tau,C} hat eine Verweisdömäne D, mit C als Teilmenge von
D.
• Die Existenz einer Verweisregel impliziert die Existenz einer inversen Verweisregel,
gemäß (146).

(146) **Biddingektorales Verweisprinzip:**
Die Existenz einer Verweisregel \( `RR_{n,\tau,C}(X,\sigma) = Y,\sigma` \) mit Verweisdömäne D impliziert die Existenz einer zweiten Verweisregel \( `RR_{n,\tau,p,D-C}(X,\sigma) = Y,\sigma` \), wobei Nar_{n}(X,\sigma) = <Y,\sigma>

(Wenn eine Regel C als Verweisdömäne hat - der Normalfall - dann ist die inverse
Regel uninteressant, weil sie sich auf eine leere Menge von Ausdrücken beziehen muss.)

Biddingektoraler Synkretismus 3

1.5 Minimalist Morphology

(147) Erste Verweisregel:
Falls n = 0 oder 1: \( RR_{n,(agr,su):{\text{per}3,\text{num}pl}}(X,\sigma) \rightarrow P_{\text{exp}}(Y,\sigma) \)
Nar_{n}(X,\sigma) = def <Y,\sigma>, wobei Nar_{n}(X,\sigma) = <Y,\sigma>
Verweisdömäne: V

(148) Implivierte Verweisregel:
Falls n = 0 oder 1: \( RR_{n,(agr,su):{\text{per}3,\text{num}pl}}(X,\sigma) \rightarrow P_{\text{exp}}(Y,\sigma) \)
Nar_{n}(X,\sigma) = def <Y,\sigma>, wobei Nar_{n}(X,\sigma) = <Y,\sigma>
Verweisdömäne: V

Symmetrischer Synkretismus

Verflechtung im Hua (auch: Yagaria; Neu Guinea):
Formen der 2.Sg. und der 1.Pl. haben immer dieselbe Endung (ein Blocksynkretismus,
kein Ganzwortsynkretismus), in allen Tempora und Modi. Man sieht aber nicht, wie
es sich hier um eine natürliche Klasse handeln könnte; und der Synkretismus ist auch
nicht direkional.

(149) **Metaaregel für symmetrischen Synkretismus:**
\( RR_{n,\tau,C}(X,\sigma) \rightarrow P_{\text{exp}}(Y,\sigma) \rightarrow RR_{n,\tau,p,C}(X,\sigma) = def <Y,\sigma> \)

(150) **Metaaregel für Hua:**
Es sei \( \tau \) eine Extension von \{agr,su:\{per2,\text{num}sg}\}. Dann:
\( RR_{\tau,\tau,V}(X,\sigma) = def <Y,\sigma> \leftrightarrow RR_{\tau,\tau,p}(agr,su:\{per1,\text{num}sg\},V,X,\sigma) = def <Y,\sigma> \)

Alternative (Chomsky (1965), Chomsky & Halle (1968a)): \( \alpha \)-Notation: Variable über Merkmalswerten.

(151) a. [+1,-2],[+pl]
    b. [-1, +2],[-pl]
    c. \( \alpha \)-Notation: [\( \alpha \alpha,-\alpha \alpha],[\text{opl}] \)

1.5 Minimalist Morphology

1.5.1 Basic Assumptions

**Refs.:** Wunderlich (1996, 1997b)

• pre-syntactic approach
• lexical-incremental approach
• no abstract morphemes
• no zero affixes
• maximal underspecification
• no inflection class features
• three information sources:
  – lexical entry of the stem (plus stem alternations)
  – lexical entry of the affix
  – organization of paradigm structures
• paradigms as filtering devices blocking overgeneration: compatibility and specificity

(152) Principles of affiliation:
  a. Monotonicity: The output of affixation must be more informative than the input.
  b. Adjacency: The input requirements of affixes must be met locally.
  c. Affix order: The order of affixes must conform to the hierarchy of functional categories, i.e., affixes that express lower ranked categories must be attached first.

(153) Paradigm principles:
  a. Completeness: Every cell of a paradigm must be occupied.
  b. Uniqueness: Every cell of a paradigm is uniquely occupied.

Observation:
Most candidate word forms have fewer specifications than the form that defines the paradigm.

(154) Selection Principles
  a. Output Specificity: Word forms with more feature specifications take precedence over those with fewer feature specifications.
  b. Input Specificity: Word forms with underlying (lexically specified) feature values take precedence over those with derived values.
  c. Simplicity: Strings made of fewer affixes take precedence over those made up of more affixes.
  (Note: Simplicity is ranked below Output Specificity.)

Basic assumption:
Word forms that are maximally specific define the dimensions of a paradigm!

Consequence:
In contrast to what is the case in DM and PFM, specificity does not select the most specific (underspecified) form for a fully specified (= syntactic) context; rather, it selects the most specific (underspecified) form for a paradigm, which need not be fully specified.

(155) Affixes (verb inflection in German):
  a. /t/ → [+2,+pl]

1.5 Minimalist Morphology

b. /st/ → [+2]
  c. /n/ → [+pl]
  d. /te/ → [+pret]
  e. /e/ → [+1] /[-pret]
  f. /t/ → [?][-pret]

(156) Simple application (weak verbs, present tense):

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
<th>Meaning</th>
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<tr>
<td>/+p</td>
<td>-pl</td>
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<tr>
<td>+2</td>
<td></td>
<td>Strong form</td>
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<tr>
<td>-2</td>
<td></td>
<td>Null form</td>
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</table>

Note:
Given that affixation by (the most specific marker) /t/ instantiates the dimensions of the present tense (indicative) paradigm, it seems that an additional assumption might be necessary to integrate 3sg. forms into the paradigm: [+1] is not a dimension introduced by the most specific marker. Then again, /t/ may define a subparadigm of its own.

(157) Candidate word forms (strong verb inflection in German):

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<thead>
<tr>
<th>Affix</th>
<th>Features</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>warf-t</td>
<td>[+2,+pl,+pret,+V]</td>
<td>Strong form</td>
</tr>
<tr>
<td>warf-n-t</td>
<td>[+2,+pl,+pret,+V] *Simp</td>
<td>Nominative form</td>
</tr>
<tr>
<td>warf-n-st</td>
<td>[+2,+pl,+pret,+V] *Simp</td>
<td>Genitive form</td>
</tr>
<tr>
<td>warf-te-t</td>
<td>[+2,+pl,+pret,+V] *In-Spec, *Simp</td>
<td>Dative form</td>
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<td>[+2,+pl,+pret,+V] *In-Spec, *Simp</td>
<td>Locative form</td>
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<tr>
<td>warf-st</td>
<td>[+2,+pret,+V]</td>
<td>Strong form</td>
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<tr>
<td>warf-n</td>
<td>[+pl,+pret,+V]</td>
<td>Nominative form</td>
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<tr>
<td>warf-te-n</td>
<td>[+pl,+pret,+V] *In-Spec, *Simp</td>
<td>Locative form</td>
</tr>
<tr>
<td>warf-te</td>
<td>[+pret,+V] *In-Spec, *Simp</td>
<td>Locative form</td>
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1.5.2 Feature Deletion by Constraint Interaction

Background:
MM has a technical means that is comparable in its effects to impoverishment (DM) and rules of referral (PFM): The interaction of violable constraints in an optimality-theoretic system may lead to unfaithful output realization of features that are part of the input (MAX, DEP violations).

Empirical domain:
Genitive/accusative syncretism with animate nouns tens in Russian

Refs.: Wunderlich (2004)

(158) Russian nouns with animacy split in forms that are used in accusative contexts
### Case features
- Nom = ( )
- Acc = (+hr)\_N
- Gen = (+hr)\_N

### Suffixes
- \(/-y/, +pl\) N.pl (class 1, 2 & 3)
- \(/-a/, +pl/neuter\) N.pl (class 4)
- \(/-u/, (+hr)\_N / a\) A.sg (class 2)
- \(/-y/, (+hr)\_N / a\) ∨ PAL] G.sg (class 2 & 3)
- \(/-a/, +hr / C \bigcap O\) A/G.sg (class 1 & 4)
- \(/-e/, +pl/+hr / PAL\) A/G.pl (class 2 & 4)
- \(/-ov/, +pl/+hr / PAL\) A/G.pl (class 3)
- \(/-ov/, +pl/+hr\) A/G.pl (class 1)

### Lexical entries for some Russian case affixes

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<tr>
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### Observation:
The interaction of the suffixes alone does not yet make the correct predictions in all cases.

### Assumption:
In addition, the distribution of suffixes is regulated by a system of violable constraints

### 1.5 Minimalist Morphology

#### (162) Constraints
- *(+hr)\_V inanim. Do not realize the feature [+hr] in accusative contexts of inanimate nouns.
- MAX(+hr). Realize the feature [+hr].
- Ranking of the constraints: *(+hr)\_V inanim \( \gg \) MAX(+hr) \( \gg \) *(+hr)\_V anim

#### (163) More constraints
- MAX(+hr) / -pl, a]
- SPECIFICITY
  - Choose the affix with the more specific selectional information.
- COMPATIBILITY
  - Do not insert a form in a context in which the categorial specifications are incompatible.

#### (164) Ranking of the constraints

\[
\text{SPEC} \geq \text{COMP} \geq \text{MAX}(+hr) \geq +(hr)\_V \text{-anim} \geq \text{MAX}(+hr)
\]

Put into words: “Realize both accusative and genitive, unless inanimate nouns occur in accusative contexts, excluding class 2 nouns (ending in -a, where there exists the accusative morpheme /-a/).”

#### (165) Selection of optimal forms in an accusative singular context

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<th>*(+hr)_V</th>
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<td>fem,</td>
<td>fem,</td>
<td>masc,</td>
<td>neut,</td>
<td>fem,</td>
<td>masc,</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>fem,</th>
<th>fem,</th>
<th>masc,</th>
<th>neut,</th>
<th>fem,</th>
<th>masc,</th>
</tr>
</thead>
<tbody>
<tr>
<td>inanimates</td>
<td>fem,</td>
<td>fem,</td>
<td>masc,</td>
<td>neut,</td>
<td>fem,</td>
<td>masc,</td>
</tr>
<tr>
<td>animate</td>
<td>fem,</td>
<td>fem,</td>
<td>masc,</td>
<td>neut,</td>
<td>fem,</td>
<td>masc,</td>
</tr>
</tbody>
</table>

### Example

- **karta**
- **karte-w**
- **karte-t**

- **stol**
- **stol-a**
- **stol-y**
Chapter 1. Introduction

(166) *A/N and A/G syncretisms in Russian nouns*

<table>
<thead>
<tr>
<th>A/N syncretism</th>
<th>A/G syncretism</th>
</tr>
</thead>
<tbody>
<tr>
<td>appears because</td>
<td>appears because</td>
</tr>
<tr>
<td>is blocked because</td>
<td>is blocked because</td>
</tr>
<tr>
<td>no affix is available (class 3)</td>
<td>an affix is available (class 2)</td>
</tr>
<tr>
<td>only under specified affixes are available (class 1 and plural)</td>
<td></td>
</tr>
<tr>
<td>a higher ranked constraint blocks the existing affix (class 1, class 4)</td>
<td></td>
</tr>
<tr>
<td>an even higher ranked constraint forces the existing affix to appear (class 2)</td>
<td></td>
</tr>
<tr>
<td>only one specific genitive affix is available (class 3)</td>
<td></td>
</tr>
</tbody>
</table>

Note:
This analysis can be extended to the plural.

(167) *Selection of optimal forms in an accusative plural context*

a. Inanimate class 2 nouns (a) |

| SPEC \{COMP | MAX (+hr) \} | *(+hr)/\| | MAX (+hr) |
|----------------|----------------|----------------|
| = | = | = |
| kart-\(\gamma\) | *\(\gamma\) | * |
| kart-\(\bar{\nu}\) | *\(\bar{\nu}\) | * |
| kart | * \(\gamma\) |

b. Animate class 2 nouns (a) |

| SPEC \{COMP | MAX (+hr) \} | *(+hr)/\| | MAX (+hr) |
|----------------|----------------|----------------|
| = | = | = |
| beli-\(\bar{\nu}\) | *\(\bar{\nu}\) | * |
| beli-\(\bar{\nu}\) | *\(\bar{\nu}\) | * |

Chapter 2

Class Features

2.1 Introduction

*Question:* What is the status of class features in languages with fusional noun inflection (Russian, Greek, German)?

*Claims:*
(i) Class features are present in morphology:
They are needed to predict marker choice for a given stem in morphology (gender, phonological, semantic features of the stem do not suffice).
(ii) Class features are binary (e.g., \([\pm \alpha], [\pm \beta]\), not privative (e.g., I, II):
They combine to yield the classical inflection classes (natural classes of inflection classes can be formed that permit a systematic account of syncretism across inflection classes).
(iii) Class features are interpretational in syntax:
They do not project, and syntactic operations do not refer to them.
(iv) Class features are absent in syntax:
Their presence in syntax would violate the Legibility Condition.
(v) Class features act as probes on noun stems that trigger a morphological Agree operation with an inflection marker that acts as a goal before syntax is reached (in the same way that, e.g., LF-uninterpretable \(\Phi\)-features on T trigger movement in syntax before LF is reached).
(vi) A pre-syntactic approach to class-driven inflectional morphology respects both the Legibility Condition and the Inclusiveness Condition; inner- or post-syntactic approaches violate at least one of these conditions.

2.2 Class Features in Morphology

*Observation:*
The noun inflection systems of Russian, Greek, and German exhibit massive syncretism (i.e., identity of two forms with a different morpho-syntactic function), both within an inflection class (*intra-paradigmatic syncretism*), and across inflection classes

\(^1\)This chapter is joint work with Artemis Alexiadou.
(trans-paradigmatic syncretism).

Paradigms
Paradigms are epiphenomena: they do not exist as genuine entities that, e.g., constraints may refer to (see Harley & Noyer (1999), Bobaljik (2002b), among many others).

(1) *Syncretism Principle* (meta-grammatical):
Identity of form implies identity of function (within a certain domain, and unless there is evidence to the contrary).

(NULL hypothesis for child and linguist.)

Assumption:
There is less evidence against systematic syncretism than is sometimes made out (Carstairs (1987), Zwicky (1991), Williams (1994)). However, we will not try to derive syncretism across numbers.

Caveat:
Throughout, we focus on the core systems of noun inflection in Russian, Greek, and German. We disregard minor inflection classes, stem alternations, stress patterns, lexical idiosyncrasies, etc. These issues are ultimately important in comprehensive morphological accounts; but they arguably do not significantly contribute to the issue of class features.

2.2.1 Noun Inflection in Russian

References:

2.2.1.1 Data

$T_1$: Inflection class I, Sg.: *masc*

<table>
<thead>
<tr>
<th><em>masc</em></th>
<th><em>plur</em></th>
<th><em>sing</em></th>
<th><em>gen</em></th>
<th><em>loc</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
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<td>a</td>
</tr>
<tr>
<td>acc</td>
<td>O</td>
<td>O</td>
<td>u</td>
<td>u</td>
</tr>
<tr>
<td>dat</td>
<td>u</td>
<td>u</td>
<td>a</td>
<td>e</td>
</tr>
<tr>
<td>gen</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>e</td>
</tr>
<tr>
<td>inst</td>
<td>om</td>
<td>om</td>
<td>en</td>
<td>e</td>
</tr>
</tbody>
</table>

Observation:
(i) Gender features on the stem do not suffice to predict inflection class ($N_{[masc]}$ can be I or II; $N_{[fem]}$ can be II or III).

$T_2$: Inflection class II, Sg.: *masc, fem*

<table>
<thead>
<tr>
<th><em>masc</em></th>
<th><em>fem</em></th>
<th><em>sing</em></th>
<th><em>gen</em></th>
<th><em>loc</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
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<td>u</td>
<td>a</td>
</tr>
<tr>
<td>acc</td>
<td>u</td>
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<td>ja</td>
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<tr>
<td>dat</td>
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<tr>
<td>gen</td>
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<td>inst</td>
<td>o(u)</td>
<td>e(u)</td>
<td>e(u)</td>
<td>o(u)</td>
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<tr>
<td>loc</td>
<td>e</td>
<td>e</td>
<td>e</td>
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</tr>
</tbody>
</table>

$T_3$: Inflection class III, Sg.: *fem*

<table>
<thead>
<tr>
<th><em>sg</em></th>
<th><em>gen</em></th>
<th><em>loc</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
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<td>O</td>
</tr>
<tr>
<td>acc</td>
<td>O</td>
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</tr>
<tr>
<td>dat</td>
<td>i</td>
<td>i</td>
</tr>
<tr>
<td>gen</td>
<td>i</td>
<td>i</td>
</tr>
<tr>
<td>inst</td>
<td>ju</td>
<td>ju</td>
</tr>
<tr>
<td>loc</td>
<td>i</td>
<td>i</td>
</tr>
</tbody>
</table>

$T_4$: Inflection class IV, Sg.: * neut*

<table>
<thead>
<tr>
<th><em>sg</em></th>
<th><em>gen</em></th>
<th><em>loc</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
<td>acc</td>
<td>o</td>
<td>o</td>
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<tr>
<td>dat</td>
<td>u</td>
<td>u</td>
</tr>
<tr>
<td>gen</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>inst</td>
<td>ohm</td>
<td>ohm</td>
</tr>
<tr>
<td>loc</td>
<td>e</td>
<td>e</td>
</tr>
</tbody>
</table>

(ii) Phonological features on the stem do not suffice to predict inflection class (e.g., $N_{[fem]}$ ending in a soft [-back] consonant can be II or III; and there are no theme vowels, despite claims to the contrary (Wunderlich (1996), Wunderlich (2002)).

(iii) Semantic features on the stem do not suffice to predict inflection class (e.g., $N_{[nom]}$ can be IV).

Conclusion:
Class features are needed.

2.2.1.2 Analysis

Note:
*Intra-paradigmatic syncretism* can be accounted for by decomposing privative case features into more primitive, binary case features that are cross-classified (yielding natural classes of cases). These primitive features are semantics-based in Jakobson (1902a), Jakobson (1902b), Neidle (1988), Franks (1995), and syntax-based in Berwisch (1967), Wiese (1999), Müller (2002); we adopt the latter view.
T3: Synergetism within and across inflection classes in Russian

<table>
<thead>
<tr>
<th>III</th>
<th>IV</th>
<th>V_n</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>a</td>
<td>o</td>
</tr>
<tr>
<td>acc</td>
<td>a</td>
<td>n</td>
</tr>
<tr>
<td>dat</td>
<td>u</td>
<td>e</td>
</tr>
<tr>
<td>gen</td>
<td>a</td>
<td>i</td>
</tr>
<tr>
<td>inst</td>
<td>oj</td>
<td>jnt</td>
</tr>
<tr>
<td>loc</td>
<td>e</td>
<td>i</td>
</tr>
</tbody>
</table>

(2) Decomposition of cases in Russian: \([\pm subject], [\pm governed], [\pm oblique]\)

nom: [+subj, -gov, -obl]
acc: [-subj, +gov, +obl]
dative: [+subj, +gov, +obl]
genitive: [+subj, -gov, +obl]
instrumental: [+subj, -gov, +obl]
locative: [+subj, -gov, +obl]

Note:

Trans-paradigmatic syncretism can be accounted in the same way by decomposing primitive, binary class features that are cross-classified (yielding natural classes of inflection classes); see Halle (1992) on Latvian noun inflection ([\pm marginal, [\pm marked] in addition to the “standard” class features A, B); Nesson (1994) on Russian noun inflection ([\pm non-end] and [aigen-end]); Oltra Massuet (1999) on verbal inflection in Catalan; Stump (2001) on verbal inflection in Bulgarian; Müller (2005) on Icelandic noun inflection; Trommer (2005) on Amharic verbs. Also see Börjeson (2006) (Slovene noun declension), Opitz (2006) (Albanian noun declension), and Weisser (2006) (Croatian noun declension).

For natural classes of Russian noun inflection classes without feature decomposition, see McCreight & Chvany (1991), Wiese (2003).

(3) Decomposition of inflection classes in Russian: \([\pm\alpha], [\pm\gamma]\)

I: [+\alpha, +\gamma] zavodn (‘factory’)
II: [-\alpha, +\gamma] kornny (‘room’), muščin- (‘man’) III: [-\alpha, -\gamma] tetrul (‘notebook’) IV: [+\alpha, +\gamma] mela (‘place’)

(4) Inflection markers (singular):

a. /o|j/:
   \{[+N][-\alpha, +\gamma], [+subj, -gov, +obl]\}

b. /u|j/:
   \{[+N][-\alpha, +\gamma], [+subj, -gov, +obl]\}

c. /om|j/:
   \{[+N][+\alpha, +subj, -gov, +obl]\}

d. /e|/:
   \{[+N][-\alpha, +\gamma], [+subj, +gov, +obl]\}

e. /e|/:
   \{[+N][-\alpha, +\gamma], [+subj, +gov, +obl]\}

f. /o|/:
   \{[+N][+\alpha, +\gamma], [+subj, +gov, +obl]\}

g. /o/:
   \{[+N][+\alpha, +\gamma], [+subj, +gov, +obl]\}

2.2 Class Features in Morphology

h. /i|/:
   \{[+N][+\alpha, +\gamma], [+subj, +gov, +obl]\}

i. /u|/:
   \{[+N][+\alpha, +\gamma], [+subj, +gov, +obl]\}

j. /a|/:
   \{[+N][+\alpha, +\gamma], [+subj, +gov, +obl]\}

Note:

Underspecified class information is underlined in inflection marker specifications.

Assumption:


(5) Subset Principle:

An inflection marker I is merged with a noun stem N if (i) and (ii) hold:

(i) The morpho-syntactic features of I are a subset of the morpho-syntactic features of N.

(ii) I is the most specific marker that satisfies (i).

(6) Specificity of inflection markers:

a. If two inflection markers I_1, I_2 differ with respect to the rank of their features, I_1 is more specific than I_2 if it has a higher-ranked feature.

b. If two inflection markers I_1, I_2 do not differ with respect to the rank of their features, I_1 is more specific than I_2 if it has more features.

(7) Hierarchy of features

Number \gg Class \gg Case

T6: The interaction of inflection markers in the singular in Russian

<table>
<thead>
<tr>
<th>I: [+\alpha, +\gamma]</th>
<th>II: [+\alpha, +\gamma]</th>
<th>III: [+\alpha, -\gamma]</th>
<th>IV: [+\alpha, +\gamma]</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>-subj, -gov, -obl</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>acc:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>-subj, +gov, +obl</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>dat:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>-subj, +gov, +obl</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>gen:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>-subj, +gov, +obl</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>inst:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>-subj, +gov, +obl</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
<tr>
<td>loc:</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
<td>/\alpha^{+}/</td>
</tr>
</tbody>
</table>
(8) Inflection markers (plural):

a. /ax/:
   \{[I N, [+pl], [+sub], [+gov, +obl]]\}

b. /ami/:
   \{[I N, [+pl], [+sub], [+gov, +obl]]\}

c. /am/:
   \{[I N, [+pl], [+sub], [+gov, +obl]]\}

d. /ov/:
   \{[I N, [+pl], [-], [+sub], [+gov, +obl]]\}

e. /O/:
   \{[I N, [+pl], [+] [+sub], [+gov, +obl]]\}

f. /I/:
   \{[I N, [+pl], [-], [+sub], [+γ]]\}

g. /a/:
   \{[I N, [+ pl], [-], [+sub], [+γ]]\}

T7: Minimal interaction of inflection markers in the plural Russian

<table>
<thead>
<tr>
<th>Nom:</th>
<th>I: [+α, +γ]</th>
<th>II:</th>
<th>III:</th>
<th>IV:</th>
<th>I: [+α, +γ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>acc:</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/a/</td>
</tr>
<tr>
<td>dat:</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/a/</td>
</tr>
<tr>
<td>gen:</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/A/</td>
<td>/a/</td>
</tr>
<tr>
<td>loc:</td>
<td>/A/</td>
<td>/A/</td>
<td>/a/</td>
<td>/a/</td>
<td>/a/</td>
</tr>
</tbody>
</table>

Singular vs. plural markers:
Plural markers do not fit into singular contexts, but singular markers compete in plural contexts. However, since singular markers do not have a number feature, they can never become the most specific markers for a given context.

Note:
The systems relies on two rules of referral (Zwicky (1985), Corbett & Fraser (1993), Stump (2001)) to account for accusative/genitive syncretism with animates.

(9) A rule of referral for accusative/genitive syncretism in the singular:
   \( \text{I}[[+α, +γ],[+sub], [+gov, +obl]] \rightarrow \text{I}[[+α, +γ],[+sub], [+gov, +obl]] / [+animate] \quad \text{II} \)

b. A rule of referral for accusative/genitive syncretism in the plural:
   \( \text{I}[[+pl],[+sub], [+gov, +obl]] \rightarrow \text{I}[[+pl],[+sub], [+gov, +obl]] / [+animate] \quad \text{II} \)

2.2.2 Noun Inflection in Greek

References:

2.2 Class Features in Morphology

2.2.2.1 Data

Assumption (Ralli (1994)):
There are eight inflection classes. (Traditional view: three classes)

T9: Inflection classes I–IV

<table>
<thead>
<tr>
<th></th>
<th>I: masc</th>
<th>I fem</th>
<th>II: masc</th>
<th>II fem</th>
<th>IV: masc</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>biper (‘mountain’)</td>
<td>psifer (‘voice’)</td>
<td>mazer(i)m (‘fighter’)</td>
<td>w(ε) (‘yard’)</td>
<td>pot(i) (‘city’)</td>
</tr>
<tr>
<td>acc/sg</td>
<td>o(n)</td>
<td>o(n)</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
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<td>u</td>
<td>s</td>
<td>s</td>
<td>s</td>
</tr>
<tr>
<td>voc/sg</td>
<td>e</td>
<td>e</td>
<td>O</td>
<td>O</td>
<td>O</td>
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<tr>
<td>nom/pl</td>
<td>i</td>
<td>i</td>
<td>es</td>
<td>es</td>
<td>s</td>
</tr>
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<td>us</td>
<td>us</td>
<td>es</td>
<td>es</td>
<td>s</td>
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<td>gen/pl</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>voc/pl</td>
<td>i</td>
<td>i</td>
<td>es</td>
<td>es</td>
<td>s</td>
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</table>

T9: Inflection classes V–VIII

<table>
<thead>
<tr>
<th></th>
<th>V: neut</th>
<th>VI: neut</th>
<th>VII: neut</th>
<th>VIII: neut</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>upa (‘mountain’)</td>
<td>kral (‘state’)</td>
<td>spila (‘house’)</td>
<td>soma (‘body’)</td>
</tr>
<tr>
<td>acc/sg</td>
<td>o</td>
<td>os</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>gen/sg</td>
<td>u</td>
<td>os</td>
<td>u</td>
<td>os</td>
</tr>
<tr>
<td>voc/sg</td>
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</tr>
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<td>i</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>acc/pl</td>
<td>a</td>
<td>i</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>gen/pl</td>
<td>on</td>
<td>on</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>voc/pl</td>
<td>a</td>
<td>i</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

Observation:
(i) Gender features on the stem do not suffice to predict inflection class (N[masc] can be I or II; N[neut] can be I, III, or IV; N[neut] can be V–VIII).
(ii) Phonological features on the stem do not suffice to predict inflection class (vocalic vowels are either part of the ending, in which case they cannot encode inflection class by definition; or they are part of the stem, where they fail to unambiguously encode inflection class; see, e.g., mazer(i) (‘fighter’) vs. papa(ε) (‘priest’) vs. papu(ε) (‘grandfather’) in class II).
(iii) Semantic features on the stem do not suffice to predict inflection class.

2.2.2.2 Analysis
T₁₀: Synergetism within and across inflection classes in Greek

<table>
<thead>
<tr>
<th>2-decl.</th>
<th>1-decl.</th>
<th>0-decl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>os</td>
<td>s</td>
</tr>
<tr>
<td>acc/sg</td>
<td>o(n)</td>
<td>O</td>
</tr>
<tr>
<td>gen/sg</td>
<td>u</td>
<td>s</td>
</tr>
<tr>
<td>voc/pl</td>
<td>e</td>
<td>s</td>
</tr>
<tr>
<td>nom/pl</td>
<td>i</td>
<td>es</td>
</tr>
<tr>
<td>acc/pl</td>
<td>i</td>
<td>es</td>
</tr>
<tr>
<td>gen/pl</td>
<td>i</td>
<td>es</td>
</tr>
<tr>
<td>voc/pl</td>
<td>i</td>
<td>es</td>
</tr>
</tbody>
</table>

(10) Decomposition of cases in Greek: ([±government], [±oblique], ([±subject])

nominative: [±government], [±oblique]
accusative: [±government], [±oblique]
genitival: [±government], [±oblique]
 vocative: [±government], [±oblique]

(11) Decomposition of inflection classes in Greek: [±α], [±β], [±γ]

I:  [+α, +β, +γ]  kipm (‘garden’), pšfj (‘vote’)

II:  [+α, +β, -γ]  qunm (‘mountain’)

VII:  [+α, -β, +γ]  spithm (‘house’)

VIII:  [+α, -β, -γ]  somajm (‘body’)

VI:  [-α, +β, +γ]  krapm (‘state’)

IV:  [-α, -β, +γ]  polip‘ (‘city’)

II:  [-α, +β, -γ]  marul’ (‘fighter’)

III:  [-α, -β, -γ]  avlil’ (‘yard’)

(12) Inflection markers (singular):

a. /ο(n)/: {[[N], [+α, +β, +γ], [+government], [+oblique]}

b. /ο/: {[[N], [+α, -β, +γ], [+government], [+oblique]}

c. /ο/: {[[N], [+α, +β, -γ], [+government], [+oblique]}

d. /ο/: {[[N], [+α, +β, -γ], [+government], [+oblique]}

e. /ο/: {[[N], [+α, -β, +γ], [+government], [+oblique]}

f. /ο/:

g. /ο/:

h. /ο/:

Note on η-notation with /ο/:
Assuming that variables ranging over feature values can show up in morpho-syntactic specifications of inflection markers, the two /ο/ markers in II and III/IV emerge as one: η ranges over ±. The η-notation (originally: α-notation) is introduced in Chomsky (1965), Chomsky & Halle (1968b), and has been used in morphology in Noyer (1992)

(13) Inflection markers (plural):

a. /ο/:

b. /ο/:

c. /ο/:

d. /ο/:

e. /ο/:

f. /ο/:

T₁₁: The interaction of inflection markers, singular and plural, in Greek

<table>
<thead>
<tr>
<th>1°:</th>
<th>2°:</th>
<th>3°:</th>
<th>4°:</th>
<th>5°:</th>
<th>6°:</th>
<th>7°:</th>
<th>8°:</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>acc/sg</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>gen/sg</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>voc/pl</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>nom/pl</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>acc/pl</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>gen/pl</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
<tr>
<td>voc/pl</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
<td>/ο/</td>
</tr>
</tbody>
</table>

2.2.2.3 Noun Inflection in German

References
2.2.3.1 Data

T12: Major inflection classes I–IV

<table>
<thead>
<tr>
<th>I: masc, neut</th>
<th>II: masc</th>
<th>III: neut</th>
<th>IV: masc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tischm (‘table’), Schafm (‘sheep’)</td>
<td>Baumm (‘tree’)</td>
<td>Buchm (‘book’)</td>
<td>Strohm (‘hay’)</td>
</tr>
</tbody>
</table>

nom/sg | O | O | O | O
acc/sg | O | O | O | O
dat/sg | O | O | O | O
gen/sg | O | O | O | O
nom/pl | (e)n | (e)n | (e)n | (e)n
cas/pl | (e)n | (e)n | (e)n | (e)n
dat/pl | (e)n | (e)n | (e)n | (e)n
gen/pl | (e)n | (e)n | (e)n | (e)n

T13: Major inflection classes V–VIII

<table>
<thead>
<tr>
<th>V: masc (‘weak’)</th>
<th>VI: fem</th>
<th>VII: fem</th>
<th>VIII: fem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plenum (‘planet’)</td>
<td>Ziegef (‘goat’)</td>
<td>Mausf (‘mouse’)</td>
<td>Drangsal (‘distress’)</td>
</tr>
</tbody>
</table>

nom/sg | O | O | O | O
acc/sg | (e)n | (e)n | (e)n | (e)n
dat/sg | (e)n | (e)n | (e)n | (e)n
gen/sg | (e)n | (e)n | (e)n | (e)n
nom/pl | (e)n | (e)n | (e)n | (e)n
cas/pl | (e)n | (e)n | (e)n | (e)n
dat/pl | (e)n | (e)n | (e)n | (e)n
gen/pl | (e)n | (e)n | (e)n | (e)n

Note:
On this view, /s/-plurals do not belong to the core system of German noun inflection.
Observation:
(i) Gender features on the stem do not suffice to predict inflection class (N[mas]) can be I, II, IV, or V; N[gen] can be VI, VII, or VIII; N[neut] can be I or III.
(ii) Phonological features on the stem do not suffice to predict inflection class.
(iii) Semantic features on the stem do not suffice to predict inflection class (e.g., not all members of V (weak masculines) are N[anim], and not all masculine N[anim] stems are in V.)

2.2.3.2 Analysis

(14) Decomposition of cases in German: [±subject], [±government], [±oblique]
nominative: [+sub], [+gov], [+obl]
accusative: [-sub], [+gov], [+obl]
dative: [-sub], [+gov], [+obl]
genitive: [+sub], [+gov], [+obl]

2.3 Class Features in Syntax

2.3.1 Class Marker Phrases

Claim in Bernstein (1993):
Class markers have a syntactic reflex (see Haegeman (1998) for a generalisation of this proposal).

Assumption:
Languages that provide the morphological evidence for class markers, e.g., Spanish (Harris (1991)), have a functional projection in the DP, associated with them in addition to DP and NumP, namely CMP.
**T15:** The interaction of inflection markers, singular and plural, in German

<table>
<thead>
<tr>
<th></th>
<th>I.</th>
<th>II.</th>
<th>III.</th>
<th>IV.</th>
<th>V.</th>
<th>VI.</th>
<th>VII.</th>
<th>VIII.</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/pl</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>sec/pl</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>3pl</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>gen/pl</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
</tbody>
</table>

**T16:** Inflection markers in Spanish (from Aronoff (1994, 64)):

<table>
<thead>
<tr>
<th>Marker</th>
<th>Class</th>
<th>Gender</th>
<th>Example</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>/o/</td>
<td>I</td>
<td>masc</td>
<td>muchacho</td>
<td>'boy'</td>
</tr>
<tr>
<td>/o/</td>
<td>I</td>
<td>fem</td>
<td>mucha</td>
<td>'girl'</td>
</tr>
<tr>
<td>/a/</td>
<td>II</td>
<td>masc</td>
<td>día</td>
<td>'day'</td>
</tr>
<tr>
<td>/a/</td>
<td>II</td>
<td>fem</td>
<td>muchacha</td>
<td>'girl'</td>
</tr>
<tr>
<td>/O/</td>
<td>III</td>
<td>masc</td>
<td>padre</td>
<td>'father'</td>
</tr>
<tr>
<td>/O/</td>
<td>III</td>
<td>fem</td>
<td>madre</td>
<td>'mother'</td>
</tr>
</tbody>
</table>

Note:
According to Bernstein, these languages (a) are characterized by the presence of headmovement within the DP and (b) exhibit indefinite nounellipsis.

(17) [DP [NumP [CMP [NP]]]]

**2.3 Class Features in Syntax**

d. *a small

Assuming that both in English and Spanish adjectives are relocated in the specifier of NP (Cinque (1993)), in the Spanish example (18-a) the head noun moves from its base position to a higher head in the functional domain, while it remains in its base position in English:

(19)

```
   DP
   D NumP
   N CMP
   Adj
```

*Note:*
Bernstein attributes this difference to the presence of class markers in Spanish, as opposed to their absence in English.

**2.3.2 Problems for Bernstein’s Correlation**

Class features are not syntactically active (Alexiadou et al. (2001)).

**First problem:**
There are languages that exhibit N-movement and indefinite noun ellipsis in the absence of distinct class markers.

**Observation 1:**
French is similar to Spanish, although its noun morphology differs from that of Spanish considerably, i.e., it has no obvious class markers.

(20) **N-movement and N-ellipsis in French**

Un cube rouge est sur le coin gauche de cette table. Un bleu
a cube red is on the left corner of this table, a blue (one)
est sur le coin droit
is on the right corner

**Observation 2:**
Italian is similar to Spanish, although it is not immediately transparent whether the language has class markers (see Bernstein (1993)):

(21) **N-movement and N-ellipsis in Italian**

a. uno libro grande
   a book big

b. uno poco
   a small
b. uno grande
   a big one

Second problem:
There are languages that lack N-movement in the presence of inflectional class distinctions (but have no system of nominal class markers comparable to that of Spanish).

Observation 1:
Greek has class-driven noun inflection (see previous section). However, no noun movement seems to take place, given that the head noun always follows adjectives. (N-ellipsis is possible.)

(22) No N-movement in Greek:
   a. *to spiti meghalo/paljo/oreo
      the house big/old/nice
   b. to meghalo/paljo/oreo spiti
   c. i amerikanid-a ginek-a
      the American female

(23) N-ellipsis in Greek:
   I Maria tha agorasi ena prisino vivhoki ego ena kokino
   Mary bought a gift birthday nice
e. Mary will buy a green book and I a red one

Observation 2: Russian permits indefinite N-ellipsis. N.A order is also possible, as shown by the examples in (24). However, there is good reason to doubt that this phenomenon involves head movement. The reason is that N may end up in front of numerals (Franks (1995)), determiners, and even outside the DP. For this reason, the phenomena in (24) are probably better analyzed as instances of (potentially remnant) NP scrambling,

(24) N-movement and N-ellipsis in Russian:
   a. Éto [NP1, vopros] složnyj t1
      this is question complicated
   b. My tam zili [NP1, goda] dva t1
      we there lived two
   c. [DP2, [NP1, Razgovor]] étot t1 ja nashi t2 naročno
      conversation this I began intentionally
   d. [NP1, t2 Čelovek] on [NP neploxo] j2 t1
      person he is not bad

(25) U menja bol'šaja mašina a u nego [DP makn'kaja [N -]]
    with me big car and with him small

Observation 3:
German has N-ellipsis, but no N-movement.

2.3 Class Features in Syntax

(26) No N-movement in German:
   Er hat [gp ein neues Buch1] / *[DP ein Buch1 neues t1] gekauft
   he has a new book a book new bought

(27) N-ellipsis in German:
   Er hat [gp ein neues [N -] gekauft
   he has a new (one) bought

Third problem:
There are languages that lack inflectional class distinctions but show evidence for head-movement, and indefinite noun ellipsis. Hebrew is a case in point (Aronoff (1994, 75-79) - Danon (1996), Ritter (1991)).

(28) N-movement in Hebrew (Ritter (1991)):
   [np ha smalot1 ha yapot t1]
   the dresses the nice

(29) Ellipsis in Hebrew:
   (I) saw three flowers red and four purple

T17: Distribution of class features, ellipsis, and NA order:

<table>
<thead>
<tr>
<th>Language</th>
<th>Indefinite ellipsis</th>
<th>N movement</th>
<th>Inflection classes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spanish</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>French</td>
<td>+</td>
<td>+</td>
<td>(−)</td>
</tr>
<tr>
<td>Italian</td>
<td>+</td>
<td>+</td>
<td>(−)</td>
</tr>
<tr>
<td>Hebrew</td>
<td>+</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Greek</td>
<td>+</td>
<td>−</td>
<td>+</td>
</tr>
<tr>
<td>Russian</td>
<td>+</td>
<td>(−)</td>
<td>+</td>
</tr>
<tr>
<td>German</td>
<td>+</td>
<td>−</td>
<td>+</td>
</tr>
</tbody>
</table>

2.3.3 General Considerations

Observation:
Verbs do not impose inflection class restrictions on their arguments.

Note:
There is no verb-subject agreement with respect to inflection class. In fact there is even no noun-adjective agreement with respect to inflection class.

(30) a. la chica inteligente
    the girl intelligent
b. el chico inteligente
    the boy intelligent
Conclusion:
Syntax cannot interpret class features. Class features are necessary in morphology but uninterpretable in syntax.

(31) **Legibility Condition** (Chomsky (2000), Chomsky (2001)):
Morpho-syntactic features can be present in some component of grammar only if they are interpretable in this component.

Further conclusion, given the Legibility Condition:
Class features are absent in syntax.

2.4 Proposal

Note:
Features that are uninterpretable at LF must be deleted in syntax, and they can be deleted by participating in an Agree operation. Agree applies under matching of a probe and a goal if both involve uninterpretable features (and may be accompanied by Merge (movement)).

Proposal:
Class features act as probes in morphology.

Assumption:
(i) Agree operates in syntax to remove LF-uninterpretable features before LF is reached.
(ii) Agree operates in morphology to remove syntactically uninterpretable features before syntax is reached.

(32) **Components of Grammar**:
Lexicon \(\rightarrow\) Morphology \(\rightarrow\) Syntax \(\rightarrow\) PF, LF

a. Lexicon: list of exceptions
b. Morphology: includes probe-driven Agree (=fusional inflection), pure (selection-driven) Merge (perhaps incl. derivational morphology)
c. Syntax: probe-driven Agree (incl. movement), pure (selection-driven) Merge (perhaps incl. derivational morphology, see Borer (2002), Alexiadou (2001))

(33) **Fusional noun inflection**:

a. Noun stem is taken from the lexicon with its inherent features (incl. class, gender features).

b. Non-inherent features (incl. fully specified case and number features) are added in morphology.

c. A class feature on the noun stem acts as a probe and requires an Agree operation resulting in Merge with an inflection marker (the goal).

d. All of an inflection marker’s features (including often underspecified – class and Case features) are inherent.

e. The inflection marker determined by the Subset Principle is selected from the lexicon and merged with the noun stem, resulting in Agree.

f. The class feature of the noun stem, and all morpho-syntactic features of the inflection marker, all deleted in morphology.

g. The inflected noun enters syntax, bearing only fully specified and syntactically interpretable morpho-syntactic features.

Note:
Underspecified inflection markers give rise to a well-known problem: Syntax needs fully specified Case information, not the underspecified Case information provided by inflection markers. This problem does not arise if the morpho-syntactic features of an inflection marker are automatically deleted by inflection operations.

Side remark:
In the terminology of Stump (2001), the present approach qualifies as “realizational”: despite being a lexical item with morpho-syntactic features, an inflection marker does not actually contribute any morpho-syntactic information to the noun that it combines with.

Observation 1:
By assimilating inflection and syntactic operations, the Subset Principle can in fact be dispensed with in favour of Chomsky’s (2001) principle **Maximix Matching Effects**:

(34) **Specificity as Maximix Matching Effects**

a. \(/\text{trad}^d/\):
\[ [\text{N}\,\text{-bel,-pl,}-\text{subj},+\text{gov,}-\text{obl}] ] \quad [\text{N}\,\{\text{a}\},+\text{obl}] \]

b. \(/\text{trad}^d/\):
\[ [\text{N}\,\text{-bel,-pl,}-\text{subj},+\text{gov,}-\text{obl}] ] \quad [\text{N}\,\{\text{a}\}] \]

c. \(/\text{trad}^d/\):
\[ [\text{N}\,\text{-bel,-pl,}-\text{subj},+\text{gov,}-\text{obl}] ] \quad [\text{N}] \]

Observation 2:
The approach also offers a straightforward account of indeclinable noun stems in Greek and Russian for which separate inflection classes have often been stipulated; see, e.g., \textit{reporter} \(_m\) (‘reporter’), \textit{plach} (‘beach’) in Greek, \textit{bursan} \(_m\) (‘bourgeois’), \textit{kofen} \(_m\) (‘coffee’) in Russian. These noun stems simply lack a class feature – hence, a probe that might trigger inflection.
2.5 Further Issues

2.5.1 The Status of Derivational Morphology

(iii) Class features trigger inflection post-syntactically; they are not present in syntax, but enter the derivation after syntax (Embick 2000), perhaps by a dissociation operation (Embick 1998). They might then act as probes in a post-syntactic morphology and undergo deletion before PF is reached. Such an approach may at first sight seem to be able to accommodate the gist of our proposal. However, it invariably violates the Inclusiveness Condition.


Nothing can be added in the course of the derivation.

Conclusion:
A pre-syntactic approach is compatible with both the Legibility Condition and the Inclusiveness Condition; inner- and post-syntactic approaches are not.

Consequence:
The present approach would seem to support a syntactic analysis of Agree operations in terms of checking rather than valuation (or assignment). If morpho-syntactic features are not valued before syntax, morphological realization cannot take place before syntax.

2.5.2 The Timing of Inflection

Note:
Class features are needed in morphology to account for noun inflection markers Russian, Greek, and German. A priori, there are three possibilities concerning the timing of inflection:

(36)  a. Noun inflection applies pre-syntactically.
       b. Noun inflection applies in the syntax.
       c. Noun inflection applies post-syntactically.

Given that there is reason to assume that class features are absent in syntax, we have suggested a pre-syntactic approach to noun inflection where class features are deleted before the noun enters syntax. What about the alternatives?

Intra-Syntactic Approaches
1. Intra-syntactic approaches
   Class features trigger inflection in the syntax; however, a class feature that shows up in the syntax is incompatible with the Legibility Condition.

Post-Syntactic Approaches
2. Post-syntactic approaches (as in Distributed Morphology; see Halle & Marantz 1993, Harley & Noyer 1999):
   There are two possibilities:
   (i) Class features trigger inflection post-syntactically; but they are present in syntax already. Then, the same problem as with 1. arises: At the point where a late insertion
Chapter 3

Fission and Impoverishment

3.1 Syncretism and Iconicity in Icelandic Noun Declensions

3.1.1 Icelandic Noun Declensions

Table 1: Weak inflection classes

<table>
<thead>
<tr>
<th></th>
<th>Mw</th>
<th>Nw</th>
<th>Fw</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>penn</td>
<td>aug</td>
<td>haf</td>
</tr>
<tr>
<td>nom sg</td>
<td>pen-si</td>
<td>aug-s</td>
<td>haf-s</td>
</tr>
<tr>
<td>acc sg</td>
<td>pen-sa</td>
<td>aug-s</td>
<td>haf-n</td>
</tr>
<tr>
<td>dat sg</td>
<td>pen-sa</td>
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<td>haf-n</td>
</tr>
<tr>
<td>gen sg</td>
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<td>aug-s</td>
<td>haf-n</td>
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<td>haf-ar</td>
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<td>pen-sa</td>
<td>aug-n</td>
<td>haf-ar</td>
</tr>
<tr>
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<td>aug-u</td>
<td>haf-u-n</td>
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<tr>
<td>gen pl</td>
<td>pen-sa</td>
<td>aug-n-a</td>
<td>haf-a</td>
</tr>
</tbody>
</table>

Table 2: Strong feminine inflection classes

<table>
<thead>
<tr>
<th></th>
<th>Fa'</th>
<th>Fa'</th>
<th>Fi</th>
<th>Fc1</th>
<th>Fc2</th>
</tr>
</thead>
</table>
|       | sel (‘ma-
|       | chine’) | drottning | mynd | geit | vik |
| nom sg| vél-o | drottning-o | mynd-o | geit-o | vik-o |
| acc sg| vél-o | drottning-u | mynd-o | geit-o | vik-o |
| dat sg| vél-o | drottning-ur | mynd-ar | geit-ar | vik-ar |
| gen sg| vél-ar | drottning-ar | mynd-ar | geit-ar | vik-ar |
| nom pl| vél-ar | drottning-ar | mynd-ar | geit-ar | vik-ar |
| acc pl| vél-ar | drottning-ar | mynd-ar | geit-ar | vik-ar |
| dat pl| vél-ar | drottning-ar | mynd-ar | geit-ar | vik-ar |
| gen pl| vél-ar | drottning-ar | mynd-ar | geit-ar | vik-ar |
Table 3: Strong masculine inflection classes

<table>
<thead>
<tr>
<th>Case</th>
<th>Ma</th>
<th>Mr</th>
<th>Mu</th>
<th>Mc</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom sg</td>
<td>hest</td>
<td>stað</td>
<td>fjórð</td>
<td>fót</td>
</tr>
<tr>
<td>acc sg</td>
<td>hest-O</td>
<td>stað-O</td>
<td>fjórð-O</td>
<td>fót-O</td>
</tr>
<tr>
<td>dat sg</td>
<td>hest-i</td>
<td>stað-i</td>
<td>fjórð-i</td>
<td>fót-i</td>
</tr>
<tr>
<td>gen sg</td>
<td>hest-s</td>
<td>stað-ar</td>
<td>fjórð-ar</td>
<td>fót-ar</td>
</tr>
<tr>
<td>nom pl</td>
<td>hest-ar</td>
<td>stað-ar</td>
<td>fjórð-ar</td>
<td>fót-ar</td>
</tr>
<tr>
<td>acc pl</td>
<td>hest-a</td>
<td>stað-i</td>
<td>fjórð-i</td>
<td>fót-i</td>
</tr>
<tr>
<td>dat pl</td>
<td>hest-um</td>
<td>stað-um</td>
<td>fjórð-um</td>
<td>fót-um</td>
</tr>
<tr>
<td>gen pl</td>
<td>hest-a</td>
<td>stað-a</td>
<td>fjórð-a</td>
<td>fót-a</td>
</tr>
</tbody>
</table>

Table 4: Strong neuter inflection class

<table>
<thead>
<tr>
<th>Case</th>
<th>Na</th>
<th>lóð ('table')</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom sg</td>
<td>borð-O</td>
<td></td>
</tr>
<tr>
<td>acc sg</td>
<td>borð-O</td>
<td></td>
</tr>
<tr>
<td>dat sg</td>
<td>borð-i</td>
<td></td>
</tr>
<tr>
<td>gen sg</td>
<td>borð-s</td>
<td></td>
</tr>
<tr>
<td>nom pl</td>
<td>borð-O</td>
<td></td>
</tr>
<tr>
<td>acc pl</td>
<td>borð-O</td>
<td></td>
</tr>
<tr>
<td>dat pl</td>
<td>borð-um</td>
<td></td>
</tr>
<tr>
<td>gen pl</td>
<td>borð-a</td>
<td></td>
</tr>
</tbody>
</table>

3.1.2 Properties of the Inflection System

3.1.2.1 General Properties: Syncretism and Iconicity

1. Syncretism Principle:
   Identity of form implies identity of function (within a certain domain, and unless there is evidence to the contrary).

2. Iconicity Principle:
   Similarity of form implies similitude of function (within a certain domain, and unless there is evidence to the contrary).

3.1.2.2 Language-Specific Properties

<table>
<thead>
<tr>
<th>Case</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom sg</td>
<td>ur</td>
<td>0</td>
<td>0</td>
<td>ur</td>
<td>0</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
<td>0</td>
<td>i</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>acc sg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>u</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>a</td>
<td>a</td>
<td>u</td>
</tr>
<tr>
<td>dat sg</td>
<td>i</td>
<td>i</td>
<td>0</td>
<td>u</td>
<td>0</td>
<td>i</td>
<td>i</td>
<td>0</td>
<td>0</td>
<td>a</td>
<td>a</td>
<td>u</td>
</tr>
<tr>
<td>gen sg</td>
<td>a</td>
<td>s</td>
<td>a</td>
<td>r</td>
<td>a</td>
<td>r</td>
<td>a</td>
<td>r</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>u</td>
</tr>
<tr>
<td>nom pl</td>
<td>a</td>
<td>0</td>
<td>a</td>
<td>i</td>
<td>r</td>
<td>i</td>
<td>r</td>
<td>i</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
</tr>
<tr>
<td>acc pl</td>
<td>a</td>
<td>0</td>
<td>a</td>
<td>i</td>
<td>r</td>
<td>i</td>
<td>r</td>
<td>i</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
</tr>
<tr>
<td>dat pl</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
<td>um</td>
</tr>
<tr>
<td>gen pl</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>(n)a</td>
<td>(n)a</td>
</tr>
</tbody>
</table>

3.1.3 Analysis

3.1.3.1 Background Assumptions

4. [N-cn ]

5. Subset Principle:
   A vocabulary item V is inserted into a functional morpheme F iff (i) and (ii) hold:
   (i) The insertion context of V is a subset of the set of the morpho-syntactic features of F.
   (ii) V is the most specific vocabulary item that satisfies (i).

6. Specificity of vocabulary items:
   A vocabulary item V_i is more specific than a vocabulary item V_j iff there is a feature class Ω such that (i) and (ii) hold:
   (i) The insertion context of V_i has more features in Ω than the insertion context
of \( V_j \).
(ii) There is no higher-ranked feature class \( \mathcal{Y}' \) such that the insertion contexts of \( V_i \) and \( V_j \) have a different number of features in \( \mathcal{Y}' \).

(7) **Hierarchy of feature classes**

Gender, class \( \gg \) case

### 3.1.3.2 Natural Classes and Feature Decomposition

#### (8) Decomposition of cases \([\pm n], [\pm v], [\pm obl]\)

- **nominative:** \(-n, +v, -obl\)
- **accusative:** \(-n, +v, -obl\)
- **dative:** \(-n, +v, +obl\)
- **genitive:** \(+n, +v, -obl\)

(9) **Natural classes of cases:**

a. \{nominative, accusative, dative\} \(\rightarrow\) \(-n\)

b. \{nominative, accusative, genitive\} \(\rightarrow\) \(-obl\)

c. \{nominative, accusative\} \(\rightarrow\) \(-n, -obl\)

d. \{accusative, dative, genitive\} \(\rightarrow\) \(+v\)

e. \{accusative, dative\} \(\rightarrow\) \(-n, +v\)

(10) **Decomposition of inflection classes:**

\[
\begin{align*}
[+w] & \quad [+f] & \quad [-f] \\
[+c] \quad [+m] & \quad [-m] & \quad [-w] \\
Fw & \quad [+v] & \quad [+c] & \quad \text{Mw} & \quad \text{Nw} & \quad [+f] & \quad [-f] \\
Fa & \quad [+a'] & \quad [+a] \quad [-a] & \quad [+m] \quad [-m] & \quad [-v] \\
Fa' & \quad Fc & \quad [-c] & \quad \text{Fc1} & \quad [-c] & \quad \text{Fc2} & \quad \text{Me} & \quad \text{Mu} & \quad \text{Fa} & \quad \text{F1} & \quad [+v] & \quad [+c] & \quad \text{Ma} & \quad [+a] & \quad [-a] & \quad [+m] & \quad [-m] & \quad [-v] \\

\end{align*}
\]

### 3.1.3.3 Impoverishment and Fission

#### (11) **Hierarchy of feature classes (extended):**

Weak/strong \(\gg\) gender \(\gg\) \(a\)-type \(\gg\) case

#### (12) **Inflection classes:**

<table>
<thead>
<tr>
<th>Case</th>
<th>-vowel</th>
<th>[+vowel]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ma</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>2 Na</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>3 Fa'</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>4 Mi</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>5 Fi</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>6 Mu</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>7 Mc</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>8 Fe1</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>9 Fe2</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>10 Mw</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>11 Nw</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
<tr>
<td>12 Fw</td>
<td>-weak</td>
<td>[-vowel]</td>
</tr>
</tbody>
</table>

#### (13) **Impoverishment operations in cn:**

a. \([vowel] \rightarrow O / [\{pl\}, [+n, +v]]\)

b. \([vowel] \rightarrow O / [\{pl\}, [+fem], [+n]]\)

c. \([+v, -n, -obl] \rightarrow O / [\{masc, -fem\}]\)

d. \([vowel] \rightarrow O / [\{pl\}, [+weak]]\)

e. \([vowel] \rightarrow O / [\{pl\}, [+masc, -a-type], [+n, +v]]\)

### Table 6: Feature specifications on cn after impoverishment

<table>
<thead>
<tr>
<th>Case</th>
<th>1 Ma</th>
<th>2 Na</th>
<th>3 Fa'</th>
<th>4 Mi</th>
<th>5 Fi</th>
<th>6 Mu</th>
<th>7 Mc</th>
<th>8 Fe1</th>
<th>9 Fe2</th>
<th>10 Mw</th>
<th>11 Nw</th>
<th>12 Fw</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
</tr>
<tr>
<td>acc</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
</tr>
<tr>
<td>gen</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
<td>[+vowel]</td>
</tr>
</tbody>
</table>

...
3.1.3.4 Vocabulary Insertion

(14) Vocabulary items

\[
\begin{align*}
I & \quad /r/ \rightarrow \{+obl\} \\
II & \quad /a/ \rightarrow \{[-pl], [-weak], [+n]\} \\
    & \quad /u/ \rightarrow \{[-pl], [-weak], [-fem], [-v]\} \\
    & \quad /i/ \rightarrow \{[-pl], [-weak], [-fem], [+n-type], [+obl]\} \\
    & \quad /s/ \rightarrow \{[-pl], [-weak], [-fem], [+a-type], [+n, -obl]\} \\
    & \quad /u/_{2} \rightarrow \{[-pl], [-weak], [+fem], [+c-type], [+n]\} \\
    & \quad /u/_{3} \rightarrow \{[-pl], [-weak], [+fem], [+a-type], [-n, +v]\} \\
III & \quad /a/ \rightarrow \{[-pl], [-weak]\} \\
    & \quad /u/ \rightarrow \{[-pl], [-weak], [+fem], [-v]\} \\
    & \quad /i/ \rightarrow \{[-pl], [-weak], [+masc], [-n, -v]\} \\
TV & \quad /a/ \rightarrow \{[-pl], [-n]\} \\
    & \quad /u/ \rightarrow \{[-pl], [-a-type]\} \\
    & \quad /i/ \rightarrow \{[-pl], [-a-type], [-c-type]\} \\
    & \quad /um/ \rightarrow \{[-pl], [-n, +v, +obl]\} \\
    & \quad /a/_{2} \rightarrow \{[-pl], [-n, +v, -obl]\}
\end{align*}
\]

Syncretism and Iconicity in the Singular of Strong Declensions

Table 7: Vocabulary insertion in the singular of strong declensions

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|c|}
\hline
   & 1 Ma & 2 Na & 3 Fa(4) & 4 Mi & 5 Fi & 6 Mu & 7 Mc & 8 Ft1 & 9 Ft2 \\
\hline
acc & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
\hline
dat & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
gen & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
\end{tabular}

Syncretism and Iconicity in the Singular of Weak Declensions

Table 8: Vocabulary insertion in the singular of weak declensions

\begin{tabular}{|c|c|c|c|c|c|c|c|c|c|}
\hline
   & 10 Mw & 11 Nw & 12 Fw \\
\hline
nom & [-\(\in\)o] & [-\(\in\)o] & [-\(\in\)o] \\
acc & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
g & [-\(\in\)v] & [-\(\in\)v] & [-\(\in\)v] \\
\hline
dat & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
gen & \(\pm\) & \(\pm\) & \(\pm\) \\
\hline
\end{tabular}

3.1.4 Eine Variante ohne Verarmung?

Annahme 1:

(15) Spaltung \(a\) (fissiun; Halle & Marantz (1993)):
   a. Spaltung gliedert aus einem Morphem M mit den Merkmalen \(\alpha\) ein Merkmal- 
bündel \(\beta\) aus, so dass zwei terminale Knoten M1 und M2 entstehen.
   b. (i) M1 hat die Merkmale \(\beta\).
       (ii) M2 hat die Merkmale \(\alpha\sim\beta\).

Annahme 2:
Kasusdekomposition erfolgt wie oben.
Annahme 3: Genusdekomposition erfolgt anders.

(16) **Genusdekomposition:**
   a. Mask = [-neut,-fem]
   b. Fem = [-neut,+fem]
   c. Neut = [+neuter]

Annahme 4: Flexionsklassen werden ebenfalls dekomponiert; die Dekomposition erfolgt ähnlich, aber nicht identisch wie oben.

(17) **Dekomposition der Flexionsklassen:**
[4 [Ä 5 6] [b 7 8 9] [c 1 2 3] [d 10 [f 11 12]]]

Annahme 5: Es gibt keine Verarmungsregeln.

(18) **Vokabularelemente:**
   a. **Morphem 1:**
      /ur/ \ {[-pl],-[neut,-fem],[n,-v]}
      /u/ \ {[-pl],[n,+v],[+3]}
      /i/ \ {[-pl],[fem],[-obl],[+A,-E]}
      /ar/ \ {[-pl],[+n],[+E]}
      /s/ \ {[-pl],[fem],[+n],[+D]}
      /ur/ \ {[-pl],[+n],[+9]}
      /i/ \ {[-pl],[neut,-fem],[n,-v],[+10]}
      /a/ \ {[-pl],[+E]}
      /u/ \ {[-pl],[+v],[+12]}
      /a/ \ {+[pl],[neut],[n,-obl],[+C,-F]}
      /i/ \ {+[pl],[n,-obl],[+B]}
      /u/ \ {+[pl],[n,-obl],[+2]}
      /um/ \ {+[pl],[+obl]}
   b. **Morphem 2:**
      /r/ \ {+[pl],[neut],[n,-obl]}
      /o/ \ {+[pl],[neut,-fem],[n,+v,-obl],[+7]}
      /a/ \ {+[pl],[+u]}

**Konsenzen:**
(i) Das System macht empirisch die richtigen Vorhersagen.
(ii) Durch den Verzicht auf Verarmungsregeln können die System-definierenden Eigenschaften der islandischen Nominalflexion nicht abgeleitet werden.
(iii) Es gibt allerdings eine Annahme: Der Subtraktionseffekt in (3-f) (wiederholt als (19)) folgt.

(19) Maskuline Deklinationen (außer Mc) haben im Nominativ Plural einen Marker, der mit einem Vokal anfängt und mit einem /r/ aufhört; der jeweilige Marker für den Akkusativ Plural ergibt sich, wenn man vom Nominativmarker das /r/ wegstreicht.

**Beobachtung:**
Dieser Effekt folgt systematisch, weil es für Morphem 2 einen hochspezifischen Nullmarker gibt, der die Einsetzung eines konkurrierenden, weniger spezifischen /r/ blockiert.

**Bemerkung:**

**Beispiel:**
Trommer (1999a) über ein Verbalparadigma des klassischen Arabisch (eine Reanalyse von Halle (1997); 26em, 87em sind ausgeblendet).

(20)

<table>
<thead>
<tr>
<th>1</th>
<th>Singular</th>
<th>Dual</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>aktub</td>
<td>n-aktub</td>
<td>n-aktub</td>
</tr>
<tr>
<td>2mask</td>
<td>t-aktub</td>
<td>t-aktub-aa</td>
<td>t-aktub-uu</td>
</tr>
<tr>
<td>3mask</td>
<td>y-aktub</td>
<td>y-aktub-aa</td>
<td>y-aktub-uu</td>
</tr>
</tbody>
</table>

**Annahmen:**
(i) Verarmung fügt in der 1. Person den Unterschied zwischen Plural und Dual, nämlich das Merkmal [+dl].
(ii) Person und Numerus werden in zwei separate X0's gespalten.

(21) **Vokabularelemente:**
   a. /r/ \ [+1,-3,-pl]  
   b. /n/ \ [+1,-3,+pl]
   c. /s/ \ [+1,-3]
   d. /y/ \ [+3]
   e. /aa/ \ [+pl,+dl]
   f. /u/ \ [+pl]

(22)

<table>
<thead>
<tr>
<th>Syntax</th>
<th>1, Dual</th>
<th>2, Dual</th>
<th>3, Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>+1,-3,-pl,+dl</td>
<td>[1,-3,-pl,+dl]</td>
<td>[1,-3,-pl,+dl]</td>
<td></td>
</tr>
<tr>
<td>Verarmung</td>
<td>+1,-3,+pl</td>
<td>+1,-3,+pl</td>
<td>+1,-3,+pl</td>
</tr>
<tr>
<td>Vokabular-</td>
<td>n-X</td>
<td>t-X-aa</td>
<td>y-X-aa</td>
</tr>
</tbody>
</table>

**Konsenzen:**
Es kann nicht der Fall eintreten, dass in der 1. Person Dual und Plural unterschieden sind.
Trommers Idee:
Verarmung muss nicht durch eine gesonderte Regel bewirkt werden; Verarmung kann schlicht aufgefasst werden als Ergebnis der Einsetzung von Nullmarkern. ("Impoverishment is simply the effect of zero-VIs that consume features.")

(23) Struktur von Vokabularelementen bei Trommer:
   a. abstrakt:
      (Phon Context Target Deletes)
   b. konkret:
      ((pref ?) ({})) {(1+)((p-l)(pl+))} {(1+)((p-l)(pl+))}

Bemerkung:
"Target encodes the necessary features of the target Feature Structure where insertion can take place and Deletes enumerates the features which are deleted when the VI is inserted."

Trommers Vorschlag:
Die Verarmung des Dualmerkmals bei der 1. Person ergibt sich aus einem entsprechenden Null-Vokabularelement:

(24) Verarmung des Duals bei der 1. Person:
   ((Ø) ({})) {(1+)((p-l)(pl+)(d1+))} {(d1+))}

Potentielles Problem:
"The empirical question remains if the VIs which have to be stipulated under this analysis conform to the specificity hierarchy assumed for VIs."

Bemerkung:

Ein weiteres Beispiel (Trommer (2003a)):

(25) Vokabularelemente für KIATposition/en):
   a. /gva/ → [+1],[DAT],[+pl]
   b. /m/ → [+1],[DAT]
   c. /g/ → [+2],[DAT]
   d. /a/ → [+1]
   e. Ø → [+2]

(5) Vokabularelemente für Plural:
   f. /-t/ → [+pl]

3.2 Global Impoverishment in Sierra Popoluca

(26) Vokabularelemente für T/Agr:
   b. /-s/ → [+3],[+pl]
   c. /-en/ → [+3],[+pl]

(27) Syntaktische Struktur für die Vokabularreinsetzung:

Bemerkung:

Abgeleitetes Paradigma für xatav in Georgischen:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Obj</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.Sg</td>
<td>-</td>
<td>-</td>
<td>m-xatav-Ø</td>
<td>m-xatav-t</td>
<td>m-xatav-s</td>
<td>m-xatav-en</td>
</tr>
<tr>
<td>1.Pl</td>
<td>-</td>
<td>-</td>
<td>g-v-xatav-Ø</td>
<td>g-v-xatav-t</td>
<td>g-v-xatav-s</td>
<td>g-v-xatav-en</td>
</tr>
<tr>
<td>2.Sg</td>
<td>g-xatav-Ø</td>
<td>g-xatav-t</td>
<td>-</td>
<td>-</td>
<td>g-xatav-Ø</td>
<td>g-xatav-t</td>
</tr>
<tr>
<td>2.Pl</td>
<td>g-xatav-Ø</td>
<td>g-xatav-t</td>
<td>-</td>
<td>-</td>
<td>g-xatav-Ø</td>
<td>g-xatav-t</td>
</tr>
<tr>
<td>3.Sg</td>
<td>v-xatav-Ø</td>
<td>v-xatav-t</td>
<td>0-xatav-Ø</td>
<td>0-xatav-t</td>
<td>0-xatav-s</td>
<td>0-xatav-en</td>
</tr>
<tr>
<td>3.Pl</td>
<td>v-xatav-Ø</td>
<td>v-xatav-t</td>
<td>0-xatav-Ø</td>
<td>0-xatav-t</td>
<td>0-xatav-s</td>
<td>0-xatav-en</td>
</tr>
</tbody>
</table>

Trommers Beobachtung:
Eine bei Halle und Marantz vorausgesetzte Verarmungsregel wie (28-a) ist formulierbar als Eintrag für ein phonologisch leeres Vokabularelement wie in (28-b).

(28) a. [+pl] → 0 /+-Nom,+3,+pl]
   b. 0 → [+pl] /+-Nom,+3,+pl]

Problem:
Lässt sich diese Analyse auf alle vorgeschlagenen Fälle von Verarmung generalisieren? Schwierigkeiten können dort entstehen, wo der Verarmungs-Nullmarker wegen des Teilmengeprinzips (mit der Spezifizitätsbedingung darin) so spezifisch sein müsste, dass er erwünschte Vokabularreinsetzung auch zu verhindern droht.

3.2 Global Impoverishment in Sierra Popoluca

3.2.1 Introduction

Goal:
An analysis of verbal argument encoding morphology in Sierra Popoluca on the basis of Distributed Morphology that is maximally economical and accounts for all instances of syncretism (marker homonymy).

Main claims:
1. Morphological underspecification is needed.
2. Person features and case features must be decomposed into smaller units ([±1, ±2]; [±gov]).
3. Impoverishment is needed.
5. The local domain of impoverishment can be larger than the functional morpheme (Q-morpheme).
6. Post-syntactic vocabulary insertion can be replaced by pre-syntactic probe-driven Agree (Alexiadou & Müller 2005), based on Chomsky (2000, 2001); post-syntactic impoverishment can be reformulated as a pre-syntactic operation.

3.2.2 The Syntax of Argument Encoding in Sierra Popoluca

Sierra Popoluca

A Mixe-Zoque language spoken in Mexico (Isthmus of Tehuantepec, Veracruz, Soteapán: ‘Soteapan Zoque’); speakers < 30,000.

Lit.: Elson (1960a,b), Elson & Pickett (1964), Lind (1964), Marlett (1986).

Note: Sierra Popoluca is a head-marking, ergative language.

Head-marking:
The encoding of primary arguments in Sierra Popoluca does not proceed by dependent-marking (case-markers on DPs); it proceeds by head-marking (Nichols 1986): The prefield 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 (Elson 1960a, 29-30, Elson 1960b, 207-208). Overtly realized argument DPs are optional throughout.

Assumptions:
(i) The argument encoding prefixes of Sierra Popoluca are morphological realizations of person and case features bundles on the functional categories T and v (Chomsky 1995, ch. 10) that agree with DP arguments merged in vP/VP; they are not incorporated pronouns (Jelink 1984).
(ii) The DP arguments that the person and case feature bundles on T and v agree with may be phonologically empty pronouns throughout, or (where possible) overtly realized DPs (see Baker 1996, Phillips 1993, Bruning 2001) for some of the options that arise.

Ergative marking pattern:
The encoding of primary arguments in Sierra Popoluca does not follow an accusative marking pattern; it 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).

### Table 10: Accusative vs. ergative pattern of argument encoding (Plank 1995)

<table>
<thead>
<tr>
<th>Accusative Pattern</th>
<th>Ergative Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>(DP_{\text{acc}}V_i)</td>
<td>(DP_{\text{erg}}V_i)</td>
</tr>
<tr>
<td>(DP_{\text{acc}}V_i)</td>
<td>(DP_{\text{erg}}V_i)</td>
</tr>
</tbody>
</table>

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

**Assumptions:**
(i) Ergative case and absolutive case are features on functional heads (v, T) that value (or match with) corresponding features on argument DPs under Agree.
(ii) Ergative case is located on v, absolutive case is located on T. 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).
(iii) 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 intransitive contexts, v does not bear a case feature, and all arguments (external or internal) bear absolutive case regulated by T. See Murasugi (1992), Plank (1994).
(iv) Head movement of V to v, and of v+V to T yields a complex word T+v+V.

(29) **Absolutive markers in intransitive contexts**

a. A-nik-pa
   LABS-go-INC
   ‘I am going.’

b. A-pšišn
   LABS-man
   ‘I am a man.’

c. Ta-hoš-y-pa
   LINCL.ABS-take.a.walk-INC
   ‘You and I take a walk.’
d. O-Wi’k-pa
   3.ABS -ERG-hit-INC
   ‘He eats.’

e. O-Nik-pa  dawan
   3.ABS-go-INC John
   ‘John is going.’

f. O-Ko’c-ta-p  dawan
   3.ABS-hit-PASS-INC John
   ‘John is being hit.’

(30) Absolute and ergative markers in transitive contexts

a. A-O-ko’c-pa
   1.ABS-3.ERG-hit-INC
   ‘He hits me.’

b. O-Au-ko’c-pa
   3.ABS-1.ERG-hit-INC
   ‘I hit him.’

c. M-an-ko’c-pa
   2.ABS-1.ERG-hit-INC
   ‘I hit you.’

d. O-I-ko’c-pa
   3.ABS-3.ERG-hit-INC
   ‘He hits him.’

e. O-I-ko’c-yah-pa
   ‘They hit him.’/‘He hits them.’/‘They hit them.’

Note:
The ergative markers also show up in two other contexts:
(i) Ergative markers act as possessive markers in DPs (see Benveniste (1974), Anderson (1992)).
(ii) Ergative markers appear with the distribution of a nominative marker in a nominative-accusative system in certain types of embedded clauses: in those temporal adjunct clauses that do not have a Spanish adverb, and to some extent in clauses embedded under intransitive verbs.

(31) Ergative markers as possessive markers

a. an-tik
   1.ERG-house
   ‘my house’

b. M-an-ha:tuq
   2.ABS-1.ERG-father
   ‘You are my father.’

(32) Ergative markers in adjunct clauses:

3.2 Global Impoverishment in Sierra Popoluca

mu an-nik
abs 1.ERG-go
‘when I went’
(Elson (1960b, 208), Marlett (1986, 364))

(33) Syntactic structure of ergative/absolute marking (for (30-b), simplified):

(34) Order of verbal affixes in Sierra Popoluca

PERS.ABS — PERS.ERG — V — NUM — PASS — ASP

Note:
Number, passive, and aspect markers are ignored here.
(i) Number marking is of secondary importance in Sierra Popoluca (on nouns as well as on verbs; see Elson (1960b, 208, 219), Noyer (1992, 214-215)), and does not contribute to argument encoding.
(ii) Passive and aspect markers may 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).

3.2.3 The Morphology of Argument Encoding in Sierra Popoluca

Table 11: Fusional case/person markers in Sierra Popoluca

<table>
<thead>
<tr>
<th></th>
<th>ABS</th>
<th>ERG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>an</td>
<td>an</td>
</tr>
<tr>
<td>1.inf</td>
<td>ta</td>
<td>tan</td>
</tr>
<tr>
<td>2</td>
<td>mi</td>
<td>in</td>
</tr>
<tr>
<td>3</td>
<td>O</td>
<td>i</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>ABS — ERG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 — 2</td>
</tr>
<tr>
<td>2</td>
<td>2 — 1</td>
</tr>
</tbody>
</table>

Two difficulties for head-marking languages

(i) There is no reliable encoding of arguments in 3/3 contexts. Some languages solve this problem by employing strategies like gender (class) agreement or obligatory passivization (Nichols (1986, 112-113), Assen (2002)); other languages don’t. Sierra Popoluca belongs in this latter class.
(ii) 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: participent reduction. This is also known as a neutralization effect (Noyer 1992)). Both situations can be found in Sierra Popoluca.

(35) 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-i3n > an

Note:
(i) Reflexivity is marked by a suffix on the verb.
(ii) Nothing special happens when two 3. persons co-occur (non-reflexively).

Observation:
Participant reductions like the one at hand can be accounted for straightforwardly by invoking optimality theory (Prince & Smolensky 2004). See Trommer (2003b) on the ban on simultaneous realization of 1-SUBJ and 2.OBJ in Aini.

(36) An optimality-theoretic analysis:
P.ASS-1./2. ⇒ ALIGN(PERS)-LEFT ⇒ P.ASS-3. PARSER-CASE

Problem:
Such an approach takes the markers in table 11 as given and ignores the fact that they consist of very few recurring building blocks: the segments /n/, /a/, /i/, /m/, and /i/.

Consequence:
A maximally simple approach that accounts for all instances of syncretism within the inventory of case/person markers in Sierra Popoluca must involve subanalysis of the markers in table 11.

Claim:
A subanalysis of the markers in table 11 automatically accounts for the participant reduction effects.

Problem (Elson & Pickett 1964, 51-52; also cf. 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 person of subject and object which occur with transitive verbs

3.2 Global Impoverishment in Sierra Popoluca

[...] Clearly, there are some further morpheme cuts that can be made [in table 11]: α adds the second person to the first; α always involves the first person; man- (1-you) can be dissolved into mi- + an, and an ‘you-me’ into a+ + an; but further cuts become more difficult. The best solution 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.”

Solution:
These objections disappear if underspecification of markers and impoverishment (underspecification of syntactic contexts) are available.

(Also see the appendix on Pike’s analysis of German verb inflection.)

3.2.4 A Distributed Morphology Approach

3.2.4.1 Background Assumptions

(37) Late vocabulary insertion:
   a. Functional morphemes like v and T contain fully specified bundles of morpho-
      syntactic features in syntax; however, they do not yet contain phonological
      material.
   b. Inflection markers are vocabulary items that pair phonologically and (often un-
      underspecified) morpho-syntactic features; they are inserted post-syntactically
      in accordance with the Subset Principle.

(38) Subset Principle (Halle 1997)):
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 fea-
   tures of M.
(ii) V is the most specific vocabulary item that satisfies (i).

(39) Specificity of vocabulary items (Lumsden 1992), Noyer (1992), Wiese (1999)):
A vocabulary item Vj is more specific than a vocabulary item Vi j iff there is a class of
   features F such that (i) and (ii) hold.
(i) Vi bears more features belonging to F than Vj does.
(ii) There is no higher-ranked class of features F’ such that Vi and Vj have a
different number of features in F’.

Morpho-syntactic features can be deleted post-syntactically before vocabulary inser-
   tion takes place; this effects a “retreat to the general case”.

(41) Fission (Noyer 1992, Frampton 2002, not Halle & Marantz 1993)):
If insertion of a vocabulary item V with the morpho-syntactic features α takes place
   into a fissioned morpheme M with the morpho-syntactic features β, then α
is split up into $\beta$ and $\alpha$-$\beta$, such that (a) and (b) hold:

a. $\alpha$-$\beta$ is available for further vocabulary insertion,
b. $\beta$ is not available for further vocabulary insertion.

**Assumption:**
T and v in Sierra Popoluca are fissioned morphemes.

### 3.2.4.2 Case and Person Features

**Assumption:**
Cases and persons are decomposed into combinations or more primitive binary features. Under specification with respect to these features encodes natural classes (of cases and persons) that vocabulary items and impoverishment operations can refer to.

(42) **Case** (Bierwisch (1967)):
   a. **ERG** = [+gov]
   b. **ABS** = [−gov]

(43) **Person** (Noyer (1992), Wiese (1994), Frampton (2002)):
   a. $1 = [+1,−2]$
   b. $1_{mix} = [+1,+2]$
   c. $2 = [−1,+2]$
   d. $3 = [−1,−2]$

### Natural classes of persons in Icelandic verbal inflection:

<table>
<thead>
<tr>
<th>$[A]$ Weak conjugation, class 1: krefja ('demand')</th>
<th>$[B]$ Strong conjugation, class 3: sleppa ('slip')</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>present</strong></td>
<td><strong>past</strong></td>
</tr>
<tr>
<td>1.Sg.</td>
<td>kref</td>
</tr>
<tr>
<td>2.Sg.</td>
<td>krefur</td>
</tr>
<tr>
<td>3.Sg.</td>
<td>krefu</td>
</tr>
<tr>
<td>1.Pl.</td>
<td>krefum</td>
</tr>
<tr>
<td>2. Pl.</td>
<td>krefað</td>
</tr>
<tr>
<td>3. Pl.</td>
<td>krefa</td>
</tr>
</tbody>
</table>

**Analysis**
Two impoverishment rules ensure that the system-defining nature of two kinds of syncretism can be derived:

(i) In past singular contexts, $[±1]$ is deleted, and 1. and 3. person become indistinguishable: $[−2]$ (Frampton (2002), also see Wiese (1994)).


### 3.2 Global Impoverishment in Sierra Popoluca

(45) **Feature hierarchy (for determining specificity):**

$[±gov] \gg [±1] \gg [±2]$

#### 3.2.4.3 Subanalysis of Sierra Popoluca Argument Encoding Morphology

(46) **Vocabulary items:**

a. $/n/ \leftrightarrow [+gov]$

b. $/a/ \leftrightarrow [+i]$

c. $/i/ \leftrightarrow [−i]$

d. $/m/ \leftrightarrow [+2] ([−gov])$

e. $/t/ \leftrightarrow [+2] ([+1])$

**Note:**
The insertion contexts for $/m/$ and $/t/$ include features in brackets; this captures the difference between primary exponents and secondary exponents (Noyer (1992, ch. 1)). Features in brackets may have been targeted by earlier insertion operations.

(47) **Impoverishment rule $[A]$ (local):**

$[gov] \rightarrow 0/[−\alpha1,−\alpha2]$

(i) $[+gov] \rightarrow 0/[−1,−2]$

(ii) $[−gov] \rightarrow 0/[+1,+2]$

**Note:**
$\alpha$ is a variable over $±$ (see Chomsky & Halle (1968), Halle (1992), Noyer (1992), Harley (1994), Johnston (1996), Alexiadou & Müller (2005). (47) unifies two separate impoverishment rules:

(i) Ergative is deleted in 3. person contexts.

(ii) Absolutive is deleted in 1. person inclusive contexts.

(48) **Impoverishment rule $[B]$ (global):**

$[−1,−2] \rightarrow 0/[−gov]$

**Crucial assumptions:**

(i) Rule $[A]$ applies *locally*, in the minimal functional morpheme (T or v).


(Alternatively, the local domain is the phrase; Chomsky (2001, 2005).)

(iii) The rules do not apply iteratively; they apply either once or not at all in their respective domain. (This is to avoid unwanted massive deletion by the global rule $[B]$.)

**Note:**
The co-existence of rules $[A]$ and $[B]$ is incompatible with Noyer’s (1992) tenet that impoverishment is produced by feature co-occurrence restrictions plus feature hierarchies, and not by rules. The reason is that $[A]$ and $[B]$ together closely resemble the scenario in (49). Noyer’s approach rules out such a scenario because impoverishment here must be triggered by a filter $*[\alpha, \beta]$ in interaction with a universal hierarchy of features which must rank one of the features higher than the other one (which is then deleted).
(49) Noyer’s impossible scenario:
   a. $\alpha \rightarrow \emptyset / \beta$
   b. $\beta \rightarrow \emptyset / \alpha$

(50) Results of cyclic vocabulary insertion (from the inside out):
   a. ABS:
      (i) $[+1,-2,gov] \rightarrow /a/$
      (ii) $[+1,+2, \cdots] \rightarrow /t-a/$
      (iii) $[-1,+2,gov] \rightarrow /m-a/$
      (iv) $[-1,-2, \cdots] \rightarrow /0/$
   b. ERG:
      (i) $[+1,-2,gov] \rightarrow /a-n/$
      (ii) $[+1,+2,gov] \rightarrow /t-a-n/$
      (iii) $[-1,+2,gov] \rightarrow /-n/$
      (iv) $[-1,-2, \cdots] \rightarrow /i/$
   c. ABS-ERG
      (i) $[+1, \cdots,gov] \rightarrow [+1, \cdots,gov] (2 \rightarrow 1)$
      (ii) $[+1,-2,gov] \rightarrow [+1, \cdots,gov](1 \rightarrow 2)$
      (iii) $[+1,-2,gov] \rightarrow [-1, \cdots,gov] (3 \rightarrow 3)$
      (iv) $[+1, \cdots,gov] \rightarrow [-1,+2,gov](1 \rightarrow 3)$
      (v) $[+1,-2,gov] \rightarrow [-1,+2,gov] (2 \rightarrow 3)$
      (vi) $[+1,-2,gov] \rightarrow [-1, \cdots,gov] (3 \rightarrow 1)$
      (vii) $[-1,-2, \cdots] \rightarrow /a/$
      (viii) $[-1, \cdots] \rightarrow /m-i/$

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}.

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 \rightarrow 2, 2 \rightarrow 1.

Conclusion:
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
effects in transitive contexts. The following concepts proved necessary:
   (i) Underspecification of case/number markers.
   (ii) Fission.
   (iii) Impoverishment, including global impoverishment.

3.3 A Pre-Syntactic Alternative

Question:
Can global impoverishment be avoided by assuming fusion of v and T (Halle & Marantz
(1993)), which would create a complex v-T morpheme without internal structure?

Answer:
No. Vocabulary insertion must be restricted to the simple v and T morphemes through-
out, and cannot combine features from v and T to provide a single insertion context.

3.3 A Pre-Syntactic Alternative

Observation:
Given optimal design considerations (Chomsky (2001, 2005)), splitting up inflection
markers into two separate units (f-morpheme and vocabulary item) looks like an
imperfection. The null hypothesis would be that the elementary operations of syntax
(Merge, Agree, Move) also active in morphology, and specific morphological operations
like vocabulary insertion can be dispensed with.

Claim:
This presupposes a pre-syntactic morphology that nevertheless employs underspecification
(like the system in Wunderlich (1996)). Such a system, based on minimalist
assumptions, is developed in Alexiadou & Müller (2005) (see chapter 2).

(51) Components of Grammar:
Lexicon \rightarrow Morphology \rightarrow Syntax \rightarrow PF, LF

(52) Sketch of verbal inflection:
   a. A verb stem is taken from the lexicon with its inherent features (e.g., class
      features).
   b. Non-inherent features (incl. fully specified case and person features) are added in
      morphology; these features provide the context for underspecified inflection
      markers.
   c. All of an inflection marker's features (including underspecified case and person
      features) are inherent.
   d. The inflection marker determined by (an appropriately revised version of) the
      Subset Principle is selected from the lexicon and merged with the verb stem,
      resulting in Agree.
   e. Syntactically uninterpretable features of the verb stem, and all morpho-
      syntactic features of the inflection marker, are deleted in morphology.
   f. The inflected verb enters syntax, bearing only fully specified and syntactically
      interpretable morpho-syntactic features.

Side remark:
In the terminology of Stump (2001), this approach qualifies as “lexical-realizational”,
just like standard Distributed Morphology: Despite being a lexical item with
morpho-syntactic features, an inflection marker does not actually contribute any
Chapter 3. Fission and Impoverishment

morpho-syntactic information to the stem that it combines with.

**Question:**
Can a pre-syntactic approach to inflection handle fission and impoverishment?

**Impoverishment:**
Impoverishment can be viewed as a pre-syntactic operation, provided that the features that are affected are invisible for morphology, but not for subsequent syntactic operations. On this view, impoverishment of T applies in the morphological component after its features have been added, but before the Agree operation with (matching features of) an inflection marker is carried out. Impoverishment marks features as morphologically inaccessible, but it does not delete them (cf. Chomsky’s (1995) difference between deletion and erasure).

**Fission:**
Suppose that the defining property of fission is that a class feature probe that has triggered an Agree operation (Alexiadou & Müller (2005)) does not delete immediately, but may trigger further Agree operations, and only deletes when no further Agree operation is possible anymore. I.e., a “fissioned morpheme” emerges as a certain kind of class feature probe (in a morpheme).

**Note:**
This may be straightforward for Icelandic noun decension, but Sierra Popoluca does not have different inflection classes for verbs. The inflection class feature triggering inflection in Sierra Popoluca must therefore be trivial. See Aronoff (1994) definition of inflection classes:

(53) **Inflectional Class:**
An inflectional class is a set of lexemes whose members each select the same set of inflectional realizations.

Aronoff (1994, 182): “Strictly speaking, a language whose major lexical categories each have only one inflectional class will still have inflectional classes.”

**Note:**
A similar approach suggests itself for multiple wh-movement in Bulgarian (assuming that such multiple movement is a homogenous phenomenon, but cf. Bošković (2002)): The wh-probe feature on C does not delete after checking the first wh-phrase; it deletes when there is no further wh-phrase left.

(54) **Multiple wh-movement in Bulgarian:**
[CP Koj1 kog02 kakvo3 C [TP t1 o pišta1 t2 t3 ]]?
who whom what asked

(55) **An Example ((50-b) again):**

3.4 Appendix: Pike on German Verbs

3.4.1 The Idea

Observation:
There is evidence that the individual word forms are composed of smaller units: partial syncretism.

**Partial Syncretism in the Suppletive Paradigm: Subanalysis**

(56) **Pike’s (1965) subanalysis of verb inflection with sein (‘be’) in German:**

<table>
<thead>
<tr>
<th>1sg</th>
<th>b</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>2sg</td>
<td>b</td>
<td>s</td>
</tr>
<tr>
<td>3sg</td>
<td>b</td>
<td>s</td>
</tr>
<tr>
<td>1pl</td>
<td>z</td>
<td>n</td>
</tr>
<tr>
<td>2pl</td>
<td>z</td>
<td>s</td>
</tr>
<tr>
<td>3pl</td>
<td>z</td>
<td>s</td>
</tr>
<tr>
<td>inf</td>
<td>z</td>
<td>n</td>
</tr>
</tbody>
</table>

**Claim** (Baerman et al. (2005));
“Whatever the merits of such an analysis, it is not one which is compatible with most morphological models.”
Side remark: Pike’s (1965) article contains two further analyses of inflectional phenomena in German: a subanalysis of definite article inflection (der, die, das, etc.) and a subanalysis of personal pronouns, including suppletion phenomena (ich, mich, mir, mein, etc.).

Observation: Pike-style analyses have independently been developed for these phenomena in current morphological theories:

- Wunderlich (1997a), Wiese (1999) on the inflection of definite articles

Subanalysis in Current Morphological Theories

Question:
Do we have to assume that the verb forms in (56) are morphological constructions (i.e., not decomposable)?

Answer:
Probably not:

Subanalysis is pursued in many current morphological theories:

- Paradigm Function Morphology (and other stem-and-paradigm approaches): Bulgarian verb inflection (Stump (2001)), argument encoding markers on verbs in Georgian and Potawatomi (Anderson (1992))
- Minimalist Morphology (Wunderlich (1996, 1997b))

3.4.2 Appendix 1: Pike’s (1965) Subanalysis of German Verb Inflection in Paradigm Function Morphology

(57) \( RR_{n,T,C}(X,σ) =_{def} Y,σ \)

(58) Pike’s (1965) subanalysis of verb inflection with sein (‘be’) in German:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1sg</td>
<td>b</td>
</tr>
<tr>
<td>2sg</td>
<td>b</td>
</tr>
<tr>
<td>3sg</td>
<td>b</td>
</tr>
<tr>
<td>1pl</td>
<td>a</td>
</tr>
<tr>
<td>2pl</td>
<td>a</td>
</tr>
<tr>
<td>3pl</td>
<td>a</td>
</tr>
<tr>
<td>inf</td>
<td>a</td>
</tr>
</tbody>
</table>

(59) Realization rules in Paradigm Function Morphology

- Block A:
  a. A1 \( RR_{A}(X,σ) =_{def} Y,σ \), where Y is X’s First Stem.
  b. A2 \( RR_{A}(X,σ) =_{def} Y,σ \), where Y is X’s Second Stem.
  c. A3 \( RR_{A}(X,σ) =_{def} Y,σ \), where Y is X’s Third Stem.
- Block B:
  d. B1 \( RR_{B}(X,σ) =_{def} Y,σ \).
- Block C:
  e. C1 \( RR_{C}(X,σ) =_{def} Y,σ \).
- Block D:
  f. D1 \( RR_{D}(X,σ) =_{def} Y,σ \).
  g. D2 \( RR_{D}(X,σ) =_{def} Y,σ \).
  h. D3 \( RR_{D}(X,σ) =_{def} Y,σ \).
  i. D4 \( RR_{D}(X,σ) =_{def} Y,σ \).
- Block E:
  j. E1 \( RR_{E}(X,σ) =_{def} Y,σ \).
  k. E2 \( RR_{E}(X,σ) =_{def} Y,σ \).

(60) Identity Function Default:

\( RR_{I}(X,σ) =_{def} Y,σ \)

3.4.3 Appendix 2: Pike’s (1965) Subanalysis of German Verb Inflection in Distributed Morphology

(61) \( V_{sein} \) Agr Th

(62) Vocabulary insertion rules in Distributed Morphology

- a. (i) \( /b/ \) \( \rightarrow V_{sein} /_{-3,-pl} \)
- b. (ii) \( /z/ \) \( \rightarrow V_{sein} /_{-1,-pl} \)
b. (i) /a/ $\leftrightarrow [+\beta] \sim V_{\text{sem}, [+1, +2, +pl]}
(ii) /t/ $\leftrightarrow [+\alpha] \sim V_{\text{sem}}

c. (i) /\emptyset/ $\leftrightarrow [-1, +2] \sim V_{\text{sem}, [+pl]}
(ii) /s/ $\leftrightarrow [-1, +2] \sim V_{\text{sem}, [-pl]}
(iii) /n/ $\leftrightarrow [-2] \sim V_{\text{sem}}
(iv) /\emptyset/ $\leftrightarrow [-pl] \sim V_{\text{sem}, [+\alpha]}
(v) /t/ $\leftrightarrow V_{\text{sem}, [+pl]}

Chapter 4

Morphological Richness

4.1 Introduction

Main claims:

(i) An approach to German verb inflection in terms of Distributed Morphology (Hale & Marantz (1993, 1994)) that relies on fission and impoverishment can derive all instances of syncretism in a simple and maximally general way; this provides further evidence for these two operations as means to capture systematic mismatches of morphology and syntax.

(ii) The present analysis can be transferred from a post-syntactic approach to inflectional morphology based on late insertion, to a pre-syntactic approach based on Agree-driven Merge (as assumed for syntax in Chomsky (2001, 2005)).

(iii) In a pre-syntactic approach, inflection can be shown to behave like other (syntactic) structure-building operations (conceptual argument).

(iv) A pre-syntactic approach to inflection can offer a new way of measuring morphological richness, as it plays a role in pro-drop (empirical argument).

Plot:

1. Section 2: I develop a Distributed Morphology approach to German verb inflection. The approach makes crucial use of standard techniques like (i) decomposition of person features and (ii) underspecification of inflection markers. In addition, it employs two mechanisms that only exist in Distributed Morphology: (iii) fission; and (iv) impoverishment. Fission permits a subanalysis of markers; impoverishment derives system-wide patterns of syncretism.

2. Section 3: I argue that given minimalist assumptions, post-syntactic vocabulary insertion should be replaced by pre-syntactic probe-driven Merge; post-syntactic fission and impoverishment then should be reformulated as pre-syntactic fission and impoverishment.

3. Section 4: I show that post-syntactic inflection is incompatible with an approach to pro-licensing that is (i) syntactic, and (ii) relies on the richness of morphological inventories, and I sketch a pre-syntactic alternative according to which a certain type of impoverishment blocks licensing of pro.
4.2 A Distributed Morphology Approach to German Verb Inflection

4.2.1 Background Assumptions

1. Late vocabulary insertion:
   a. Functional morphemes like v and T contain fully specified bundles of morpho-syntactic features in syntax; however, they do not yet contain phonological material.
   b. 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.

2. Vocabulary insertion into functional morphemes:
   \[ TP \ldots [T \ldots [V \ldots T \ldots [\ldots]]]] \]

3. Subset Principle (Halle (1997)):
   A vocabulary item \( V \) is inserted into a functional morpheme \( M \) if (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 specific vocabulary item that satisfies (i).

   A vocabulary item \( V_i \) is more specific than a vocabulary item \( V_j \) if there is a class of features \( F \) such that (i) and (ii) hold.
   (i) \( V_i \) bears more features belonging to \( F \) than \( V_j \) does.
   (ii) There is no higher-ranked class of features \( F' \) such that \( V_i \) and \( V_j \) have a different number of features in \( F' \).

5. Feature hierarchy (for determining specificity):
   Tense > Number > Person

   Morpho-syntactic features can be deleted post-syntactically before vocabulary insertion takes place; this effects a “retreat to the general case”.

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

Assumption:
T in German is subject to fission.

4.2.2 German Verb Inflection

<table>
<thead>
<tr>
<th>(8) a. Weak conjugation</th>
<th>b. Strong conjugation</th>
<th>c. Suppletive conjugation</th>
</tr>
</thead>
<tbody>
<tr>
<td>glauben (‘believe’)</td>
<td>rufen (‘call’)</td>
<td>sein (‘be’)</td>
</tr>
<tr>
<td>Präsens</td>
<td>Präteritum</td>
<td></td>
</tr>
<tr>
<td>1.SG</td>
<td>glaub-e</td>
<td>1.SG</td>
</tr>
<tr>
<td>2.SG</td>
<td>glaub-st</td>
<td>2.SG</td>
</tr>
<tr>
<td>3.SG</td>
<td>glaub-t</td>
<td>3.SG</td>
</tr>
<tr>
<td>2.Pl.</td>
<td>glaub-t</td>
<td>2.Pl.</td>
</tr>
</tbody>
</table>

Generalization:
There are four instances of syncretism that I take to be non-accidental:
(iv) 2.Pers.Sg (\( s \)) = 3.Pers.Sg.Pres (\( \iota \)), except for the initial \( s \).

(9) An observation supporting the systemicity of syncretism (\( \iota \)) (Faselow & Frisch (2005)):

a. Er oder ihr wohnt in Frankfurt
   he or you, Pl.Pres/3.Sg.Pres/2.Pl.Pres in Frankfurt
b. Wir oder sie wohnen in Frankfurt
c. *Ich oder du wohnt/wohnt in Frankfurt
   I or you, Sg.Pres/1.Sg.Pres/live, 2.Sg.Pres in Frankfurt

(a) Syncretisms (i) and (ii) can be derived (but only Frampton derives them as the general, system-wide properties that they are, via impoverishment).
(b) Syncretisms (iii) and (iv) cannot be derived (see, however, Bierwisch (1961, 62-66) for an early attempt to derive syncretism (iii)).

Strategy for an analysis that derives all instances of syncretism:
(i) Feature decomposition creates natural classes of persons.
(ii) Underspecification of vocabulary items captures such natural classes of persons.
(iii) Fusion ensures that \( st \) can emerge as the combination of two vocabulary items /s/ and /t/.
(iv) Impoverishment also refers to natural classes of persons and can thus derive system-wide syncretism patterns.


<table>
<thead>
<tr>
<th>T</th>
<th>-[strong]</th>
<th>[+strong]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1,-2,-pl]</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,-pl]</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,pl]</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,-pl]</td>
<td>/n/</td>
<td>/n/</td>
</tr>
<tr>
<td>[+1,2,pl]</td>
<td>/n/</td>
<td>/n/</td>
</tr>
</tbody>
</table>

(11) Two \( \Phi \)-feature impoverishment rules that apply to \( T \) in German:

| a. | \( \pm 1 \) \( \rightarrow 0 \)/[+2,-pl,+past] |
| b. | \( \pm 1 \) \( \rightarrow 0 \)/[+2,-pl] |

(12) **Vocabulary items**

| a. | /we/ \( \rightarrow [+\text{past},+\text{strong}] \) |
| b. | /s/ \( \rightarrow [+2,-pl] \) |
| c. | /n/ \( \rightarrow [+2,+pl] \) |
| d. | /t/ \( \rightarrow [-1] \) |
| e. | /e/ \( \rightarrow [-1] \) |

(13) **Vocabulary insertion into impoverished Ts in German**

<table>
<thead>
<tr>
<th>T</th>
<th>-[past]</th>
<th>-[strong]</th>
<th>[+strong]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1,-2,-pl]</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,-2,pl]</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,-pl]</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,pl]</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1,2,-pl]</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
</tr>
<tr>
<td>[+1,2,pl]</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
</tr>
<tr>
<td>[+1,2,-pl]</td>
<td>/t/</td>
<td>/t/</td>
<td>/t/</td>
</tr>
<tr>
<td>[+1,2,pl]</td>
<td>/t/</td>
<td>/t/</td>
<td>/t/</td>
</tr>
</tbody>
</table>

**Assumptions about /e/ :**

(i) Radically underspecified default markers are inserted iff there is no other marker in the functional morpheme (this also precludes unwanted iteration of /e/ -insertion; cf. Wunderlich’s (1996) Monotonicity Principle).
(ii) The vocabulary item /e/ is somewhat more abstract than the other markers in (12) in the sense that it requires a minimal indication of deviation from the present tense stem. Hence, /e/ \( \rightarrow 0 \) whenever there is stem alternation in past tense contexts (strong verbs), or a specific past suffix (weak verbs); and /e/ \( \rightarrow e \) in present tense contexts when there is no other marker.

**Observation:**

(i) 1.Pers.PL.Past \( \neq 3 \).Pers.PL.Past in Middle High German.

**4.3 Pre-Syntactic Morphology**

**4.3.1 General Assumptions**

**Observation:**

Given optimal design considerations (Chomsky, 2001, 2005), splitting up inflection markers into two separate units (morpheme and vocabulary item) looks like an imperfection. The null hypothesis would be that the elementary operations of syntax (Merge, Agree, Move) are also active in morphology, and specific morphological operations like vocabulary insertion can be dispensed with.

**Claim:**

This presupposes a pre-syntactic morphology that nevertheless employs underspecification. Such a system, based on minimalist assumptions, is developed in Alexiadou & Müller (2005) (we should all know that by now).

**14. Components of Grammar:**

\[ \text{Lexicon} \rightarrow \text{Morphology} \rightarrow \text{Syntax} \rightarrow \text{PF, LF} \]

**Assumption** (slightly more radical than it has been so far): Inflectional morphology (of the type under consideration here) takes place in the number (cf. Chomsky (2000)), more precisely, in that part of the number that corresponds to V’s extended projection (see Grimshaw (2000)) - crucially, not the lexical subarray, because V and T must be in the same local domain for this purpose (unless the lexical subarray of V includes T; see Richards (2004, 2007)).

**15. Sketch of verbal inflection:**

a. V is taken from the lexicon with its inherent features (including - possibly trivial but fully specified - class features that act as probes).

b. T and v are taken from the lexicon and enriched by features, including fully specified \( \Phi \) (person, number, gender) features; these features provide the context for underspecified inflection markers (which realize subject or object agreement).

(Note that this is assumption is slightly different from the one made in the preceding chapters, concerning the question which item provides the fully specified syntactic context.)

c. The inflection marker determined by the Subset Principle is merged with the
verb stem, under Agree, driven by V’s class feature, with the fully specified context provided by T and v, which themselves do not participate in Merge (yet). All of an inflection marker’s features (including underspecified case and Φ-features) are inherent.

d. Syntactically uninterpretable features of the verb stem (class), and all morpho-syntactic features of the inflection marker, are deleted in morphology; T and v remain unaffected.

e. The items of the numeration (inflected V, v, T, ...) enter syntax, bearing only fully specified and syntactically interpretable morpho-syntactic features.

Note 1, (15-b):
The effects of the Subset Principle follow if we make the (standard) assumption that Agree requires feature matching, and the more specific assumption that Agree also requires a maximization of matching effects (see Chomsky (2001, 15)). The latter condition then is to be understood in such a way that as many high-ranked features are affected by an Agree operation as possible, where quality outranks quantity.

Note 2, (15-b):
There is a technical issue with (15-c) that must be clarified: Where does the inflection marker that is merged with the verb stem come from?

Two possible answers
(i) An inflection marker is taken out of the lexicon when the need arises. This implies that operations in the numeration can still have access to the lexicon (and carry out search in the lexicon, selecting the most specific compatible item).

(ii) The complete inventory of inflection markers of a given type (e.g., realization for V-T in German) may enter the numeration as a single set, and the inflection operation (Merge) picks out one item of this set. This implies that not all material that enters a numeration will have to be used in the syntactic derivation.

4.3.2 Fission and Impoverishment

Question:
This pre-syntactic approach to inflection relies on decomposition and underspecification. Can it handle fission and impoverishment? (Yes, we have seen in the last chapter that it can. Still)

Impoverishment:
Impoverishment can be viewed as a pre-syntactic operation, provided that the features that are affected are invisible for morphology, but not for subsequent syntactic operations. On this view, impoverishment of T applies in the morphological component after its features have been added, but before the Agree operation with (matching features of) an inflection marker is carried out. Impoverishment marks features as morphologically inaccessible, but it does not delete them (cf. Chomsky’s (1995)

difference between deletion and erasure).

Fission:
Suppose that the defining property of fission is that a class feature probe that has triggered an Agree operation does not delete immediately, but may trigger further Agree operations, and only deletes when no further Agree operation is possible anymore. I.e., a “fissioned morpheme” emerges as a certain kind of class feature probe (in a morpheme).

Remark:
A similar approach suggests itself for multiple wh-movement in Bulgarian (assuming that such multiple movement is a homogenous phenomenon, but cf. Bošković (2002)): The wh-probe feature on C does not delete after checking the first wh-phrase; it deletes when there is no further wh-phrase left.

(16) Multiple wh-movement in Bulgarian:
[cp Koj1 kogo2 kakvo3 C [tp t1 e pital t2 t3 ]] ?
who whom what asked

(17) An illustration of pre-syntactic inflection:

a. Selection of glaubs: {V, [strong]} from the lexicon.

b. Selection of T from the lexicon; addition of fully specified φ- and tense features: T: [−1, 2, +pl, +past]

c. Application of impoverishment rule (11-b) to T:
T: [−1, 2, +pl, +past] → T: [−2, +pl, +past]

d. Agree-driven Merge of (matching, most specific) /te/ with V:
V: glaubs: {V, [strong]}, T: [−2, +pl, +past] + /te/ : [−past, −strong] →

E.g.
glaub-te-ic: V, T: [−2, +pl, +past]

f. T and the inflected V enter syntax, with all remaining morpho-syntactic features (whether affected by impoverishment, affected by Agree, or not affected at all) accessible to syntactic operations.

Conclusion:
A pre-syntactic approach in terms of Agree-driven Merge can rely on fission and impoverishment, but additional assumptions are necessary.

4.4 Pro-Drop

4.4.1 Morphological Richness

Observation (Borujdk (2002a)):
If inflectional morphology is post-syntactic, properties of the morphological inventory cannot be held responsible for V-to-T movement in syntax: The Rich Agreement
Hypothesis according to which V-to-T movement takes place if a language has a sufficiently rich morphological system of verbal inflection (Roberts (1993), Vikner (1997), Holmberg & Platza (1995), Rohrbacher (1999)) must therefore be given up in a Distributed Morphology approach. If there is any synchronically relevant correlation at all (see Alexiadou & Fanselow (2000)), it must go in the other direction: Rich verbal morphology can be a refer of movement, but not the reason for it.

Note:
The same reasoning applies to licensing of pro. Assuming post-syntactic morphology, pro-licensing cannot be determined by morphological properties (‘richness’) because these properties are not yet visible at the point of the derivation where they would be needed; therefore, either (18-a) or (18-b) must hold.

(18) Consequences of post-syntactic morphology for pro-drop:

a. Licensing of pro is a syntactic phenomenon but independent of the richness of morphological inventories (Grishaw & Samek-Lodovici (1998), optimality-theoretic syntax in general).

b. Licensing of pro is a post-syntactic (PF) phenomenon that may or may not rely on a notion of morphological richness (Perlmutter (1971), Holmberg (2004), Adger (2003)).

Observation:
This consequence does not arise if inflectional morphology is pre-syntactic.

(19) Conceptual and empirical problems with the notion of “richness”:

a. It has proven difficult to properly define morphological richness.

b. Morphological richness is usually determined on the basis of standard, fully specified paradigms which are arguably pure epiphenomena (i.e., descriptive generalizations) but not objects that grammatical principles can refer to.

c. Richness is a global property that cannot be checked locally for any given T node – the ‘local’ richness of inflection marking in T is irrelevant (cf., e.g., fully distinctive null markers).

Illustration:
There is no pro-drop in German despite seemingly rich verb inflection.

(20) Absence of pro-drop in German:
Ich denke, dass [IP pro gesungen habe]  
I think that have.1SG

Side remark:
I assume that constructions involving meteorological predicates, impersonal passives, subject inversion, and the like, never involve an expletive or ‘quasi-argumental’ empty category pro, in contrast to what is argued by Rizzi (1986) for Italian, Platza (1987) for Icelandic, and Grewendorf (1989) for German. For evidence against such a view, see, e.g., Haider (1988), Rohrbacher (1999).

State of the art:
The absence of pro-drop in German is unexpected under most approaches that rely on morphological richness.

(i) Jaeggi & Safir (1989): Pro-drop is possible in languages with morphologically uniform inflectional paradigms, where an inflectional paradigm counts as uniform if it “has either only underived inflectional forms or only derived inflectional forms”. This excludes non-pro drop languages like English and French, which have bare-stem inflectional forms in their verbal paradigms; however, it also wrongly predicts that German is a pro-drop language.

(ii) Rohrbacher (1999): A language can have pro-drop if “at least one number of one tense, the person features [1] and [2] are distinctively marked”. Again, German is wrongly expected to be a pro-drop language.

General problem:
These approaches presuppose a concept of inflectional paradigm that corresponds to the traditional notion adopted in reference grammars, but that is incompatible with recent developments in theoretical morphology, where paradigms are either epiphenomena (Halle & Marantz (1993, 1994), Bobaljik (2002b), or abstract grammatical objects that bear little resemblance to the traditional reference grammar notion (Williams (1994), Wunderlich (1996), Wiese (1999)).

Assumptions:
(i) Pro-drop involves a syntactic empty category pro (Chomsky (1982), Rizzi (1986), Grewendorf (1989)).

(ii) Some notion of morphological richness is relevant for the licensing of (argumental) pro (Rizzi (1986), Jaeggi & Safir (1989)). The task then is to show that a local determination of richness can be provided in a pre-syntactic approach to inflectional morphology.

4.4.2 A New Proposal: Impoverishment Blocks Pro-Drop

Suggestion:
The crucial property that determines whether argumental pro is licensed by T whether or not T is affected by a certain type of impoverishment in the numeration (this can be checked locally).

(21) Pro Generalization:
An argumental pro DP cannot undergo Agree with T if T has been subjected (perhaps vacuously) to Φ-feature neutralizing impoverishment in the numeration.

Terminology:
Neutralization of a feature implies that a distinction between two categorizations (e.g.,
1 pers. vs. 3 pers., or sg. vs. pl.) is not made anymore.

Consequence:
Only a system-defining syncretism (derived by impoverishment) can preclude licensing of *pro* syncretisms that are solely due to underspecification of inflection markers and accidental syncretisms cannot.

4.4.3 Icelandic

(22) Absence of pro-drop in Icelandic (Platzack (1987), Holmberg & Platzack (1995), Rohrbacher (1999)):

a. Hann dansar
   he dance-3.Sg

b. *pro dansar
dance-3.Sg

(23) Icelandic verbal inflection (Kress (1982)):

<table>
<thead>
<tr>
<th>Weak conjugation, class 1:</th>
<th>Strong conjugation, class 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>krefja</strong> ('demand')</td>
<td><strong>steppa</strong> ('slip')</td>
</tr>
<tr>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>1.Sg.</td>
<td>1.Sg.</td>
</tr>
<tr>
<td>kref</td>
<td>slepp</td>
</tr>
<tr>
<td>kraf</td>
<td>slapp</td>
</tr>
<tr>
<td>krefur</td>
<td>krafur</td>
</tr>
<tr>
<td>2.Sg.</td>
<td>2.Sg.</td>
</tr>
<tr>
<td>krefið</td>
<td>krafíð</td>
</tr>
<tr>
<td>krefjum</td>
<td>krafðum</td>
</tr>
<tr>
<td>1.PL.</td>
<td>1.PL.</td>
</tr>
<tr>
<td>krefjuð</td>
<td>krafðuð</td>
</tr>
<tr>
<td>2.PL.</td>
<td>2.PL.</td>
</tr>
<tr>
<td>krefjó</td>
<td>krafðó</td>
</tr>
<tr>
<td>3.PL.</td>
<td>3.PL.</td>
</tr>
<tr>
<td>krefja</td>
<td>krafðu</td>
</tr>
</tbody>
</table>

Analysis:
Two impoverishment rules ensure that the system-defining nature of two kinds of syncretism can be derived:

(i) In past singular contexts, [+1] is deleted, and 1. and 3. person become indistinguishable: [+2] (Frampton (2002), also see Wiese (1994)).
(ii) In present singular contexts, [+2] is deleted, and 2. and 3. person become indistinguishable: [+1].

(24) *-feature impoverishment on T:

a. [+1] → 0/[-2,-pl,-past]

b. [+2] → 0/[-1,-pl,-past]

Consequence:
It follows that Icelandic cannot have an argument *pro*, despite exhibiting what looks at first sight like ‘rich’ verbal inflection.

4.4 Pro-Drop

More generally:
All Germanic languages (including, e.g., Gothic) exhibit a system-wide syncretism of 1. and 3. Pers. Sg. Past. Consequently, the prediction is that they all do not permit pro-drop.

However:
Whereas Modern German does not have pro-drop, there are claims in the literature that Old High German did. The data may or may not be reanalyzable as involving deletion operations; however, it is instructive to note that the domain to which such *phi*-feature impoverishment in T applies grows steadily from Old High German via Middle High German to Modern German.

4.4.4 Modern Irish

(25) Pro-drop in Modern Irish (McCloskey & Hale (1984, 488)):

Dá gcéirf sé pro isteach ar an phost sin gheobhfh pro é if put-2.Sg.COND in on that job get-2.Sg.COND it

‘If you applied for that job, you would get it.’

(26) Verbal Inflection in Modern Irish: Two Paradigms (McCloskey & Hale (1984)):

<table>
<thead>
<tr>
<th>Weak conjugation, class 1:</th>
<th>Strong conjugation, class 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>put</strong></td>
<td><strong>chuireadh</strong></td>
</tr>
<tr>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>1-p</td>
<td>chuirim</td>
</tr>
<tr>
<td>2-p</td>
<td>chuir-ee</td>
</tr>
<tr>
<td>3-pl</td>
<td>chuir-eadh</td>
</tr>
<tr>
<td>1-p</td>
<td>chuir-imis</td>
</tr>
<tr>
<td>2-p</td>
<td>chuir-ee</td>
</tr>
<tr>
<td>3-pl</td>
<td>chuir-eadh</td>
</tr>
</tbody>
</table>

Observation:
There is syncretism in these paradigms (which combine synthetic and analytic forms), but it cannot be derived from general, system-defining impoverishment rules (which tend to hold across paradigms); furthermore, it resists an account in terms of underspecification in general (since it is difficult to invoke natural cases to cover the least marked forms). In both paradigms, the syncretic forms are simply the maximally underspecified elsewhere cases, blocked by more specific markers where the latter are compatible with the morpho-syntactic context provided by T.

Consequence:
It is correctly predicted that Irish has external argument pro-drop even though “Irish is not a language which is in any general sense rich in its system of person-number marking morphology for verbs” (McCloskey & Hale (1984)). (Something extra needs to be said about why only synthetic verb forms permit pro-drop.)
4.4.5 Russian

(27) **Verbal Inflection in Russian, present tense:**

<table>
<thead>
<tr>
<th>Pronoun</th>
<th>Gender</th>
<th>Number</th>
<th>Case</th>
<th>Tense</th>
<th>Stem</th>
<th>Endings</th>
</tr>
</thead>
<tbody>
<tr>
<td>'read'</td>
<td>present</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,-pl</td>
<td>čita-ju</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,-pl</td>
<td>čita-š</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,-pl</td>
<td>čita-ť</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, +pl</td>
<td>čita-em</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, +pl</td>
<td>čita-ete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3, +pl</td>
<td>čita-šť</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Observation:**
There is no syncretism, hence, no impoverishment rule. Consequently, external argument pro-drop is predicted to occur.

(28) **Pro-drop phenomena in Russian:**

pro ponimaju [čp čto [tp pro imešť v vidu idři v understand-1.SG.PRES that have-2.SG.PRES in mind go to koncert] concert]

**Note:**
There is disagreement as to whether Russian has pro-drop (alternatively, subject pronoun omission is treated as an instance of contextually licensed ellipsis).

(i) Russian has pro-drop:

(ii) Russian does not have pro-drop:

Perlmutter & Moore (2002):
“Like many other languages, Russian has what has come to be known as pro-drop: subject pronouns can be silent. [...] Pro-drop in Russian is subject to discourse conditions that make it much less common than pro-drop in Italian or Spanish.”

Rožička (1986):
There is an asymmetry between 1./2. and 3. person pro-drop.

Müller (1988): Russian differs from some other pro-drop languages in that overt subject pronouns can be unmarked in non-emphatic contexts. However, in some cases, using pro is in fact the only possibility to achieve a certain reading.

(29) **Generic interpretation of subject pronoun as ‘one’** (Müller (1988, 90)):

a. Ob etom pro mnogo govorjat about this - much talk-3.PL
b. Pro prosiat [PRO ne kuriť’] - ask-3.PL not to smoke

4.5 Pro-Drop in the Presence of Syncretism

c. Ėtu knigu pro pročitvať za dva časa
   this book - read-2SG. in two hours

**Potential problem:**
Things are slightly more difficult because Russian has radical person impoverishment in the past tense. Shouldn’t this imply that there is no pro-drop at all in this language?

(30) **Verbal Inflection in Russian, past tense:**

<table>
<thead>
<tr>
<th>Pronoun</th>
<th>Gender</th>
<th>Number</th>
<th>Case</th>
<th>Tense</th>
<th>Stem</th>
<th>Endings</th>
</tr>
</thead>
<tbody>
<tr>
<td>'read'</td>
<td>past.masc</td>
<td>past.fem</td>
<td>past.neut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,-pl</td>
<td>čita-l</td>
<td>čita-la</td>
<td>čita-l-o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,-pl</td>
<td>čita-l</td>
<td>čita-la</td>
<td>čita-l-o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3,-pl</td>
<td>čita-l</td>
<td>čita-la</td>
<td>čita-l-o</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1, +pl</td>
<td>čita-l-i</td>
<td>čita-l-ii</td>
<td>čita-l-i</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2, +pl</td>
<td>čita-l-i</td>
<td>čita-l-ii</td>
<td>čita-l-i</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3, +pl</td>
<td>čita-l-i</td>
<td>čita-l-ii</td>
<td>čita-l-i</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Observation:**
Pro-drop can also take place in these contexts (Müller & Rohrbacher (1989, 19), Rožička (1986)).

(31) **Pro-drop in Russian past tense contexts:**

Anna postupila verno [čp čto pro rešila [čp stat’ vračom]]
Anna acted correctly that she decided to become doctor

**Towards a solution:**
A diachronic perspective: The inflected past tense forms in (31) are historically 4-participle forms (with the originally accompanying auxiliaries dropped in modern Russian); as such, they never had any person features in the first place (these features had been located on the auxiliaries). Hence, the most plausible analysis of these forms is not that an impoverishment rule deletes all person features in past tense contexts, but rather that the inflection markers for past tense are not specified for person features for essentially historical reasons: The markers did not bear person features to begin with; they have been re-analyzed as finite markers in parallel with the disappearance of associated auxiliaries, and they simply have not acquired person features in their new function. This explains why subject pro-drop is possible in Russian, and in all tenses. A similar analysis can be given for pro-drop languages like Japanese, Korean, and Chinese: The generalization in (21) can be met because if there are no 0-features in the first place, there is no motivation for invoking a designated impoverishment rule that deletes 0-features - and it is only the presence of such impoverishment rules that may block pro licensing under present assumptions.

4.5 Pro-Drop in the Presence of Syncretism

Cysouw (2001) offers a comprehensive discussion of possible person syncretisms from a typological perspective, and he also provides information about pro-drop options in the
relevant languages. Based on his work, I go through six relevant cases in this section.

1. two languages involving syncretism that affects 2. and 3. person (Wambon and Kenzti-Dongola)

2. two languages involving syncretism that affects 1. and 3. person (Spanish and Koiari)

3. two languages involving syncretism that affects 1. and 2. person (English and Hunzib).

By and large, the conclusion will be that the impoverishment-based approach to morphological richness and pro-drop is corroborated by the empirical evidence.

Claim: Among the languages that exhibit syncretism in their verbal paradigms, those that do not permit pro-drop do suggest morphological analyses incorporating impoverishment, and those that do permit pro-drop do not lend themselves to morphological analyses that rely on impoverishment. This way, we can make sense of the observation that pro-drop may freely occur in languages despite the presence of syncretism in verbal paradigms, and despite the possibility that these syncretisms may be amenable to an account in terms of natural classes of persons. As a result, a standard counter-argument against correlating morphological richness and pro-drop (see, e.g., Cysouw (2001, 51) and Zifonun (2001, 57)) can be rebutted.

4.5.1 Wambon

Wambon is a Trans-New Guinea language (spoken in the Indonesian part) that exhibits syncretism of 2. and 3. person forms in its verbal paradigm (data from Vries (1989), cited after Cysouw (2004)); see (32).

(32) Verb inflection in Wambon
a. andet-ep-mbo
   eat-1.SG-PAST
   'I ate.'

b. andet-Ό-mbo
   eat-2./3.SG-PAST
   'You/he/she/it ate.'

Unlike languages like Icelandic and Dutch, which show the same pattern of syncretism in verb inflection, Wambon has free subject pro-drop. Consider now possible morphological analysis of the 2./3. person syncretism in Wambon, as in (33).

(33) a. (i) -ep ↔ [+1,-2]
   (ii) -Ό ↔ [1]

b. (i) -ep ↔ [+1,-2]
   (ii) -Ό ↔ [1]

c. (i) -ep ↔ [+1,-2]

4.5.2 Kenzti-Dongola

Consider next verb inflection in Kenzti-Dongola, a Nubian Nilo-Saharan language (data from Reineke (1870), discussed in Cysouw (2001, 43)). Again, there is a syncretism of 2. and 3. person (-sim), with another marker (-ri) reserved for 1. person contexts.

(34) Verb inflection in Kenzti-Dongola
a. ai
   tōg-ri
   1.SG.PROX beat-1.SG
   'I beat.'
b. er tógs-im
   2.SG.PRON beat-2/3.SG
   *You beat.*

c. ter tógs-im
   3.SG.PRON beat-2/3.SG
   *He/she/it beats.*

Some of the morphological analyses that are a priori possible are given in (35).

(35)  a. (i) -ir → [+1,-2]
      (ii) -im → [ -1]

   b. (i) -ir → [+1,-2]
      (ii) -im → [ -1]

   c. (i) -ir → [+1,-2]
      (ii) -α → [+1,2]
      (iii) -β → [+1,-2]
      (iv) -im → [+1]
      (v) [±2] → 0/[±1]________ (impoveryishment)

   d. (i) -ir → [+1,-2]
      (ii) -im → [ -1]
      (iii) [±2] → 0/[±1]________ (impoveryishment)

The interesting fact about Kenzi-Dongola is that pro-drop seems to be prohibited, with personal pronouns showing up in unmarked environments. This would then suggest impoverishment at work. The question then is whether there is any evidence for a system-wide pattern of syncretism in this language; and indeed there is: The personal pronouns for 2. and 3. person (er and ter) are extremely similar in their segmental make-up, and they differ a lot from the personal pronoun for 1. person (ai). Given subanalysis, this may then plausibly be taken to indicate that a uniform system-wide impoverishment rule of the type in (35-d) is active in Kenzi-Dongola. A look into Reinisch's (1879) original grammatical descriptions provides an even stronger argument for impoverishment in Kenzi-Dongola verb inflection. The inflection markers for present tense and aorist are listed in (36).

(36) Kenzi-Dongola conjugation, present tense and aorist

<table>
<thead>
<tr>
<th>Present</th>
<th>Aorist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.SG</td>
<td>-i</td>
</tr>
<tr>
<td>2.SG</td>
<td>-im</td>
</tr>
<tr>
<td>3.SG</td>
<td>-im</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Present</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.PL</td>
<td>-ru</td>
</tr>
<tr>
<td>2.PL</td>
<td>-ru</td>
</tr>
<tr>
<td>3.PL</td>
<td>-ran</td>
</tr>
</tbody>
</table>

4.5 Pro-Drop in the Presence of Syncretism

(36) clearly shows that the syncretism affecting 2. and 3. person in (34) is part of a system-wide pattern because it shows up both in present tense contexts and in aorist contexts, with different forms. Thus, an impoverishment analysis is strongly supported.2

The data presented so far are from the Dongola dialect of Kenzi-Dongola; interestingly, the Kunuz variety described in Abdel-Hafiz (1988) has slightly different markers but instantiates essentially the same pattern.

4.5.3 Spanish

Cysouw (2001, 43) notes that Spanish exhibits a 1./3. person syncretism (as it shows up systematically in the Germanic languages in singular past tense contexts; see above), but only in some paradigms. Still, pro-drop is possible throughout. The syncretism of 1. and 3. person forms that shows up in the pretérito imperfecto is shown in (37).

(37) Spanish pretérito imperfecto:

   a. habla-ndo
      speak-1./3.SG.PAST
      *I spoke.*
   b. habla-ba
      speak-2.SG.PAST
      *You spoke.*

Again, there is no evidence for an impoverishment approach: The syncretism is not part of a system-defining pattern (in other paradigms, 1. and 3. person are formally distinguished). The most straightforward analysis presumably views -t/θ as a separate tense/aspect marker (via subanalysis; compare comiù vs. comía). The ending -s is specified as [+1,±2], and +θ emerges as a default marker, with a [ ] specification.

4.5.4 Koiari

Like Wambon, Koiari is a Trans-New Guinea language (spoken in Papua New Guinea). Like Spanish, it exhibits syncretism in 1. and 3. person contexts in its verb inflection system; see (38) (the data are from Dutton (1996), cited here after Cysouw (2001, 44)).

(38) Verb inflection in Koiari:

   a. da ereva-ru
      1.PRON see-1./3.SG.PAST
      *I saw it.*
   b. a ereva-nas
      2.PRON see-2.SG.PAST
      *You saw it.*

2 Incidentally, the same conclusion can be drawn on the basis of the plural markers for 1. and 2. person.

Still, further research is required to substantiate this point, and to account for the initial t with 2. person pronouns. Furthermore, it is not yet clear whether -im in (35) should be radically underspecified ([ -1], or specified as [+1], assumed in (35-d); but considerations related to iconicity might favour non-radical underspecification.
Koiari does not exhibit pro-drop; Cysoou states that “these pronouns [...] are obligatorily used”. Under the general approach adopted here, we are therefore led to expect that impoverishment is involved: [-1, +2] contexts and [-1, -2] contexts are neutralized to [-1] contexts for morphological realization. For the time being, I will leave it at that; to decide this question, a more careful morphological analysis of the whole system of argument encoding is called for.

4.5.5 English

If one confines attention to the pattern in (39), it seems that English exhibits a syncretism of 1. and 2. person.

(39) Verb inflection in English present tense singular contexts
   a. I walk
   b. You walk
   c. She walks

The first thing to note here is that English, as a Germanic language, has inherited a system-defining syncretism for 1. and 3. person singular in past tense environments. Given that this Germanic syncretism is systematically derived by impoverishment, the fact that English does not have pro-drop is accounted for, independently of whether the syncretism in (39) can be traced back to impoverishment or not. Indeed, closer inspection reveals that that the 1./2. person syncretism in (39) does in fact not instantiate a system-wide syncretism pattern (see Williams (1994)): With verbs like be, 1. and 2. person are distinct: I am vs. You are. Moreover, the syncretism in (39) is part of a more general regularity: The syncretic form also shows up in all plural contexts (We walk, You walk, They walk), and in the intransitive (to walk). Clearly, the null form -∅ is simply the radically underspecified default form that fits everywhere (see Halle & Marantz (1993) and Williams (1994), among others).

4.5.6 Hunzib

Finally, let me turn to an instance of syncretism that affects 1. and 2. person in Hunzib, a Nakh-Daghestanian language. Relevant data are given in (40) (from Berg (1993), cited after Cysoou (2001, 46)).

(40) Verb inflection in Hunzib:
   a. da liyya-∅  ñeu
      1. PRON open-1./2.PRES door
         ‘I (shall) open the door.
   b. ma bok’o,l-∅  hæke
      2. PRON gather-1./2.PRES walnut

4.6 Conclusion

In contrast to what we have seen in English, this time there is really a syncretism affecting 1. and 2. person. The inflection marker -∅(∅) is used for 1. and 2. person in present tense contexts, and a null marker -∅ is used for 3. person. This suggests that 1. and 2. person form a natural class in Hunzib. Given that [±3] also belongs to the inventory of primitive person features that is in principle available for languages (Trommer (2006a,b), Nevins (2007)), we can assume that 1. and 2. person in Hunzib form a natural class characterized by the feature [±3] (either [+3] or [-3]) is then also needed to distinguish 1. and 2. person in Hunzib). The crucial question is whether the syncretism in (40) is due to pure underspecification of an inflection marker, or to a systematic impoverishment rule. Again, the available evidence does not quite suffice to settle this issue. However, there is one fact that would seem to support an impoverishment approach: As noted by Cysoou (2001), the same syncretism pattern shows up with different markers in Lak, which is a related Nakh-Daghestanian language; this situation is reminiscent of the situation in 1. and 3. person singular past tense contexts in the Germanic languages.

If the preceding reasoning is on the right track, the prediction is there should be no pro-drop in Hunzib, and this seems to be the case.

4.6 Conclusion

To sum up, by looking at a variety of typologically different languages, I have tried to substantiate that only system-defining patterns of syncretism are relevant for determining morphological richness; other kinds of syncretisms are not. This difference is captured by the interaction of impoverishment and underspecification of inflection markers in a version of Distributed Morphology that must be pre-syntactic so as to allow morphology to have an influence on syntactic operations. In line with this, I have argued that the abstract notion of impoverishment may offer a better means of measuring morphological richness (as relevant for pro-drop) than is available in more traditional conceptions of morphology.

4.7 Outlook

Note: A pre-syntactic approach to inflection does not imply that other morphological

3Note that in general, an alternative to postulating the three primitive features [±1], [±2], and [±3] as part of the universally accessible inventory of person features would be to assume only two primitive person features, and derive the remaining natural class by introducing variables over feature values; i.e., by adopting the system of a notation proposed in Chomsky (1965) and Chomsky & Halle (1968a). However, this would not be compatible with an impoverishment approach.
operations cannot take place within syntax, or post-syntactically. In fact, many of the
post-syntactic displacement analyses in Embick & Noyer (2001) could be maintained
in the present approach.

Open question:
To what extent could other core concepts of Distributed Morphology also be employed
in a pre-syntactic approach?

(41) Core concepts of Distributed Morphology.
  b. Local dislocation (Embick & Noyer (2001))
  c. Dissociated morphemes (Embick (2000))
  d. Fission (Halle & Marantz (1993))

(42) Fusion (based on Halle & Marantz (1993, 116)):
  a. Fusion takes two terminal nodes (morphemes) M₁ and M₂ that are sisters and
     combines them into a single terminal node Mₐ.
  b. Mₐ contains the features of both M₁ and M₂.
  c. Mₐ behaves like a single primitive morpheme: Only one vocabulary item can
     be inserted, in accordance with the Subset Principle (modulo fission).

Problem:
It is difficult to formulate fusion in a pre-syntactic approach: Two separate functional
heads would need to merge their feature sets while staying structurally distinct in the
numeration.

However:
Many (though not all) of the cases of fusion discussed in Halle & Marantz (1993) involve
fusion of case and number or fusion of agreement. In current syntactic theory
(cf. Chomsky (1995, ch. 4)), it is often assumed that T and Agr are a single node (T) in
the syntax. Similar conclusion may apply in the case of case and number (i.e., there is
only one relevant head in the syntax that bears both types of features).

Chapter 5

Enrichment

5.1 Introduction

Background (Matthews (1972, 82), Matthews (1974, 149)):
Extended (multiple) exponence in Greek verb inflection, English verb inflection, etc.

Extended exponence:
Cases of morphological realization where a single morpho-syntactic property seems to
be expressed by more than one exponent (i.e., inflection marker, in the cases to be
considered here).

Claim:
Extended exponence can be accounted for in Distributed Morphology by assuming
enrichment rules, which are complementary to well-established impoverishment rules,
and without resort to a notion like secondary exponence (Noyer (1992), Wunderlich
(1996), Bobaljik (2000), Frampton (2002)).

Empirical domain:
Interaction of argument encoding and number/person marking in:

- German (case-marking on nouns, number marking)
- Arnavi (case-marking on nouns, number marking)
- Timucua (agreement morphology on verbs, person marking)
- Sierra Popoluca (agreement morphology on verbs, person marking)

Also addressed:

- Tamazight Berber (verb inflection)
- Swahili (verb inflection)

5.2 Extended Exponence in Argument Encoding Systems

5.2.1 German

Observation:
Plural can be marked twice on nouns in dative (DAT) contexts in German (Eisenberg
Chapter 5. Enrichment

(2000), Wiese (2000a). Note: n must be a DAT plural marker rather than a simple DAT marker because it does not show up in the singular.

(1) Extended exponence in German nouns:
   a. Kind-er-n  (German)
      child-PL-DAT.PL
   b. *Kind-n
      child.SG-DAT.PL
   c. Tisch-er-n  (German)
      table-PL-DAT.PL
   d. *Tisch-n
      table.SG-DAT.PL

5.2.2 Archi

Observation:
The same phenomenon exists in the Daghhestanian language Archi (Köbrik 1991, 2003, Mel’čuk 1999, Plank 1999). Archi exhibits an ergative-absolutive (ERG-ABS) pattern of argument encoding. For a stem like *gel* (‘cup’), the ERG plural is created by adding the plural marker *ñi* and the ERG plural marker *ñi* (in that order); for a stem like *qban* (‘bridge’), the ERG plural is derived by adding the plural marker *ñi* and, again, the ERG plural marker *ñi* see (2-ac). As before, it is clear that *ñi* must be a marker of both case (ERG) and number (plural): This marker cannot be used in the singular, where the case markers *li*, *i* are used for marking ERG instead.

(2) Extended exponence in Archi nouns:
   a. gel-um-ñi
      cup-PL-ERG.PL
   b. gel-ñi
      cup.SG-ERG
   c. *qban-um-ñi
      bridge-PL-ERG.PL
   d. *qban-ñi
      bridge.SG-ERG

5.2.3 Timucua

Observation:
A similar phenomenon can be found in the domain of verb inflection in Timucua, an extinct language isolate from Florida (Mithun 1999, 53); the discussion here is based on Granberry (1990). Arguments are encoded by head-marking, i.e., case-sensitive agreement morphology on the verb; the pattern is a nominative-accusative one (NO ACC). (Assumption: case-assignment depends on Agree operations involving matching features (in the sense of Chomsky 2001), so structural case (like NOM) is present both on the case-marked DP and the case-marking head; see, e.g., Bobslij & Wurmbrand (2003)).

(3) Prefix markers:
   a. The internal argument of a transitive verb is encoded by an ‘object’, i.e., ACC prefix.
   b. Other primary arguments, including the external argument of a transitive verb, are encoded by a ‘subject’, i.e., NOM prefix.

5.2.4 Sierra Popoluca

Observation:
Sierra Popoluca (Mexe-Zoque, Mexico) employs a head-marking system of argument

c. A NOM prefix precedes an ACC prefix in transitive contexts; the two markers occupy positions no. 1 and 2 in the template identified by Granberry.
   d. These prefixes encode person (but not number) in addition to case:
      (i) two 1.NOM markers *ho- and *ni- (which occur with approximately equal frequency); Granberry (1990, 85)
      (ii) a 2.NOM marker *ce-
      (iii) a zero 3.NOM marker Ø-

(4) Suffix markers:
   a. Many more types of affixes show up on the inflected Timucua verb, but they are all suffixes.
   b. Among these: number markers indicating plural (in 7th position in Granberry’s template);
   c. Crucially, these plural markers also involve case (NOM) and person (local vs. 3) information and thus qualify as combined PERSON.NUMBER.NOM markers (not too unlike typical subject agreement markers in Indo-European languages like German or Icelandic).
   d. The markers are -bo (for 1./2.PL.NOM arguments) and -ma (for 3.PL.NOM arguments).

(5) Extended exponence in Timucua verbs
   a. loc-ni-ta-la
      1.NOM-be-ASP-LOC
      ‘I am.’
   b. ni-huba-so-ni-bec-te-la
      1.NOM-love-TR-REC-1/2.NOM.PL-ASP-LOC
      ‘We love each other.’
   c. ci-juhka-so-te-le
      2.NOM-love-TR-ASP-LOC
      ‘You love (someone).’
   d. ci-juhka-so-lo-te-le
      2.NOM-love-TR-1/2.NOM.PL-ASP-LOC
      ‘You love (someone).’
   e. ano 0-he-wa-na-no
      3.NOM-speak-ASP-LOC
      ‘The man is speaking.’
   f. 0-he-wa-na-la
      3.NOM-be-3.NOM.PL-ASP-LOC
      ‘They are just now.’

Note:
- (5-ace) involve singular subjects (1., 2., 3. person), with a prefix encoding person and case.
- (5-bdf) are corresponding examples with plural subjects (1., 2., 3. person) that exhibit extended exponence of case and person marking in Timucua.

(Other markers, irrelevant here: ASP (aspect, here: durative or bounded action), LOC (or TENSE: proximate vs. distant time), TR (transitivity), and REC (reciprocity); also note that te/la, le/la are variants.)
encoding that follows an ergative-absolutive pattern (ERG-ABS) (Elson (1960a, 29-30), Elson (1960b, 207-208)). As in Timucua, person can be marked twice on the verb.

(6) Extended exponent in Sierra Popoluca verbs, intransitive contexts
   a. A-nik-pa
      1.ABS-go-INC
      ‘I am going.’
      (Marlett (1986, 364))
   b. A-pišen
      1.ABS-man
      ‘I am a man.’
   c. Ta-hocy-pa
      1.INCL.ABS-take.a.walk-INC
      ‘You and I take a walk.’
      (Elson (1960b, 208))

(7) Extended exponent in Sierra Popoluca verbs, transitive contexts
   a. A-Ö-ko’c-pa
      1.ABS-3.ERG-hit-INC
      ‘He hits me.’
      (Sierra Popoluca) PERS.ABS = PERS.ERG = V = NUM = PASS = ASP
   b. Ö-Aq-ko’c-pa
      3.ABS-1.ERG-hit-INC
      ‘I hit him.’
   c. Ö-Tan-ko’c-pa
      3.ABS-1.INCL.ERG-hit-INC
      ‘You and I hit him.’
      (Elson (1960b, 208))

(8) Order of verbal affixes in Sierra Popoluca:

Note:
Number, passive, and aspect markers are ignored here.

(9) Apparent fusional case/person markers in Sierra Popoluca:

<table>
<thead>
<tr>
<th></th>
<th>ABS</th>
<th>ERG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>a</td>
<td>an</td>
</tr>
<tr>
<td>1.INCL</td>
<td>ta</td>
<td>tan</td>
</tr>
<tr>
<td>2.</td>
<td>mi</td>
<td>iñ</td>
</tr>
<tr>
<td>3.</td>
<td>i</td>
<td></td>
</tr>
</tbody>
</table>

Note:
This time, the evidence is not quite as direct, but it is there under an analysis that provides internal structure for the markers in (9), via subanalysis based on a decomposition of person features as in (10). The simplest analysis (that accounts for all instances of syncretism) will have to postulate that a is [+1], and that t is then marked [+1, +2] (Mueller (2006)). If so, there is extended exponent of [+1] in Sierra Popoluca.

5.3 Distributed Morphology

(10) Decomposition of person features (Frampton (2002)):
   a. [+1, -2] = 1. pers.
   b. [-1, +2] = 2. pers.
   c. [-1, -2] = 3. pers.
   d. [+1, +2] = 1. pers. incl.

Conclusion so far:
Extended exponent exists in the argument encoding systems of German, Archi, Timucua, and Sierra Popoluca.

Note:
That said, there are several cases where extended exponent has been argued to show up that may not be fully convincing upon closer inspection. For instance, Matthews (1974) argues for extended exponent on the basis of German plural formation per se, based on the fact that plural may be realized by a combination of segmental plural marker (like er) and Umlaut of the stem vowel, as in Buch (‘book’) vs. Bücher (‘books’). However, this evidence for extended exponent loses its force if we assume that Umlaut is encoded on plural markers as an abstract (‘floating’) feature; cf., e.g., Wiese (1990). Similar conclusions may be drawn in the case of deverbal noun formation in Kujamaa Joela discussed in Aronoff & Fudeman (2005, 154), where a class marker change is accompanied by vowel tensing.

Question:
For which kinds of approach does extended exponent pose a problem?

(i) Lexical-incremental approaches (e.g., Wunderlich (1996)):
Extended exponent is prima facie unexpected.
(ii) Inferential-realizational approaches (e.g., Matthews (1972), Anderson (1992), Aronoff (1994), Stump (2001)):
Extended exponent is expected.
(iii) Lexical-realizational approaches:
Distributed morphology — next section.

5.3 Distributed Morphology

(11) Late vocabulary insertion:
   a. Functional morphemes (F) contain fully specified bundles of morpho-syntactic features in syntax; however, they do not yet contain phonological material.
   b. 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.

(12) Vocabulary insertion into functional (F) morphemes:
   a. [F V F]
b. \( \mathbb{F} \) N F \]

(13) **Subset Principle (Halle (1997))**: 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).

(14) **Specificity of vocabulary items** (Lumsden (1992), Noyer (1992), Wiese (1999)): 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 \( \mathbb{F}' \).

(15) **Feature hierarchies**:
- a. Verbal domain: Tense > Person > Number > Gender
- b. Nominal domain: Number > Class > Case

(16) **Impoverishment** (Bonet (1991), Halle & Marantz (1993, 1994), Trommer (1999a), Bobaljik (2002b), Frampton (2002), Nevis (2000), Miller (2005)): Morpho-syntactic features can be deleted post-syntactically before vocabulary insertion takes place; this effects a "retreat to the general case".

Note:
As it stands, the Subset Principle ensures that only one vocabulary item can be inserted into a given functional morpheme. This is not the case when a further post-syntactic operation has applied, viz., fusion.

(17) **Fission** (Noyer (1992), Frampton (2002), not Halle & Marantz (1993)): If insertion of a vocabulary item \( V \) with the morpho-syntactic features \( \beta \) takes place into a fissioned morpheme \( M \) with the morpho-syntactic features \( \alpha \), then \( \alpha \) is split up into \( \beta \) and \( \alpha - \beta \), such that (a) and (b) hold:
- a. \( \alpha - \beta \) is available for further vocabulary insertion.
- b. \( \beta \) is not available for further vocabulary insertion.

Assumption:
The functional morphemes in this talk are subject to fission. (Background: Assuming that there are no semantically empty functional categories (Chomsky (2001)), fissioned morphemes will be far from exceptional.)

Consequence:
Vocabulary insertion into fissioned morphemes discharges morpho-syntactic features. This property makes it difficult to account for extended exponence.

### 5.4 Noyer’s Analysis of Verb Inflection in Tamazight Berber

(18) **Prefix Conjugation in Tamazight Berber** (Noyer (1992, 145-149)):

<table>
<thead>
<tr>
<th>dawa (‘cume’)</th>
<th>SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>dawa-( y )</td>
<td>n-dawa</td>
</tr>
<tr>
<td>2 MASC</td>
<td>dawa-d</td>
<td>t-dawa-m</td>
</tr>
<tr>
<td>2 FEM</td>
<td>dawa-d</td>
<td>t-dawa-n-t</td>
</tr>
<tr>
<td>3 MASC</td>
<td>t-dawa</td>
<td>dawa-n</td>
</tr>
<tr>
<td>3 FEM</td>
<td>t-dawa</td>
<td>dawa-n-t</td>
</tr>
</tbody>
</table>

**Observation:**
2. person can be expressed twice in a single verb form.

**Assumption:**
To reconcile extended exponence with the feature discharge in fissioned morphemes, Noyer introduces the concept of secondary exponence of morpho-syntactic features: A vocabulary item may presuppose that some feature (like [2]) has already been discharged prior to its insertion. This is formally encoded by adding the secondary feature(s) in brackets (also see Wunderlich (1996), Frampton (2002)).

(19) **Feature hierarchy**: Person > Number > Gender

(20) **An impoverishment rule that applies to (V-)F in Tamazight Berber**:
\([+\text{fem}] \rightarrow 0\) /[-2,-p]_

(21) **Vocabulary Items**:
- a. \( /r/ \rightarrow 1, [+pl] \)
- b. \( /y/ \rightarrow 1 \)
- c. \( /e/ \rightarrow 2 \)
- d. \( /m/ \rightarrow [+pl], [+fem] \) (2)
- e. \( /e/ \rightarrow [-pl], [+fem] \)
- f. \( /e/ \rightarrow [-pl], [+fem] \)
- g. \( /d/ \rightarrow [-pl] \) (2)
- h. \( /n/ \rightarrow [-pl] \)
- i. \( /t/ \rightarrow [+fem] \)

**Properties of the system**:
(i) Discontinuous bleeding (follows from fission)
(ii) Extended exponence (follows from secondary exponence)

**Assumption:**
Secondary exponence may be conceptually problematic since it threatens to undermine the notion of discharge. It may also raise problems for determining specificity. (Do secondary features count for the purposes of specificity?)
5.5 Enrichment

Suggestion:
Given that there is impoverishment, there is every reason to assume that the complementary operation also exists: enrichment.

(22) Enrichment:
Morpho-syntactic features can be added post-syntactically before vocabulary insertion takes place.

Potter’s problem:
• Deletion applied to some structure can only affect material that is part of the structure; but with insertion/epenthesis, things are more complicated because it is a priori unclear exactly what kind of material can or must be inserted into a given structure.
• Prof. McGonagall: ‘So... today we are starting Vanishing Spells. These are easier than Conjuring Spells, which you would not usually attempt until NEWT level, but they are still among the most difficult magic you will be tested on in your OWL.’ She was quite right; Harry found the Vanishing Spells horribly difficult.” (J.K. Rowling, Harry Potter and the Order of the Phoenix. London: Bloomsbury, 2003, p. 232.)

Assumption:
Enrichment can only insert features into a given structure that are already present: enrichment is doubling.

Differences to other approaches that involve adding material:

• Enrichment differs from dissociation (Embick 1998) and Embick & Noyer (2001)): Dissociation is a post-syntactic operation that introduces new features as part of new, ‘dissociated’ morphemes; also see Arregi & Nevins (2006) for the operation of ‘obliteration’, which differs from impoverishment in roughly the way that dissociation differs from enrichment.
• The impoverishment/enrichment dichotomy parallels the MAX/DEP constraint dichotomy in optimality theory (Prince & Smolensky 2004), used in inflectional morphology by Wunderlich (2004): An optimal violation of some MAX constraint can effect a non-realization of input features (which produces impoverishment effects); and an optimal violation of some DEP constraint can trigger a realization of features in the morphological output that are not present in the input.

Observation:
Both these approaches can introduce new material (morphemes, features).

Note:
Here and in what follows, standard person feature decomposition as in (10) is assumed ((20) then has [2] replaced with [−1, +2]).

5.6 Verb Inflection in Swahili

(23) An enrichment rule that applies to (V-)F in Tamasight Berber:
\[ \emptyset \rightarrow [−1, +2]/[−1, +2] \]

(24) Vocabulary Items:
a. /-m/ \rightarrow [−1, +2], [−pl], [−fem]  
b. /n/ \rightarrow [−1, +2], [−pl]  
c. /d/ \rightarrow [−1, +2], [−pl]  
d. /y/ \rightarrow [−1, +2]  
e. /t/ \rightarrow [−1, +2]

5.6 Verb Inflection in Swahili

Observation (Stump 2001, 162-163)):
Noyer’s concept of secondary exponence is empirically problematic since there are cases where one and the same inflection marker must act as a primary exponent of a morphosyntactic property in one context, and as a secondary exponent of the same morphosyntactic property in another context.

(25) Past tense and negation in Swahili 1. plural contexts:
a. tu-hi-taka (positive)  
  1.PL-PAST-want  
  ‘We wanted’
  
b. ha-tu-hu-taka (negative)  
  NEG-1.PL-NEG.PAST-want  
  ‘We did not want’

(26) Future tense and negation in Swahili 1. plural contexts:
a. tu-ta-taka (positive)  
  1.PL-FUT-want  
  ‘We will want’
  
b. ha-tu-ta-taka (negative)  
  NEG-1.PL-FUT-want  
  ‘We will not want’

(27) Vocabulary items (past tense, partial list):
a. /ku/ \rightarrow [past,neg]  
b. /li/ \rightarrow [past]  
c. /tu/ \rightarrow [−1, +2], [−pl]  
d. /ha/ \rightarrow [0] ([neg])

(28) Vocabulary items (future tense, partial list):
a. /ta/ \rightarrow [future]  
b. /tu/ \rightarrow [−1, +2], [−pl]  
c. /ha/ \rightarrow [neg]
5.7 Enrichment Rules for German, Archi, Timucua, and Sierra Popoloca

5.7.1 German

(31) Extended exponence in German nouns:
   a. Kind-er-n (German)
   b. Kind-n  
   c. Tisch- en  

Brute force solution (Alexiadou & Müller (2005)): The extended exponence problem in DAT plural contexts is denied by treating *en, en in Kind-er-n, Tisch-en as primitive markers.

Assumption:
A single F (Case/Number) head accompanies an N stem in the syntax in German.

(32) An enrichment rule that applies to (N)-F in German:
   \[ 0 \rightarrow [+pl]/[+pl]_[dat] \]

Restrictions on dative plural /n/:
The additional n marker that signals extended exponence in DAT plural contexts shows up only in a proper subset of the inflection classes in German declension: It occurs with inflection classes that have /er/ or /or/ as the plural marker, but it does not occur with inflection classes that have /-n/ or /-s/ as the plural marker (cf. the DAT plural forms Mensch-en vs. *Mensch-en(-e)n, Auto-s vs. *Auto-s(-e)n).

Possible analyses:
- The inflection classes that give rise to extended exponence form a natural class characterized by a primitive inflection class feature (ike \([+\delta]\)); see Alexiadou & Müller (2005). The enrichment rule in (32) would then be confined to \([+\delta]\), so that the DAT plural marker /n/ could be radically underspecified with respect to inflection class, and still only be inserted in proper contexts.
- Enrichment applies throughout, with the vocabulary item /-n/ confined to \([+\delta]\) environments.

What remains unaccounted for under these views:
- All inflection classes that have a general plural marker /-e/ or /-er/ permit a DAT plural marker /-n/.
- All inflection classes that have /-n/ or /-s/ as a general plural marker disallow an additional DAT plural marker /-n/ (there is more than one class at least in the cases of /-e/ and /-n/, based on differences in the singular, and with respect to Umlaut).

Conclusion:
Both the enrichment rule in (32) and the feature specification associated with the DAT plural marker /-n/ are not restricted to certain inflection classes; rather, the legitimate combinations are excluded on phonological or morpho-phonological grounds (Eisenberg (2000, 161)).

(33) (Simplified) Vocabulary items:
   a. /-er/ \[ \rightarrow [+pl][+\alpha,+\beta,+\gamma] \]
   b. /-n/ \[ \rightarrow [+pl][+\beta,+\gamma] \]
   c. /-n/ \[ \rightarrow [+pl][+\beta,+\gamma] \]

Note:
Primitive class features (like \([\pm\alpha],[\pm\beta],[\pm\gamma]\)) that encode natural classes of inflection classes (Oltra Massuet (1999), Alexiadou & Müller (2005), Trummer (2005)) outrank case features on the hierarchy of features. Thus, /-er/, /-or/ are inserted into fissioned (N)-F morphemes before /-n/ is.

5.7.2 Archi

(34) Extended exponence in Archi nouns:
   a. gel-um-čaj  
   b. gel-li  (Archi)
   c. q[lim-ori-čaj]  
   d. q[lim-i]

(35) An enrichment rule that applies to (N)-F in Archi:
   \[ 0 \rightarrow [+pl]/[+pl]_[erg] \]

(36) Vocabulary items:
   a. /-um/ \[ \rightarrow [+pl][+\alpha] \]
   b. /-or/ \[ \rightarrow [+pl][+\alpha] \]
   c. /-čaj/ \[ \rightarrow [+pl][+\alpha] \]

Note:
This problem does not show up under an enrichment analysis (assuming for the purposes of the argument that all the inflection markers in Swahili verb inflection are inserted into a single functional morpheme F').
Chapter 5. Enrichment

Note:
Oblique case forms are generated on the basis of the ergative form: parasitic (Priscianic) formations (Matthews 1972; Mel'ëuk 1999, 81). These forms are unproductive if case features are also decomposed (see Bierwisch 1967, Franks 1995, Wiese (1999); and Kirbik (2003, 60-61) for an approach along these lines).

(37) Paradigms of cases for ‘gel’ (‘cup’), ‘qlin’ (‘bridge’):

\[
\begin{array}{|c|c|c|}
\hline
& |g| & \text{pl} \\
\hline
\text{absolute} & \text{gel} & \text{gel-sum} \\
\hline
\text{ergative} & \text{gel-li} & \text{gel-sum-cai} \\
\hline
\text{genitive} & \text{gel-li-n} & \text{gel-sum-con} \\
\hline
\text{dative} & \text{gel-li-s} & \text{gel-sum-con} \\
\hline
\text{comparative} & \text{gel-li-Xur} & \text{gel-sum-con} \\
\hline
\text{comitative} & \text{gel-li-ni} & \text{gel-sum-con} \\
\hline
\text{permutative} & \text{gel-li-nam} & \text{gel-sum-con} \\
\hline
\end{array}
\]

5.7.3 Timucua

(38) Extended expanse in Timucua verbs

a. ho-ri-ta-la
   1. NO M-be-ASP-LOC
   'I am.'

b. ni-huba-so-ei-bo-te-la
   (Timucua)
   1. NOM-love-TR-LOC-1/2. NOM. PL-ASP-LOC
   'We love each other.'

c. ci-huba-so-te-le
   2. NO M-love-TR-ASP-LOC
   'You love (someone).'

d. ci-huba-so-bo-te-b
   2. NO M-love-TR-ASP-LOC
   'You love (someone).'

e. ano O-huna-na-no
   man 3. NOM-speak-ASP-LOC
   'The man is speaking.'

(39) An enrichment rule that applies to (V-)F in Timucua

\[
\emptyset \rightarrow [\mu_1, \nu_2, \text{nom}]/[\mu_1, \nu_2, \text{nom}]\]

Note 1:
\(\mu, \nu\) are variables over feature values (+, −) (see Chomsky 1965, 175 & 233), Chomsky & Halle (1968b, 83), Halle (1992, 80), Noyer (1992), Alexiadou & Miller (2005), Baerman (2006), and Harley (1994); Johnston (1996) for critical evaluation.

Note 2:
The case, person, and number features in (V-)F can be realized both by prefixation and by suffixation, as argued by Noyer (1992) for Tamazight Berber.

(40) Vocabulary items:

a. /ho/ (i/mi/) \rightarrow [+1, −2], [nom]

b. /ri/ \rightarrow [−1, +2], [nom]

c. /ci/ \rightarrow [−1, +2], [nom]

d. /bo/ \rightarrow [nom], [+pl]

e. /ma/ \rightarrow [−1, −2], [nom], [pl]

5.7.4 Sierra Popoluca

(41) Apparent fusional case/person markers in Sierra Popoluca:

\[
\begin{array}{|c|c|c|}
\hline
& \text{ABS} & \text{ERG} \\
\hline
1. & a & an \\
1. & ta & tan \\
1 → 2 & \text{man} \\
2 − 1 & \text{an} \\
3 & i & \\
\hline
\end{array}
\]

(42) Impoverishment rules

a. [oerg] \rightarrow 0/−[\alpha_1, \alpha_2] (global)

b. [−1] \rightarrow 0/−[2, -erg] (local)

(43) An enrichment rule that applies to F(-V) in Sierra Popoluca

\[
\emptyset \rightarrow [1] \\
\]

On this basis, the analysis of the argument encoding system of Sierra Popoluca in Miller (2006) can dispense with secondary features.

(44) Vocabulary items:

a. /n/ \rightarrow [+erg]

b. /t/ \rightarrow [+1, +2]

c. /a/ \rightarrow [+1]

d. /i/ \rightarrow [−1]

e. /m/ \rightarrow [−2, −erg]

Note:
The vocabulary items /t/ and /m/ are now more specific than in the analysis in the earlier approach (assuming that secondary features do not count for specificity), and this may create problems for marker order. Assuming ERG to be ranked high on the verbal hierarchy, and ABS low, and assuming a ranking \([±1] > [±2]\) (as in the earlier approach in Miller (2006)), all of the order facts follow, except for one: /t/ insertion is predicted to precede /a/ insertion. The fact that the order is nevertheless /t/-/a/- /m/-V can plausibly be linked to the fact that /t/ and /a/ realize the same feature (and to autonomous morphological structure).
5.8 Conclusion

1. The existence of post-syntactic enrichment in Distributed Morphology is expected for reasons of symmetry alone (given post-syntactic impoverishment); and by assuming enrichment, extended exponence can be accounted for without secondary features.

2. The present analysis differs from one in terms of secondary features in an important respect: Just as system-wide, non-accidental patterns of syncretism can be better accounted for by impoverishment than by accidental feature specifications of individual vocabulary items (Bobaljik (2002b)), only enrichment (and not an approach in terms of secondary features) makes it possible to treat extended exponence as a system-wide property. For instance, the fact that case and person can be realized twice on verbs in Timucua can be expressed as such by an enrichment rule, and is thus more than an accidental by-product of individual marker specifications.

3. An enrichment-based approach does not imply that extended exponence is a completely unmarked phenomenon that comes for free (as in Stump (2001), Anderson (2005)). Rather, it always takes a specific post-syntactic operation to bring it about: In the unmarked case, a single morpho-syntactic feature is not realized by more than one exponent (cf. Wurzel (1984)).

5.9 Pre-Syntactic Morphology

Obvious question:
Can enrichment be implemented in the pre-syntactic approach to inflectional morphology laid out in the previous chapters?

Answer:
Yes. The copy operations apply in the pre-syntactic, morphological component (e.g., the numeration), in the same way that pre-syntactic impoverishment does. Perhaps the additional features should be accompanied by a diacritic that precludes their use in syntax.

Chapter 6

Paradigm Economy

6.1 Introduction

Background:
(i) In Distributed Morphology, paradigms do not exist as genuine objects that, e.g., grammatical constraints can refer to. Rather, paradigms are epiphenomena—essentially, empirical generalizations that need to be derived in some way.
(ii) This view is incompatible with a more traditional view according to which paradigms exist as genuine entities in the grammar.

(1) Some constraints on paradigms:
   a. The Paradigm Economy Principle (Carstairs (1987))
   b. The No Blur Principle (Carstairs-McCarthy (1994))
   c. The Basic Instantiated Paradigm Principle (Williams (1994) vs. Bobaljik (2002b))

Observation:
(i) Constraints like the Paradigm Economy Principle and No Blur restrict the number of possible inflection classes that can be generated on the basis of a given set of inflection markers (for a given grammatical category).
(ii) If such constraints cannot be adopted for principled reasons, there is a danger that the theory is not restrictive enough.
(iii) Principled reasons that preclude adopting constraints on the number of possible inflection classes (on the basis of a given marker inventory):
   - non-existence of paradigms in morphological theory
   - decomposition of inflection class features in order to account for trans-paradigmatic syncretism (see Hallé (1992), Oltra Massuet (1999), Stump (2001), Alexiadou & Müller (2005), and below).

(Compare Noyer’s (2005) Interclass Syncretism Constraint, which is similar in its effects to No Blur, and fundamentally incompatible with a decomposition of inflection class features.)
Two possible strategies:
(i) argue that the question of how inflection classes can be constrained is irrelevant from a synchronic perspective;
(ii) argue that restrictions on the number of possible inflection classes (based on a given marker inventory) follow from independently motivated assumptions, without invoking specific constraints that explicitly impose restrictions on possible inflection classes.
I adopt the latter strategy.

A meta-principle that restricts possible inflectional systems (null hypothesis for both child and linguist) (Alexiadou & Müller (2005)):

(2) Syncretism Principle:
Identity of form implies identity of function
(within a certain domain, and unless there is evidence to the contrary).

Claim:
Accompanied by two simple and widely accepted auxiliary assumptions (which I call Elsewhere and Blocking), the Syncretism Principle significantly restricts the number of possible inflection classes by itself:

(3) Inflection Class Economy Theorem:
Given a set of \( n \) inflection markers, there can be at most \( 2^{n-1} \) inflection classes, independently of the number of grammatical categories that the markers have to distribute over.

6.2 Paradigm Economy

6.2.1 The Paradigm Economy Principle

Background question:
What is the largest number of inflection classes (paradigms) which a given array of inflectional resources can be organized into?

(4) The Paradigm Economy Principle (Carstairs 1987, 511):
When in a given language \( L \) more than one inflectional realization is available for some bundle or bundles of non-lexically-determined morphosyntactic properties associated with some part of speech \( N \), the number of macroparadigms for \( N \) is no greater than the number of distinct “rival” macroinflections available for that bundle which is most generously endowed with such rival realizations.

Consequence:
The number of (macro-) inflection classes does not exceed the greatest number of allomorphs.

(5) An impossible paradigm (Carstairs-McCarthy (1998)):

<table>
<thead>
<tr>
<th>Cell</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
<th>Class D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a</td>
<td>a</td>
<td>f</td>
<td>f</td>
</tr>
<tr>
<td>2</td>
<td>b</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>3</td>
<td>c</td>
<td>c</td>
<td>h</td>
<td>h</td>
</tr>
<tr>
<td>4</td>
<td>d</td>
<td>d</td>
<td>d</td>
<td>g</td>
</tr>
</tbody>
</table>

- number of inflection classes: 4
- greatest number of allomorphic variation: 2

(6) Hungarian present indefinite verb inflection

<table>
<thead>
<tr>
<th></th>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
<td>olvastak</td>
<td>il-ek</td>
</tr>
<tr>
<td>2</td>
<td>olvastak-O</td>
<td>il-ek(-O)</td>
</tr>
<tr>
<td>Pl 1</td>
<td>olvastak-en</td>
<td>il-en</td>
</tr>
</tbody>
</table>

Logical possibility.
Given complete independence of distribution of markers over (macro-) inflection classes: 276,480 inflection classes.

Actual (macro-) inflection classes: very few. How many exactly?

(7) Some Hungarian verbs

<table>
<thead>
<tr>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>olvansi</td>
<td>ülni</td>
</tr>
<tr>
<td>'read'</td>
<td>'sit'</td>
</tr>
<tr>
<td>enni</td>
<td>'eat'</td>
</tr>
<tr>
<td>érténi</td>
<td>'understand'</td>
</tr>
<tr>
<td>írni</td>
<td>'write'</td>
</tr>
</tbody>
</table>

| Sg 1 | olvastak | il-ek       | egy-en | értj-ek | írj-ek |
| 2   | olvastak-O | il-( -O )-el | egy-el | értj-( -O )-el | írj-(-O )-el |
| 3   | olvastak-en | il-en       | egy-ek | értj-en | írj-en |
| Pl 1 | olvastak-en | il-ink      | egy-ink | értj-ink | írj-ink |
| 2   | olvas-atok | il-atok     | egy-atok | értj-atok | írj-atok |
| 3   | olvas-anak | il-anak     | egy-anak | értj-anak | írj-anak |
Chapter 6. Paradigm Economy

6.2 Paradigm Economy

<table>
<thead>
<tr>
<th></th>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
<td>normal</td>
<td>ik</td>
</tr>
<tr>
<td>Pl 1</td>
<td>unk</td>
<td>unk</td>
</tr>
</tbody>
</table>

**Observation:**
The Paradigm Economy Principle crucially relies on the notion of macro-paradigm (or macro-inflection class).

**9) Macro-Paradigm:**
A macro-paradigm consists of:

a. any two or more similar paradigms whose inflectional differences either can be accounted for phonologically, or else correlate consistently with differences in semantic or lexically determined syntactic properties (like gender);

or

b. any paradigm which cannot be thus combined with other paradigm(s).

**10) German noun inflection**

<table>
<thead>
<tr>
<th>Case</th>
<th>Masculine</th>
<th>Feminine</th>
<th>Neuter</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>Hund, Schaf</td>
<td>Frau, Schafe</td>
<td>Mann, Frau</td>
<td>Männer</td>
</tr>
<tr>
<td>acc/sg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>dat/sg</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>gen/sg</td>
<td>eis</td>
<td>eis</td>
<td>eis</td>
<td>eis</td>
</tr>
<tr>
<td>nom/pl</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>acc/pl</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>dat/pl</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>gen/pl</td>
<td>e</td>
<td>e</td>
<td>e</td>
<td>e</td>
</tr>
</tbody>
</table>

**German noun inflection and paradigm economy:**
The classification in (10) is that of Alexiadou & Müller (2005), but there is a similar taxonomy of inflection classes in Carstairs (1986, 8). (Carstairs actually has 14 inflection classes, including ones with s as a plural marker.)

**Observation:**
The greatest number of allomorphic variation is 4 (nom/acc/gen plural; 5 if /s/ is included).

**Conclusion:**
There can at most be 4 (5) macro-inflection classes.

**11) Macro-inflection classes for German noun declension**

a. III (cér-plural)

b. V (so-called 'weak masculines')

c. IV/VI (cér-plural; gen/s for masc/neut; gen/s for fem)

d. II/II (cér-plural; gen/s for masc/neut; gen/s for fem)

e. I/III (cér-plural; gen/s for masc/neut; gen/s for fem)

**Problem:**
It seems that (11-de) must be combined into a single macroclass, with Umklaut accounted for independently (viz., (morpho-)phonologically). Carstairs (1987, 58): Stem allomorphy does indeed not give rise to different macro-inflection classes (there is "a distinction between affixal and non-affixal inflection").

**12) Russian noun inflection**

<table>
<thead>
<tr>
<th>Case</th>
<th>Masculine</th>
<th>Feminine</th>
<th>Neuter</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>0</td>
<td>a</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>acc/sg</td>
<td>/a</td>
<td>u</td>
<td>/a</td>
<td>u</td>
</tr>
<tr>
<td>dat/sg</td>
<td>u</td>
<td>e</td>
<td>i</td>
<td>u</td>
</tr>
<tr>
<td>gen/sg</td>
<td>a</td>
<td>i</td>
<td>i</td>
<td>a</td>
</tr>
<tr>
<td>loc/sg</td>
<td>e</td>
<td>e</td>
<td>i</td>
<td>e</td>
</tr>
</tbody>
</table>
b. Plural

<table>
<thead>
<tr>
<th>nom/pl</th>
<th>Ha</th>
<th>Hb/nu</th>
<th>Ha/Hz fnu</th>
<th>Ha/Hz fsu</th>
<th>IvA</th>
<th>IvB</th>
</tr>
</thead>
<tbody>
<tr>
<td>s</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>acc/pl</td>
<td>y/av</td>
<td>y/aj</td>
<td>y/aj</td>
<td>a/aj</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>dat/pl</td>
<td>am</td>
<td>am</td>
<td>jam</td>
<td>am</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>gen/pl</td>
<td>av</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>ref/pl</td>
<td>ami</td>
<td>ami</td>
<td>jami</td>
<td>ami</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>loc/pl</td>
<td>ax</td>
<td>ax</td>
<td>ax</td>
<td>ax</td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>

**Problem:**

1. If the [acc ← gen] animacy effect with class I noun stems and all plural noun stems gives rise to different inflection classes in each case, the number of inflection classes would have to be 8.

2. However, the greatest number of allomorphic variation is 4 (accusative singular).

**Solution:**

- The variation in acc/sg (class 1) and acc/pl (all classes) contexts correlates consistently with differences in semantic properties (animacy), and is thus predictable: 8 → 4.
- The differences between class 1 and class 4 are also predictable on the basis of gender: 4 → 3.
- Thus, there are only three macro-inflection classes in Russian noun declension.

**Conclusion:**

Given the concept of macro-paradigm (or macro-inflection class), counter-examples to the Paradigm Economy Principle can be explained away. On this view, if a different inflectional pattern can be described by invoking gender features, semantic features (like animacy), phonological features, or if it involves non-affixal inflection, it is irrelevant for paradigm economy: Only those differences count which are absolutely irreducible.

**Problem:**

(i) Without a concept like that of a macro-paradigm, the Paradigm Economy Principle would be much too restrictive; it would exclude many of the attested inflection patterns in languages with inflection classes.

(ii) However, assuming such a liberal notion of macro-paradigm reduces the Paradigm Economy Principle’s predictive power.

### 6.2.2 No Blur

**Background:**

The No Blur Principle is proposed in Carstairs-McCathy (1994) as a successor to his earlier Paradigm Economy Principle.

(13) **The No Blur Principle** (Carstairs-McCathy (1994, 742)):

Within any set of competing inflectional realizations for the same paradigmatic cell, no more than one can fail to identify inflection class unambiguously.

**Underlying idea:**

There is typically one elsewhere marker that is not specified for inflection class, but no more than that.

**Note:**

Just like the Paradigm Economy Principle, the No Blur Principle blocks (what looks like) a constant re-use of inflectional material in various inflection classes, and thereby restricts the number of possible inflection classes over a given inventory of markers. (Comment: However, this is exactly what seems to happen in inflectional systems of various types, again and again. Moreover, No Blur, at least as a tendency, is in conflict with the existence of trans-paradigmatic syncretism).

(14) **Strong feminine inflection classes in Icelandic**

<table>
<thead>
<tr>
<th>Ha</th>
<th>Fa'</th>
<th>Fi</th>
<th>Fc1</th>
<th>Fc2</th>
</tr>
</thead>
<tbody>
<tr>
<td>sel ('ma-(chine)')</td>
<td>drottning ('queen')</td>
<td>mynd ('picture')</td>
<td>geit ('goat')</td>
<td>vik ('bay')</td>
</tr>
<tr>
<td>nom sg</td>
<td>vel-O</td>
<td>drottning-O</td>
<td>mynd-O</td>
<td>geit-O</td>
</tr>
<tr>
<td>acc sg</td>
<td>vel-O</td>
<td>drottning-u</td>
<td>mynd-U</td>
<td>geit-O</td>
</tr>
<tr>
<td>dat sg</td>
<td>vel-O</td>
<td>drottning-u</td>
<td>mynd-U</td>
<td>geit-O</td>
</tr>
<tr>
<td>gen sg</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
</tr>
<tr>
<td>nom pl</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
</tr>
<tr>
<td>acc pl</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
</tr>
<tr>
<td>dat pl</td>
<td>vel-um</td>
<td>drottning-um</td>
<td>mynd-um</td>
<td>geit-um</td>
</tr>
<tr>
<td>gen pl</td>
<td>vel-es</td>
<td>drottning-es</td>
<td>mynd-es</td>
<td>geit-es</td>
</tr>
</tbody>
</table>

**Analysis** (Carstairs-McCathy (1994, 740-742)):

- Genitive singular and nominative plural are the leading forms ('Kennformen'; cf. Wurzel (1987)).
- Markers for gen/sg: ur ← gen/sg, class Fc2; ar ← gen/sg.
- Markers for nom/pl: ar ← nom/pl, class Fa; ir ← nom/pl, class Fi; ur ← nom/pl

**Problem:**

The No Blur Principle makes wrong predictions if the complete system of Icelandic noun declension is taken in to account: In both gen/sg and nom/pl contexts, there is more than one marker that fails to unambiguously identify inflection class.

(15) **The complete system of inflection classes in Icelandic noun inflection** (Kress (1982), Müller (2005)):
6.3 Paradigm Economy as a Theorem

6.3.1 Claim

(16) Inflection Class Economy Theorem:

Given a set of \( n \) inflection markers, there can be at most \( 2^{n-1} \) inflection classes, independently of the number of instantiations of the grammatical category that the markers have to distribute over.

Note:
The number of \( 2^{n-1} \) inflection classes encodes the powerset of the inventory of markers, minus one radically underspecified marker. For instance: Assuming an abstract system with five markers and six instantiations of a grammatical category (e.g., case), the Inflection Class Economy Theorem states that there can at most be sixteen (i.e., \( 2^{5-1} = 2^4 \)) inflection classes, out of the 15,625 (i.e., \( 5^6 \)) that would otherwise be possible.

Claim:
The Inflection Class Economy Theorem follows under any morphological theory that makes the three assumptions in (17), (18), and (19), which I call ‘Syncretism’, ‘Elsewhere’, and ‘Blocking’.

(I basically presuppose an approach along the lines of Distributed Morphology (Halle & Marantz 1993, 1994, Noyer 1992)), but things are exactly the same under alternative morphological theories, e.g., Minimalist Morphology (Wunderlich 1996, 1997b), or Paradigm Function Morphology (Stump 2001).)

(17) Syncretism (first assumption):
The Syncretism Principle holds: For each marker, there is a unique specification of morpho-syntactic features.

Note:
The Syncretism Principle underlies much recent (and, based on the Jakobsonian tradition, some not so recent) work in inflectional morphology; it provides simple and elegant analyses, and it has been empirically confirmed for a variety of inflectional systems in the world’s languages.

(18) Elsewhere (second assumption):
There is always one elsewhere marker that is radically underspecified with respect to inflection class (and more generally). Other markers may be underspecified to an arbitrary degree (including not at all).

Note:
(i) Underspecification as a means to account for syncretism is employed in most recent theories of inflectional morphology, including Distributed Morphology, Minimalist Morphology, and Paradigm Function Morphology.

(ii) The assumption that there is always one radically underspecified elsewhere marker in inflectional systems is quite common (see, e.g., Stump’s 2001 Identity Function Default rule).
(ii-a) It is well-motivated empirically because it can account for ‘discontinuous’ occurrences of markers in paradigms (where natural classes captured by non-radical underspecification is unlikely to be involved).

(ii-b) It ensures that there are (usually) no paradigmatic gaps in inflectional systems (which should otherwise be an option, given underspecification).

(19) **Blocking** (third assumption):

Competition of underspecified markers is resolved by choosing the most specific marker: For all (competing) markers $\alpha, \beta$, either $\alpha$ is more specific than $\beta$, or $\beta$ is more specific than $\alpha$.

*Note:* A Specificity constraint along these lines is adopted in Distributed Morphology (typically as part of the definition of the Subset Principle, see Halle (1997)), in Minimalist Morphology (see Wunderlich (1996, 1997b, 2004)), and in Paradigm Function Morphology (Stump (2001) calls the relevant constraint Panini’s Principle).

**Consequence:**

(i) Syntactism is systematic in the sense that only one specific morpho-syntactic features is associated with any given inflection marker (with the qualifications made in (2)).

(ii) For any given fully specified context, there is always one inflection marker that fits.

(iii) For any given fully specified context, there is never more than one inflection marker that fits.

(Elsewhere and Blocking emerge as two sides of the same coin; see ‘Completeness’ and ‘Uniqueness’ in Wunderlich (1996, 90).)

**Two remaining issues**

(i) How does the Inflection Class Economy Theorem constrain inflectional systems?

(ii) How does the Inflection Class Economy Theorem follow as a theorem from Syntactism, Elsewhere, and Blocking?

### 6.3.2 Illustration

(20) **Two versions of the basic question:**

a. Given an inventory of markers for a certain domain (e.g., noun inflection), how many inflection classes can there be?

b. Given an inventory of markers with associated features encoding a grammatical category (e.g., case) for a certain domain (e.g., noun inflection), how many inflection classes can there be?

**Assumption:**

(20-a) is the more interesting question: It does not presuppose that the specification of a marker for a grammatical category (e.g., with respect to case and/or number) is somehow privileged, i.e., more basic than its inflection class features. (Carstairs (1987)

only tries to answer (20-b).)

**A system without restrictions**

If, in a given domain (e.g., noun inflection), there are $n$ markers for $n$ instantiations of a grammatical category (e.g., case), the markers can be grouped into $n^m$ distinct inflection classes (i.e., the set of $m$-tuples over an input set with $n$ members). [Thanks to the compiling toolbox, UMass linguistics.]

**Abstract example 1:** 3 markers, 4 cases: $81 (= 3^4)$ possible inflection classes

```
 a a a a a b c b a a b a b a b a a b c a a c e c b a
 a a a a a b c b a b a b a b a b a b a b e c a c a c e c b
c a c a a c b a b a a a b e c a a c a c e c b
a a c c a c b c a a c b c e c e b b c e
a b a a a c b b a a a b c a a e a a a a a b c e
a b b a a b a b a a b a a e a b c e
a b b b a a b b b b b b e c a a b a a e a b c e
a b b c a a b b b b c b c a a a b a e a b c e
c a b c a a b b e c c e c a c e a c c c
```

**Note:**

(i) The letters $a, b,$ and $c$ stand for the three markers.

(ii) All four-letter rows (4-tuples separated by either a vertical line or a line break) correspond to one inflection class, with the first marker in a row being used for the first instantiation of case (e.g., nominative), the second one for the second instantiation of case (e.g., accusative), the third one for the third instantiation of case (e.g., dative), and the fourth one for the fourth instantiation of case (e.g., genitive).

(iii) It is unlikely that a language can be found in which eighty-one inflection classes have been generated on the basis of three markers and four instantiations of a grammatical category.

(21) **Predictions for example 1**

a. Paradigm Economy Principle, worst case scenario:

   3 inflection classes: the size of the inventory

b. No Blur Principle, worst case scenario:

   9 inflection classes: $(3-1) \times 4 + 1$

c. Inflection Class Economy Theorem, worst case scenario:

   4 inflection classes: $2^{9-1}$

(22) **Explanation of worst case scenario, Paradigm Economy Principle:**

All three markers can be allomorphs for a single case specification (e.g., $a, b,$ and $c$ can all be accusative markers); still, there can then only be three distinct inflection
6.3 Paradigm Economy as a Theorem

Recall:
(i) Syncretism: Only one morpho-syntactic feature specification is associated with each marker of the inventory for a given morphological domain (exceptions apart).
(ii) Elsewhere: There is always one marker that in principle fits into every context of fully specified morpho-syntactic features.
(iii) Blocking: There is always only one marker that can in fact be used for any fully specified context of morpho-syntactic features.

(26) Argument via marker deactivation combinations:

a. Since each inflection marker M can only be associated with one specification of morpho-syntactic features (because of Syncretism), it follows that for each inflection marker M and for each inflection class I, it must be the case that M is either compatible with I or incompatible with I.

b. A marker is compatible with an inflection class I if it bears no inflection class feature, if it bears fully specified inflection class information that completely characterizes I, or if it is characterized by a set of underspecified inflection class features that is a subset of the fully specified set of features that characterize the inflection class.

c. M is activated for I if it is compatible with it; and deactivated for I if it is
### Abstract example 3: 5 markers, 4 cases: 625 (= 5^4) possible inflection classes


| a a a a | c e a a | b e a a | b e d a | e a e a | b a e a | e a a a |
| a a b b | e c b c | b c d c | c c e c | d c d e | b d e f | f e f e |
| a a c c | e a e e | b e c c | b d e e | c c e e | d d e e | e e e e |
| a a d d | c e d d | b b d d | c c d e | d c d e | e e e e | e e e e |

#### d. Blocking ensures that each inflection class can be defined in terms of the markers that are active in it. For all competing markers α and β, it is fixed once and for all by the markers' feature specifications (and independently of inflection classes) that either β is more specific than α, or α is more specific than β.

#### e. Hence, if the same set of markers is activated for two inflection classes I₁ and I₂, I₁ must be identical to I₂.

#### f. Conversely, since every marker is either activated or deactivated for any given inflection class, it also follows that if the same set of markers is deactivated for two inflection classes I₁ and I₂, then I₁ and I₂ must be the same inflection class (because the same set of markers is then activated for I₁ and I₂, because a marker /x/ can only have one specification [4], and because specificity relations among competing markers are fixed).

#### g. In order to determine the maximal number of inflection classes on the basis of a given inventory of markers, it now suffices to successively deactivate all possible marker combinations.

#### h. Starting with the full inventory of markers, we can proceed by successively deactivating all combinations of markers, which yields class after class.

#### i. Thus, all markers of the inventory are compatible with class I; all except for marker α are compatible with class I; all except for markers α, β are compatible with class I; and so forth.

#### j. However, by assumption (Elsewhere), one marker always is the elsewhere (default) marker: It is compatible with all inflection classes because it is radically underspecified; and therefore it cannot be deactivated by definition.

#### k. Consequently, all possible marker deactivation combinations are provided by the powerset of the set of all the markers of the inventory minus the elsewhere marker: 2^n-1 for n markers.

#### l. Thus, given a set of n inflection markers, there can be at most 2^n-1 marker deactivation combinations.

#### m. Since marker deactivation combinations fully determine possible inflection classes, it now follows that given a set of n inflection markers, there can be at most 2^n-1 inflection classes.

---

**Note:** This reasoning is independent of the number of instantiations of the grammatical category (e.g., the number of cases) that a set of markers needs to distribute over. In contrast to what is the case under the No Blur Principle, an increase in instantiations of a grammatical category does not induce an increase in possible inflection classes over a given inventory of markers. Hence:
(27) **Inference Class Economy Theorem:**
Given a set of $n$ inference markers, there can be at most $2^{n-1}$ inference classes, independently of the number of grammatical categories that the markers have to distribute over.

### 6.3.4 Examples

#### 6.3.4.1 A First Example

**Note:**
In order to illustrate the possible marker deactivation patterns, the case categories are now called 1, 2, 3, and 4. Given an inventory of three markers, there are $2^{3-1} = 4$ deactivation combinations.

**(28) Example 1 revisited:**
- 3 markers: \{a, b, c\}
- 4 cases: 1, 2, 3, 4
  - a. Deactivation combinations: \{a, b, c\}, \{bc\}, \{b, c\}

**Observation:**
Of the 81 inference classes that would logically be possible under, only four remain, given Syntactic, Underdescription, and Blocking (i.e., the Inference Class Economy Theorem). This result holds under any specificity-induced order of the markers, and under any assignment of case features to markers.

**(29) A possible assignment of case specifications to markers:**

- a. Markers:
  - (i) \(/a/ \leftrightarrow [\ ]\)
  - (ii) \(/b/ \leftrightarrow [12]\)
  - (iii) \(/c/ \leftrightarrow [234]\)
- b. Specificity:
  - \(/b/ > /c/ > /a/\)
- c. Deactivation combinations and inflection classes:
  - \{b, c\} → aaaa
  - \{b\} → acc
  - \{c\} → bbca
  - \{\} → bbc

**(30) Another possible assignment of case specifications to markers:**

- a. Markers:
  - (i) \(/a/ \leftrightarrow [\ ]\)
  - (ii) \(/b/ \leftrightarrow [234]\)
  - (iii) \(/c/ \leftrightarrow [4]\)
- b. Specificity:
  - \(/c/ > /b/ > /a/\)
- c. Deactivation combinations and inflection classes:

#### 6.3.4.2 A second example

**(31) Example 3 revisited:**
- a. 5 markers: \{a, b, c, d, e\}
- b. 4 cases: 1, 2, 3, 4

**(32) A possible choice:**
- a. Markers:
  - (i) \(/a/ \leftrightarrow [\ ]\)
  - (ii) \(/b/ \leftrightarrow [23]\)
  - (iii) \(/c/ \leftrightarrow [14]\)
  - (iv) \(/d/ \leftrightarrow [3]\)
  - (v) \(/e/ \leftrightarrow [34]\)
- b. Specificity:
  - \(/d/ > /e/ > /c/ > /b/ > /a/\)
- c. Deactivation combinations & inflection classes:
  - \{b, c, d, e\} → aaaa
  - \{b, c, d\} → aaaa
  - \{b, c, e\} → aaaa
  - \{b, c\} → aaaa
  - \{b, d, e\} → aaaa
  - \{b, d\} → aaaa
  - \{b, e\} → aaaa
  - \{b\} → aaaa

**(33) Another possible choice:**
- a. Markers:
  - (i) \(/a/ \leftrightarrow [\ ]\)
  - (ii) \(/b/ \leftrightarrow [2]\)
  - (iii) \(/c/ \leftrightarrow [3]\)
  - (iv) \(/d/ \leftrightarrow [4]\)
  - (v) \(/e/ \leftrightarrow [3]\)
- b. Specificity:
  - \(/c/ > /d/ > /e/ > /b/ > /a/\)
- c. Deactivation combinations & inflection classes:
  - \{b, c, d, e\} → aaaa
  - \{b, c, d\} → aaaa
  - \{b, c, e\} → aaaa
  - \{b, c\} → aaaa
  - \{b, d, e\} → aaaa
  - \{b, d\} → aaaa
  - \{b, e\} → aaaa
  - \{b\} → aaaa

**Note:**
The question of how the cases 1, 2, 3, 4 are derived from more primitive decomposed features (e.g., how [234] can be a natural class), and how systems with apparently unnatural classes (under minimal decomposition) are derived, is orthogonal.
(34) A third possible choice:

a. Markers:
   (i) /a/ → \[ \]
   (ii) /b/ → [234]
   (iii) /c/ → [34]
   (iv) /d/ → [123]
   (v) /e/ → [123]

b. Specificity:
   /d/ > /e/ > /c/ > /b/ > /a/

c. Deactivation combinations & inflection classes:
   \{b, c, d, e\} → aaaa
   \{b, c, d\} → eeee
   \{b, c, e\} → dddd
   \{b, d, e\} → cacc
   \{b, d\} → eee
   \{b, e\} → dddc
   \{b\} → dddd
   \{c, d, e\} → abbb
   \{c, d\} → eeb
   \{c, e\} → ddb
   \{c\} → cccc
   \{d, e\} → cbcc
   \{d\} → dddd
   \{e\} → eddd
   \{\} → dddd

Note: Again, the issue of what the decomposed case and inflection class features that encode the deactivation patterns in systems like (32)-(35) would actually look like is strictly speaking orthogonal to present concerns. Still, for the case at hand, in the worst case there would have to be four binary inflection class features \{±α, [±β], [±γ] and [±δ]\} whose cross-classification yields the sixteen inflection classes (with individual markers underspecified as, e.g., [±α]); two abstract grammatical category features (e.g., case features such as [±governed], [±oblique], as in Bierwisch (1967)) would suffice for all systems but (34), where either reference to negated specifications would be necessary, or a third primitive feature would have to be invoked.

6.4 Conclusion

Scope of the result:

There may be minor imperfections in inflectional systems that can be traced back to historical factors. In particular, these deviations from optimal design show up in the form of isolated markers that cannot be given unique specifications, resulting in a case of non-systematic homophony. In such a situation, the set of possible inflection classes is mildly increased; it is \(2^{n-1+x}\), for \(x\) additional marker specifications required by unresolved, accidental homophony.

Abstractness of inflection markers:

The notion of “marker” is to be understood in a somewhat more abstract way that ignores allomorphic variation which is phonologically or morpho-phonologically conditioned (and not morphologically, as with variation determined by inflection class membership). For instance, Halle (1994) argues that the marker realizations \(ov\) and \(ej\) for genitive plural in Russian are allomorphs whose choice is morpho-phonologically determined; on this view, there is but a single marker \(/ov/\), accompanied a single underspecified set of morpho-syntactic features (perhaps involving underspecified inflection class features, as suggested in Alexiadou & Müller (2005) in order to account for fact that this marker exhibits trans- paradigmatic syncretism).

Note:

The same reasoning applies to
(i) the use of disjunction or negation in marker specifications (see, e.g., Bierwisch (1967), Wunderlich (1996)), but only if contradictory feature specifications are involved;
(ii) the use of variables over feature values in marker specifications (i.e., a notation (see Chomsky (1965), Chomsky & Halle (1968a) for the original concept, Noyer (1992), Harley (1994), Johnston (1996), Alexiadou & Müller (2005), Börjesson (2006), Georgi (2006), Lahne (2006), and Opitz (2006) on its use in morphology).

On the other hand:

The \(2^{n-1}\) formula captures worst case scenarios. Overlapping marker specifications reduce the number of possible inflection classes further. Moreover, for an inflectional system to fully exploit the logical possibilities for developing inflection classes as they arise under the Inflection Class Economy Theorem is extremely unlikely - typically, far from all marker deactivation combinations will be employed.

(36) Consequences for other morphological operations:

a. Fission (Distributed Morphology; Halle & Marantz (1993), Noyer (1992)), rule blocks (stem- and paradigm accounts; Anderson (1992), Stump (2001)). Both concepts give rise to instances of subanalysis, in the sense that what may look like a complex marker at first sight turns out to be best analyzed as a sequence of smaller markers, each with its own specifications (Janda & Joseph (1992), Berkaud (2005)); unproblematic as long as it is understood that no more than one inflection class can determine a sequence of subanalyzed markers in each case.

b. Impoverishment (Distributed Morphology): Given that standard impoverishment (as feature deletion) can be reanalyzed as insertion of a highly specific null marker (Trumner (1990a)), each impoverishment rule also increases the set of n’s (for which the powerset is created) by one.
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