I. Introduction: Morphology as a Separate Component of Grammar

1. Background

Central assumption:
Inflectional morphology is closely related to syntactic structure, but there are cases where morphology does not share the same vocabulary with syntax (morphomic features, underspecified features), and there are other areas where principles or constraints are relevant for morphology that seem to play no role in syntax. Therefore, the null hypothesis in (1) that morphology = syntax, just applied to smaller linguistic objects, cannot be maintained.

(1) The morphology = syntax assumption:
“The alternative [to theories that envisage a separate morphological component] would be to reject the additional non-syntactic assumptions, and push the syntactic program that we have been discussing as far as possible. [...] There are just different morphemes and [...] these somehow interfere with one another when syntactic structure is built, but there is no competition, no ordering of morphemes, no duplication of syntactic features in terminals and vocabulary items, no extra mechanism of vocabulary insertion (as yet unformalized).”

(Chris Collins on fb, 2016)

2. Morpho-Syntactic Features between Morphology and Syntax

Morphology:
Inventory of inflection markers (exponents)

Syntax:
Distribution of inflection markers (exponents)

Paradigm 1: Pronominal inflection in German

<table>
<thead>
<tr>
<th>[-pl]</th>
<th>+masc</th>
<th>+neut</th>
<th>+fem</th>
</tr>
</thead>
<tbody>
<tr>
<td>-nom</td>
<td>-er</td>
<td>-es</td>
<td>-e</td>
</tr>
<tr>
<td>+acc</td>
<td>-en</td>
<td>-es</td>
<td>-e</td>
</tr>
<tr>
<td>+dat</td>
<td>-em</td>
<td>-em</td>
<td>-er</td>
</tr>
<tr>
<td>+gen</td>
<td>-es</td>
<td>-es</td>
<td>-er</td>
</tr>
</tbody>
</table>

Syntactic structure

(2) dass Fritz diesem Mann traut
that Fritznom this mandet trusts
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.

3. 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. These features thus qualify as morphonic (Aronoff (1994)).
(ii) Underspecification is relevant in morphology, but (typically) not in syntax.

Paradigm 2: Russian noun inflection, inflection class [1], singular: [+masc]

<table>
<thead>
<tr>
<th></th>
<th>zavod[ø] (‘factory’)</th>
<th>student[ø] (‘student’)</th>
<th>žitel[ø] (‘inhabitant’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>zavod-Ø</td>
<td>student-Ø</td>
<td>žitel-Ø</td>
</tr>
<tr>
<td>akk/sg</td>
<td>zavod-Ø</td>
<td>student-a</td>
<td>žitel-ja</td>
</tr>
<tr>
<td>dat/sg</td>
<td>zavod-u</td>
<td>student-u</td>
<td>žitel-ju</td>
</tr>
<tr>
<td>gen/sg</td>
<td>zavod-a</td>
<td>student-a</td>
<td>žitel-ja</td>
</tr>
<tr>
<td>inst/sg</td>
<td>zavod-om</td>
<td>student-om</td>
<td>žitel-em</td>
</tr>
<tr>
<td>prep/sg</td>
<td>zavod-e</td>
<td>student-e</td>
<td>žitel-e</td>
</tr>
</tbody>
</table>

3.1. Necessity of Inflection Classes

Observation (Aronoff (1994), Corbett & Fraser (1993), Fraser & Corbett (1994), Halle (1994)): 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.

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] – see Dirigent ‘conductor’ vs. Planet ‘planet’).

3.2. Syncretism and Underspecification

Observation:
There are many homonymies 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:
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 [+dat, +masc, –pl] and [+dat, +neut, –pl]: -em; and this marker is different from all the other markers in paradigm 1.
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>-Ø</td>
<td>-a</td>
</tr>
<tr>
<td>[–acc]</td>
<td>-Ø/-a</td>
<td>-u</td>
</tr>
<tr>
<td>[–dat]</td>
<td>-a</td>
<td>-i/-ov(-ej)</td>
</tr>
<tr>
<td>[–gen]</td>
<td>-a</td>
<td>-am</td>
</tr>
<tr>
<td>[–inst]</td>
<td>-o</td>
<td>m</td>
</tr>
<tr>
<td>[–peep]</td>
<td>-e</td>
<td>-i/-ej</td>
</tr>
</tbody>
</table>

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>Hund</td>
<td>‘dog’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schaf</td>
<td>‘sheep’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baum</td>
<td>‘tree’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mann</td>
<td>‘man’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strahl</td>
<td>‘ray’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auge</td>
<td>‘eye’</td>
<td></td>
<td></td>
<td></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>Planet</td>
<td>‘planet’</td>
<td>Ziege</td>
<td>‘goat’</td>
<td>Maus</td>
</tr>
<tr>
<td>nom</td>
<td>Planet-Ø</td>
<td>Ziege-Ø</td>
<td>Maus-Ø</td>
<td>Drangsal-Ø</td>
</tr>
<tr>
<td>acc</td>
<td>Planet-en Ziege-en Maus-en Drangsal-en</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dat</td>
<td>Planet-en Ziege-en Maus-en Drangsal-en</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gen</td>
<td>Planet-en Ziege-en Maus-en Drangsal-en</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Paradigm 8: Noun inflection in German (simplified)

<table>
<thead>
<tr>
<th></th>
<th>[1]</th>
<th>[2]</th>
<th>[3]</th>
<th>[4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[–nom]</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-Ø</td>
</tr>
<tr>
<td>[–acc]</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-(e)n</td>
</tr>
<tr>
<td>[–dat]</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-Ø</td>
<td>-(e)n</td>
</tr>
<tr>
<td>[–gen]</td>
<td>-(e)s</td>
<td>-(e)s</td>
<td>-(e)s</td>
<td>-(e)n</td>
</tr>
<tr>
<td>[+nom]</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
</tr>
<tr>
<td>[+acc]</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
</tr>
<tr>
<td>[+dat]</td>
<td>-(e)n</td>
<td>-(e)n</td>
<td>-(e)n</td>
<td>-(e)n</td>
</tr>
<tr>
<td>[+gen]</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
<td>-(e)</td>
</tr>
</tbody>
</table>

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.

4) 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 -en is not characterized as [–dat,–masc,–fem] or as [–dat,–masc,–fem]. Rather, this marker is characterized by a feature specification that is underspecified with respect to gender: [+dat,–fem,–pl].

Observation:
The same situation arises with case features. Consider again paradigm 1. The marker -es is employed for both nominative neuter and accusative neuter contexts. This syncretism is in line with a basic Indo-European principle (see (5)), and thus certainly not accidental.

(5) Reconstructed case system of Proto-Indo-European, singular only

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>*-s</td>
<td>*-m</td>
<td>*-s / *-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
</tr>
<tr>
<td>VOC</td>
<td>*-Ø</td>
<td>*-m</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
</tr>
<tr>
<td>ACC</td>
<td>*-m</td>
<td>*-m</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</td>
<td>*-Ø</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).

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

a. nominative = [+obj,–obl]

b. accusative = [+obj,–obl]

c. dative = [+obj,+obl]

d. genitive = [+obj,+obl]

Consequence:

Nominative and accusative form a natural class.

Genitive and dative form a natural class.

Accusative and dative form a natural class.

Nominative and genitive form a natural class.

Nominative and dative do not form a natural class.

Accusative and genitive do not form a natural class.

3.3. Alternative Accounts of Syncretism

Side remark:

Deriving syncretism by feature decomposition and underspecification is a well-established research strategy. However, there are also other theoretical approaches to syncretism, including those in (7) (none of these alternative approaches is inherently incompatible with underspecification).

(7) Alternative approaches:

a. Paradigm geometry


The main idea is that syncretism are derivable 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


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.

4. Underspecification and Competition

4.1. 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.


4.2. 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.

(8) Subset Principle:

An inflection marker $F$ is merged with a stem $S$ for a fully specified feature structure $M$ 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).

(9) 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 $F_j$.

Note:


• Assumption: Plural does not have gender features in German.

• Assumption: The morphological exponents are either consonantal or $\emptyset$; an additional $\emptyset$ with consonantal markers does not have to be morphologically encoded (it is added in the phonological component).

10. Marker entries

a. /n/ $\leftrightarrow$ [+pl,+obj,+obl]  

b. /m/ $\leftrightarrow$ [+fem,+obj,+obl]  

c. /s/ $\leftrightarrow$ [+fem,+obl]
5. Further Instantiations of Grammatical Categories

Observation:
There is similar evidence for decomposition and underspecification for virtually all (instances of) grammatical categories: number, person, tense, aspect, inflection class, ...

5.1. Numerus und Person im Englischen

Das englische Verb 'be' im Präsens

<table>
<thead>
<tr>
<th></th>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sg</td>
<td>am</td>
<td>are</td>
</tr>
<tr>
<td>2. Sg</td>
<td>are</td>
<td>are</td>
</tr>
<tr>
<td>3. Sg</td>
<td>is</td>
<td>are</td>
</tr>
</tbody>
</table>

Unterspezifikationsanalyse:

a. /am/ $\leftrightarrow$ [1,–pl]
b. /is/ $\leftrightarrow$ [3,–pl]
c. /are/ $\leftrightarrow$ [ ]

Bemerkung: /are/ ist nicht vollständig ohne Spezifikation. Vermerkt muss mindestens sein, dass es sich um eine finite Verbform von 'be' handelt.

5.2. Numerus im Gotischen

Pronomina, Nomina, Verben im Gotischen

<table>
<thead>
<tr>
<th>Singular</th>
<th>Nominativ</th>
<th>Präsens</th>
<th>Person 1</th>
<th>Person 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nom</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–obj,obl</td>
<td>r se</td>
<td>s se</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>Acc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–obj,obl</td>
<td>n r se</td>
<td>s re</td>
<td>r e</td>
<td>r e</td>
</tr>
<tr>
<td>Dat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–obj,obl</td>
<td>m s re</td>
<td>m s re</td>
<td>re</td>
<td>re</td>
</tr>
<tr>
<td>Gen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–obj,obl</td>
<td>s re</td>
<td>s re</td>
<td>re</td>
<td>re</td>
</tr>
</tbody>
</table>

Numerusmerkmale:


Unterspezifikationsanalyse:


5.3. Genus im Norwegischen

Im Norwegischen (bokmål) gibt es zwei Genera (Neutrum und Utrum) und zwei Numeri (Singular und Plural). Wie im Deutschen gibt es eine starke und eine schwache Deklination der Adjektive.

<table>
<thead>
<tr>
<th></th>
<th>Starke</th>
<th>Schwach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Utrum</td>
<td>Neutrum</td>
</tr>
<tr>
<td>Singular</td>
<td>Ø</td>
<td>e</td>
</tr>
<tr>
<td>Plural</td>
<td>e</td>
<td>e</td>
</tr>
</tbody>
</table>

Unterspezifikationsanalyse:

a. /Ø/ $\leftrightarrow$ [–neut,–pl,–stark]b. /t/ $\leftrightarrow$ [+neut,–pl,–stark]c. /e/ $\leftrightarrow$ [ ]

5.4. Person im Isländischen

Konjugation im Isländischen

<table>
<thead>
<tr>
<th></th>
<th>Schwache Verben, Klasse 1:</th>
<th>Starke Verben, Klasse 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presens</td>
<td>krefja (forderen')</td>
<td>sleppa (entschlüpfen')</td>
</tr>
<tr>
<td>Präteritum</td>
<td>krafði</td>
<td>slapp-Ø</td>
</tr>
<tr>
<td>1.Sg.</td>
<td>kref</td>
<td>slepp</td>
</tr>
<tr>
<td>2.Sg.</td>
<td>krefur</td>
<td>sleppur</td>
</tr>
<tr>
<td>3.Sg.</td>
<td>krefur</td>
<td>sleppur</td>
</tr>
<tr>
<td>1.Pl.</td>
<td>krefjum</td>
<td>sleppum</td>
</tr>
<tr>
<td>2.Pl.</td>
<td>krefjuð</td>
<td>sleppuð</td>
</tr>
<tr>
<td>3.Pl.</td>
<td>krefja</td>
<td>sleppa</td>
</tr>
</tbody>
</table>

Personmerkmale im Isländischen:

a. 1. Person = [+1,–2]b. 2. Person = [+1,+2]

5.5. Interaction

d. /r/ $\leftrightarrow$ [+obl]e. /n/ $\leftrightarrow$ [+mask,fem,–obj,obl]f. /r/ $\leftrightarrow$ [+mask,fem,–obl]g. /s/ $\leftrightarrow$ [–fem,–obl]h. /e/ $\leftrightarrow$ [ ]

(11) Interaction

dies | masc.sg: | neut.sg: | fem.sg: | pl: |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[+m,–f]</td>
<td>[–m,–f]</td>
<td>[m,+f]</td>
<td>[+pl]</td>
</tr>
</tbody>
</table>

nom | –obj,obl | r se | s se | e | e |
acc | –obj,obl | n r se | s re | r e | r e |
dat | –obj,obl | m s re | m s re | re | re |
gen | –obj,obl | s re | s re | re | re |
c. 3. Person = \([-1,-2\] 

5.5. Person im Wambon

(22) Konjugation im Wambon (Trans New-Guinea)

a. andet-ep-mbo
   essen-1.SG-PRÄT
b. andet-Ø-mbo
   essen-2./3.SG-PRÄT

(23) Unterspezifikationsanalyse

a. /ep/ ↔ [+1,–2]
b. /Ø/ ↔ [-1]

Oder:
(24) Unterspezifikationsanalyse

a. /ep/ ↔ [+1,–2]
b. /Ø/ ↔ [-1]

5.6. Person im Hunzib

(25) Konjugation im Hunzib (Nakh-Dagestanisch):

a. đə hîyaa-č əçu
   1.PRON öffnen-1./2.PRÄS Tür
   'Ich werde die Tür öffnen.'
b. mə bok'o.l-čo hexe
   2.PRON sammeln-1./2.PRÄS Walnüsse
   'Du wirst Walnüsse sammeln.'
c. oxlul hîyaa-Ø əçu
   DEM öffnen-3.PRÄS Tür
   'Sie/er öffnet die Tür.'

(26) Personmerkmale im Hunzib:

a. 1. Person = [+1,–3]
b. 2. Person = [-1,–3]
c. 3. Person = [-1,+3]

5.7. Kasus im Tschechischen 1

(27) Deklination der Nomina im Tschechischen

<table>
<thead>
<tr>
<th>Nom</th>
<th>Akk</th>
<th>Gen</th>
<th>Dat</th>
<th>Lok</th>
<th>Ins</th>
</tr>
</thead>
<tbody>
<tr>
<td>masc1</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>masc2</td>
<td>-e</td>
<td>-a</td>
<td>-ø</td>
<td>-u</td>
<td>-ø</td>
</tr>
<tr>
<td>masc3</td>
<td>-i</td>
<td>-u</td>
<td>-ø</td>
<td>-u</td>
<td>-i</td>
</tr>
<tr>
<td>masc4</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>masc5</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>fem1</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>fem2</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>neutr1</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>neutr2</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
<tr>
<td>neutr3</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
<td>-ø</td>
</tr>
</tbody>
</table>

Singular

Dual

Plural

Kasusmerkmale im Tschechischen

a. Nominativ = [+obl,–obj,–präp]
b. Akkusativ = [+obl,–obj,–präp]
c. Genitiv = [+obl,–obj,–präp]
d. Dativ = [+obl,–obj,–präp]
e. Lokativ = [+obl,–obj,–präp]
f. Instrumental = [+obl,–obj,–präp]

5.8. Kasus im Tschechischen 2

(28) Singular der Deklinationen masc2 und fem1:

<table>
<thead>
<tr>
<th>masc2</th>
<th>fem2</th>
</tr>
</thead>
<tbody>
<tr>
<td>+anim</td>
<td>+anim</td>
</tr>
</tbody>
</table>

Nominativ

Akkusativ

Genitiv

Dativ

Lokativ

Instrumental
6. Further Evidence for Morphomic Features

Note:
In some cases it looks like feature decomposition alone does not suffice to account for systematic cases of syncretism because the syncretism spans two categories. Arguably, this goes for syncretisms involving feminine/singular and plural in German pronominal inflection (see paradigm 1): However, feminine and plural do not form a natural class in any obvious sense that would be predicted by the distribution of these categories in the syntax.

Another case:
Verb inflection in Borana Oromo (Afro-Asiatic; Kenya).

(30) Verb inflection in Borana Oromo (Stroomer (1995))

<table>
<thead>
<tr>
<th>aff, main</th>
<th>aff, neg</th>
<th>aff, sub</th>
<th>neg, sub</th>
</tr>
</thead>
<tbody>
<tr>
<td>present/sg 1</td>
<td>-a</td>
<td>-u</td>
<td>-u</td>
</tr>
<tr>
<td>2</td>
<td>-ta</td>
<td>-tu</td>
<td>-tu</td>
</tr>
<tr>
<td>3 masc</td>
<td>-a</td>
<td>-u</td>
<td>-u</td>
</tr>
<tr>
<td>3 fem</td>
<td>-ti</td>
<td>-tu</td>
<td>-tu</td>
</tr>
</tbody>
</table>

Observation:
It looks like 3 masc and 1 form a natural class, as do 3 fem and 2: The syncretisms span gender and person. If these instances of syncretism are to be accounted for via underspecification, the features involved must be non-syntactic and abstract – i.e., morphomic (see Bonami & Boyé (2010) for a general approach along these lines).

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

(31) Stump’s taxonomy of theories of inflection:

<table>
<thead>
<tr>
<th>Incremental</th>
<th>Realizational</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical</td>
<td>Inferential</td>
</tr>
</tbody>
</table>

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 is 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.

8. Empirical Evidence for Realizational Theories

8.1. Extended Exponence

(34) Extended exponence (Matthews (1972a; 1974)):
The morpho-syntactic properties that are associated with an inflected word, can be realized by more than one morphological exponent in a word.

(35) Plural formation with diminutives in Breton:
a. bagig ‘small boat’
b. bagoùigoù ‘small boats’

(36) Negative preterite forms in Swahili:
a. tu-li-ta ‘we wanted’

Some theories

(32) a. lexical-incremental:
   Lieber (1992), Wunderlich (1996; 1997c;b) (Minimalist Morphology)
b. lexical-realizational:
   Halle & Marantz (1993; 1994) ( Distributed Morphology)
c. inferential-incremental:
   hardly attested
d. inferential-realizational:

Differences
Abstracting away from underspecification, (33) shows different treatments.

(33) a. Lexical approaches (incremental or realizational):
   students[+N,+dat,+masc,–pl] ⇐ /student/[+N,+masc, class[1]] + /u/[+dat,+masc,–pl, class[1]]
   diesem[+N,+dat,+masc,–pl] ⇐ /dies/[+D] + /em/[+dat,+masc,–pl]

b. Inferential-realizational approaches:
   students[+N,+dat,+masc,–pl] ⇐ word form of the stem /student/ for the specification [+dat,–pl]
   diesem[+D,+dat,+masc,–pl] ⇐ word form of the stem /dies/ for the specification [+dat,–pl]

Comment
The type of theory sketched above is lexical (i.e., inflection markers exist as separate objects) and realizational (i.e., inflection markers do not contribute new features that the word form would not have otherwise). However, as will become clear, this approach differs significantly from Distributed Morphology.

Note:
Roughly the same distinction as between lexical and inferential theories had already been proposed by Hockett (1954): item-and-arrangement approaches vs. item-and-process approaches.
b. ha-tu-ku-taka ‘we did not want’
    ku = neg.pret, ha = neg.

(37) **Participle 2 in German:**
    a. sprechen
    b. ge-sproch-en (3 exponents)

(38) **Standard ways out → extended exponence:**

- **Feature decomposition:**
  Upon closer inspection, there is in fact no extended exponence.

- **Contextual features:**
  The second exponent only uses the features of the first exponent as secondary, contextual features.

- **Enrichment:**
  There is a rule that copies the relevant features prior to morphological realization.

- **Denial:**
  Features can be realized more than once without any problems.

(39) **Abstract example:**
Kind-er-n – Kind-PL-PL.DAT
    a. pl = [+sg,+pl]
       er ↔ [+sg], n ↔ [+pl,+obj,+obl]
    b. [+pl] ≠ ([+pl])
       er ↔ [+pl], n ↔ [+obj,+obl]+[+pl])
    c. Ø → [+pl]/[+pl],[+obj,+obl][+[pl]]
    d. er ↔ [+pl], n ↔ [+obj,+obl,+pl]

8.2. **Amorphematic Exponence**
In many cases a morphological exponent does not look like an affix; here it is a priori difficult to analyze it as a lexical item.

(40) **Umlaut with plurals in German:**
    a. Mutter – Mütter
    b. Tal – Täler

(41) **Ablaut with strong verbs in German:**
    a. werfen – warfen
    b. gießen – gossen

(42) **Subtractive perfect morphology in Papago (Uto-Aztecan) (Anderson (1992, 65), Aronoff & Fudeman (2005, 47)):**

<table>
<thead>
<tr>
<th>Imperfekt</th>
<th>Pl.</th>
<th>Sg.</th>
<th>Pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>hijn ‘gehend’</td>
<td>hijn ‘ging’</td>
<td>hi:</td>
<td>‘dispatched’</td>
</tr>
<tr>
<td>hijn ‘bellend’</td>
<td>hijn ‘belled’</td>
<td>hi:n</td>
<td>‘bellte’</td>
</tr>
<tr>
<td>gatwıd ‘schoßend’</td>
<td>gatwıd ‘schoß’</td>
<td>gatwi</td>
<td>‘schoßt’</td>
</tr>
<tr>
<td>‘elpig ‘schälend’</td>
<td>‘elpig ‘schälte’</td>
<td>elpi</td>
<td>‘sählt’</td>
</tr>
</tbody>
</table>

**Way out: amorphematic exponence**

**Assumption:**
There are empty affixes with diacritic elements that encode the non-affixial properties.

(43) **Plural markers in German:**
    a. ‘Ø ↔ [+pl,KlasseXY]’
       (zero exponent with a floating feature)
    b. ‘(e) ↔ [+pl,KlasseXY]’
       (optionally realizable a with a floating umlaut feature)

(44) **Subtractive perfect exponent in Papago:**
[-1]Ø ↔ [+perf]

(45) **Semantics of the diacritic elements:**
    a. ‘X = a vowel undergoes umlaut if it is closest to X and can in principle be affected by umlaut.
    b. ‘[-1]Ø = the closest segment to the left of X is deleted.

**Note:**
Influential analyses of this type have been developed by McCarthy (1981) (for binyanim in Arabic) and Marantz (1982) (for reduplication). Also see Trommer (2011; 2014; 2015) for a recent optimality-theoretic approach.

9. **Word and Paradigm Approaches**

- All approaches mentioned so far presuppose that inflected words are separable into a stem and one or more inflectional exponent(s).
- In strict Wort and Paradigm Approaches, this assumption is not made (cf., e.g., Matthews (1991), Blevins (2004)). Here the inflected word is a primitive of grammar. Nevertheless, generalizations can be established over the set of all inflected word forms in a paradigm, and these generalizations can to some extent trace the effects of morphological rules of inflection.

**Final remark:**
In principle, mixed approaches are conceivable, e.g.:

- Some complex word forms are derived by rules of inflection, others aren’t (e.g., weak vs. strong verbs in German or English).
• Some aspects of complex word forms are derived by concatenation of two lexical items; in addition, there can be rules of inflection that affect a stem without lexical material being involved (e.g., plural by affixation vs. plural by umlaut in German).

II. Distributed Morphology 1

Refs.: Halle & Marantz (1994; 1993)


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.

(46) Structure of vocabulary items:
/phonological features/ ↔ [morpho-syntactic features]

Three central assumptions of Distributed Morphology:
(i) late insertion
(ii) underspecification
(iii) syntactic hierarchical structure all the way down

10.1. Late Insertion

(47) 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 X0 categories (i.e., morphemes) are morphologically realized by insertion of vocabulary items (vocabulary insertion, VI). This way, (l-) 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.

10.2. 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.

10.3. 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. In addition, genuinely morphological operations (which apply after syntax but before insertion) manipulate syntactic items and respect syntactic principles (to a certain degree). Among these purely morphological operations are merger, fusion, fission, and impoverishment.

10.4. Structure of the Grammar

Observation:
In practice, Distributed Morphology typically (though not necessarily) envisages syntactic structures that employ many different functional categories. In that respect, the approach is very much compatible with a certain type of syntactic approach developed within the general Principles and Parameters framework (or, possibly, the Minimalist Program); see, e.g., studies based on cartography.

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

Side remark (Arregi & Nevis (2012, ch. 6)):
Assuming a Distributed Morphology approach, there are various operations that apply post-syntactically (after all regular syntactic operations) but before phonological realization: copying, fission, dissimilation, impoverishment, metathesis. Here the order is relevant, and it follows from how close to syntax, or close to phonology, a given post-syntactic operation is: Rules where concepts like hierarchy play a role apply before rules that mention phonological features.

10.5. 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 effects 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”

10.6. 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.

10.7. Examples

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. \([X, F_1, F_2, F_3] \) (f-morpheme)
c. \( F_2 \rightarrow \emptyset / \left[ X \right] Y \) (impoveryment)
d. \( \left[ X, F_1, F_2, F_3 \right] Y \) (f-morpheme after impoverishment, before insertion)
e. Insertion applies to \( P_B \), not to \( P_A \) (even though the latter is more specific).

(52) A concrete example: Adjectival markers in Norwegian (Harley & Noyer (2003), Sauerland (1996)):

a. Vocabulary items:
   (i) \( /t/ \leftrightarrow [–pl,+neut] /\text{Adj} \)
   (ii) \( \emptyset \leftrightarrow [–pl,–neut] /\text{Adj} \)
   (iii) \( /e/ \leftrightarrow [ ] /\text{Adj} \)

b. Impoverishment:
   \( [±\text{neut}] \rightarrow \emptyset \) in syntactic contexts with weak inflection

Paradigm 9: Adjectival markers in Norwegian

\[
\begin{array}{|c|c|c|}
\hline
\text{Strong} & [\text{neut}] & [+\text{neut}] \\
\hline
[–pl] & \emptyset & /t/ \\
[+pl] & /e/ & /e/ \\
\hline
\text{Weak} & [\text{neut}] & [+\text{neut}] \\
[–pl] & /e/ & /e/ \\
[+pl] & /e/ & /e/ \\
\hline
\end{array}
\]

10.8. Clitic Object Pronouns in Spanish

(53) Structure of object clitics (as with nouns):

\[
[\text{Det} [\text{Det} \text{Det Theme} ] \text{Number} ]
\]

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

Subset Principle and Specificity

(54) 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).

(55) Specificity of vocabulary items:
A vocabulary item \( V_i \) is more specific than a vocabulary item \( V_j \) iff \( V_i \) has more morpho-syntactic features than \( V_j \).

Vocabulary Insertion 1: Det markers

(56) Det markers (`stems'):

\[
\begin{array}{l}
/n/ \leftrightarrow [1.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/m/ \leftrightarrow [1.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/o/ \leftrightarrow [2.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/t/ \leftrightarrow [2.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/l/ \leftrightarrow [ ] /\llbracket [+\text{case}] \\
/s/ \leftrightarrow [ ] /\llbracket [+\text{case}] \\
\end{array}
\]

Assumption:
After insertions of the stems, but before insertion of theme vowels and number markers, the two redundancy rules in (57-a) and (57-b) apply, in this order.

(57) Redundancy rules:

a. \( [ ] \rightarrow [\llbracket III \rrbracket /\llbracket dat\rrbracket ] \)

b. \( [ ] \rightarrow [II] /\llbracket [+\text{fem}] \rrbracket \)

Remark:
At least redundancy rule (57-a) should possibly be understood in such a way that it applies only in the context [3.\text{Pers}]:
\( [ ] \rightarrow [\llbracket III \rrbracket /\llbracket dat\rrbracket ] /3\text{.Pers}\)
Otherwise, it seems that wrong predictions would be made for [2.Pers]-dative contexts. But see below.

Vocabulary Insertion 2: Theme vowels

(58) Theme vowels and inflection class features:

\[
\begin{array}{l}
/e/ \leftrightarrow [III] \\
/a/ \leftrightarrow [II] \\
/o/ \leftrightarrow [ ] \\
\end{array}
\]

Vocabulary Insertion 3: Number markers

(59) Number markers:

\[
\begin{array}{l}
/s/ \leftrightarrow [+\text{pl}] \\
/o/ \leftrightarrow [ ] \\
\end{array}
\]

All Vocabulary Items

(60) Det markers (`stems'):

\[
\begin{array}{l}
/n/ \leftrightarrow [1.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/m/ \leftrightarrow [1.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/o/ \leftrightarrow [2.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/t/ \leftrightarrow [2.\text{Pers}] /\llbracket +\text{pl}\rrbracket \\
/l/ \leftrightarrow [ ] /\llbracket [+\text{case}] \\
/s/ \leftrightarrow [ ] /\llbracket [+\text{case}] \\
\end{array}
\]

(61) Redundancy rules:

a. \( [ ] \rightarrow [\llbracket III \rrbracket /\llbracket dat,3.\text{Pers}\rrbracket ] \)

b. \( [ ] \rightarrow [II] /\llbracket [+\text{fem}] \rrbracket \)
would also have to be classified as incompatible with 2. Person contexts. Such an approach then /l/ or /s/ would have to be inserted instead. Consequently, these latter markers.

(63) Number markers:
/s/ ↔ [+pl]
(O) ↔ [\ ]

Paradigm 10: Clitic object pronouns in Spanish

<table>
<thead>
<tr>
<th>[–pl]</th>
<th>[+masc]</th>
<th>[3.Pers]</th>
<th>[+fem]</th>
<th>[2.Pers]</th>
<th>[1.Pers]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc</td>
<td>/l/-/o/-Ø</td>
<td>/l/\m/-/a/-Ø</td>
<td>/t/-[III]/-/e/-Ø</td>
<td>/m/-[II]/-/e/-Ø</td>
<td>/Ø/-[III]/-/e/-Ø</td>
</tr>
<tr>
<td>Dat</td>
<td>/l/-[III]/-/e/-Ø</td>
<td>/t/-[III]/-/e/-Ø</td>
<td>/m/-[II]/-/e/-Ø</td>
<td>/Ø/-[III]/-/e/-Ø</td>
<td></td>
</tr>
<tr>
<td>Refl</td>
<td>/s/-[III]/-/e/-Ø</td>
<td>/l/-[III]/-/e/-Ø</td>
<td>/t/-[III]/-/e/-Ø</td>
<td>/m/-[II]/-/e/-Ø</td>
<td>/Ø/-[III]/-/e/-Ø</td>
</tr>
<tr>
<td>[–pl]</td>
<td>[+masc]</td>
<td>[3.Pers]</td>
<td>[+fem]</td>
<td>[2.Pers]</td>
<td>[1.Pers]</td>
</tr>
<tr>
<td>Acc</td>
<td>/l/-/o/-/s/</td>
<td>/l/-[III]/-/a/-/s/</td>
<td>/Ø/-/o/-/s/</td>
<td>/n/-/o/-/o/-/s/</td>
<td></td>
</tr>
<tr>
<td>Dat</td>
<td>/l/-[III]/-/e/-/s/</td>
<td>/t/-[III]/-/e/-/s/</td>
<td>/m/-[II]/-/e/-/s/</td>
<td>/Ø/-[III]/-/e/-/s/</td>
<td></td>
</tr>
<tr>
<td>Refl</td>
<td>/s/-[III]/-/e/-/s/</td>
<td>/l/-[III]/-/e/-/s/</td>
<td>/t/-[III]/-/e/-/s/</td>
<td>/m/-[II]/-/e/-/s/</td>
<td>/Ø/-[III]/-/e/-/s/</td>
</tr>
</tbody>
</table>

10.9. Comments

Remark:
The inflection class features typeset 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 (57-a). Similarly for gender features and (57-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 be 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 /t/. /t/ could in principle be restricted to singular contexts; but then /l/ or /s/ would have to be inserted instead. Consequently, these latter markers would also have to be classified as incompatible with 2. Person contexts. 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 /o/ in (58) does not depend on the presence of this feature for insertion. Why, then, is the stem marker /n/ equipped with this feature in order to trigger subsequent /o/ insertion (in contrast to /l/ and /Ø/)? 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 (57-n). However, as noted above, this rule may only hold for [3.Pers] contexts: would it also apply in [2.Pers] contexts, Ø would also need class information ([I]). Thus, the sole remaining scenario under which [I] would be needed for /n/ would be one where (57-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.

Note:
At this point, Distributed Morphology ceases to be fully realizational.

10.10. 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.

(64) Impoverishment rule for [2.Pers]:

Consequence:
There is a retreat to the general case: In the plural, the [2.Pers] features is deleted. Therefore, Ø cannot be inserted, and the same goes for /t/. As a result, the most specific remaining stem marker is /l/. Consequently, /los/ 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, (57-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.

(65) Impoverishment rule for [Dative]:

\[
\text{[Dat]} \rightarrow \emptyset / \text{[+Acc]}
\]

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

Spurious ‘se’

(66) Spurious se (based on Bonet (1995)):

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

Interaction of impoverishment rules

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


\[\quad \Rightarrow \quad [\text{[+Theme}+[+pl] & [3.Pers,Acc]+Theme+[–pl]}
\]

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) under-specification (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 imperatives, which may co-occur with clitic object pronouns.

(68) 2.Pers.Plural imperatives with clitic pronouns, 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 3. ACC THEME PL
   ‘You give it to me!’

(69) 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.

10.11. Structures

(70) Structure in Standard Spanish:

(71) Structure in Carribean Spanish:

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.

**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** (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 $M_\alpha$.

b. $M_\beta$ has the features of both $M_1$ and $M_2$.

c. At this point, only one vocabulary item $V$ can be inserted in $M_\alpha$; 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**

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

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

b. $M_\beta$ has the features of both $M_1$ and $M_2$.

c. At this point, only one vocabulary item $V$ can be inserted in $M_\alpha$; insertion is regulated by the Subset Principle.

**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), Trommer (1999a) is different. (This latter version may be a bit more widely adopted in the recent literature.)

**The two concepts of fission**

(77) **Fission**$_\alpha$ (Halle & Marantz (1993)):

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

b. $M_\beta$ has the features of both $M_1$ and $M_2$.

(78) **Fission**$_\beta$ (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.
12. Verb Agreement in Georgian

Example:
Agreement markers on the verb in Georgian (based on Anderson (1992); also see Stump (2001)). Halle & Marantz (1993, 116ff) analyse the agreement marking on the verb by presupposing functional clitic morphemes that have undergone fusion.

(79) Paradigm
   a. v-xatav "I paint him."
   b. v-xatav-t "We paint him."
   c. Ø-xatav "You<sup>sg</sup> paint him."
   d. Ø-xatav-t "You<sup>pl</sup> paint him."
   e. xatav-s "He paints him."
   f. xatav-en "They paint him."

   g. m-xatav-s "He paints me."
   h. gv-xatav-s "He paints us."
   i. g-xatav-s "He paints you<sup>sg</sup>.
   j. g-xatav-(s-)t "He paints you<sup>pl</sup>.
   k. xatav-s "He paints him."
   l. xatav-s "He paints them."

   m. g-xatav "I paint you."
   n. m-xatav "You paint me."
   o. g-xatav-t "We paint you<sup>sg</sup>/youpl."
   or "I paint you<sup>pl</sup>.
   p. gv-xatav "You<sup>sg</sup> paint us."
   q. gv-xatav-t "You<sup>pl</sup> paint us."

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 (80) applies.
(iv) Finally, vocabulary insertion takes place.

(80) Fission of clitic clusters in Georgian:
[CI ... [+pl] ... ] + stem → [+pl] + CI + stem, where
   a. linear order is irrelevant; and
   b. fission does not apply if [+pl] is part of an argument bearing the features [+1],[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 [S0M]-marked argument with respect to person and number. The vocabulary items that are inserted in T/Agr are organised according to so-called "screeves". ("Screeves": loanword from Georgian; specific conjugation patterns that are roughly comparable to tenses.)
2. A (phonologically oriented) readjustment 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
(81) Vocabulary items for clitic positions:
   a. /gv-/ ↔ [+1],[DAT],[+pl]
   b. /m-/ ↔ [+1],[DAT]
   c. /g-/ ↔ [+2],[DAT]
   d. /v-/ ↔ [+1]
   e. Ø ↔ [+2]
(82) Vocabulary items for T/Agr in the examples above:
   b. /-s/ ↔ [+3],[+pl]
   c. /-en/ ↔ [+3],[+pl]

Specificity problems

Question:
It is really clear whether the competition of vocabulary items in (81) can always be resolved by specificity. As noted by Halle and Marantz, additional assumptions may be called for in cases like (81), 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 (81) has more
features in its context of insertion than the vocabulary item /v-/ in (81).
(An indeterminacy with respect to specificity could only arise if an element \( \alpha \) can only be more specific than another element \( \beta \) if the features of \( \alpha \) are a proper superset of the features of \( \beta \). Something along these lines has indeed been proposed, but it is not the case under present assumptions.)

Syntax

(83) Syntactic structure for vocabulary insertion:

\[
\begin{align*}
1 & \{ \text{Pers.}, \text{case}, \text{Num} \} & 2 & \{ \text{Pers.}, \text{case}, \text{Num} \} & 3 & \text{stem} & 4 & \text{T/Agr} & 5 & \{-3, -pl\}
\end{align*}
\]

Remarks on (83):

1. Position 1 contains the clitic cluster and up to two case and \( \Phi \) feature bundles (1. or 2. Person).
2. Position 2 encodes the verb stem.
3. Position 3 contains a case and \( \Phi \) feature bundle that realizes agreement with the subject (i.e., the nominative-marked argument).
4. Position 4 is only activated under fission. By assumption, it does not have to be stipulated that the \(-3/-\) feature that has been split off from the clitic cluster is realized as a (final) suffix; this is supposed to follow from the suffixal status of the vocabulary item /-t/, which is the only one that fits in this context.

Derived paradigm for xatav in Georgian:

<table>
<thead>
<tr>
<th>Subj( \rightarrow )</th>
<th>1.Sg.</th>
<th>1.Pl.</th>
<th>2.Sg.</th>
<th>2.Pl.</th>
<th>3.Sg.</th>
<th>3.Pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obj( \downarrow )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.Sg.</td>
<td>m-xatav-O</td>
<td>m-xatav-t</td>
<td>m-xatav-s</td>
<td>m-xatav-en</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.Pl.</td>
<td>g-xatav-O</td>
<td>g-xatav-t</td>
<td>g-xatav-s</td>
<td>g-xatav-en</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.Sg.</td>
<td>g-xatav-O</td>
<td>g-xatav-t</td>
<td>g-xatav-s</td>
<td>g-xatav-en</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.Pl.</td>
<td>g-xatav-O</td>
<td>g-xatav-t</td>
<td>g-xatav-s</td>
<td>g-xatav-en</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.Sg.</td>
<td>x-xatav-O</td>
<td>x-xatav-t</td>
<td>x-xatav-s</td>
<td>x-xatav-en</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.Pl.</td>
<td>x-xatav-O</td>
<td>x-xatav-t</td>
<td>x-xatav-s</td>
<td>x-xatav-en</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:

- /-s/ in 3.Sg. \( \rightarrow \) 2.Pl. contexts is deleted via readjustment.
- In 1.Pl. \( \rightarrow \) 2.Pl. context, there should be two /-t/ markers if nothing else is said.
- In (e.g.) 1.Sg. \( \rightarrow \) 3.Pl. or 2.Sg. \( \rightarrow \) 3.Pl. contexts, there is no /-t/ because 3.Pers. clitics do not undergo incorporation.
- Alternative (\( ? \)): \( \{ \pm pl \}-\) impoverishment with 3.Pers. in the clitic cluster.

Conclusion: Georgian verb agreement

Relevant morphological Operationen:

1. Verschmelzung (merger) von T und V.
2. Insertion eines Agr-Morphems (auch bekannt unter dem Terminus Dissoziation (dissoziation)).
3. Fusion (fusion) von T und Agr.

13. Verflechtung im Englischen

Relevante morphologische Operationen:

1. Verschmelzung (merge) von T und V.
2. Insertion eines Agr-Morphems (auch bekannt unter dem Terminus Dissoziation (dissoziation)).
3. Fusion (fusion) von T und Agr.

13.1. Satzstruktur im Englischen

(84) They sleep late

\[
\begin{align*}
\text{Oberflächenstruktur (Input für Morphologie):} & \quad \{ ce \ T \ F P \ D \ P \ ( \{ +3, +pl \} ) \} \| t \ F \ T \ ( \{ \text{part}, \text{prät} \} ) \} \| v P \ V \ A P \ \| \\
\text{Struktur nach Verschmelzung von T und V unter Adjazenz:} & \quad \{ ce \ T \ F P \ D \ P \ ( \{ +3, +pl \} ) \} \| t \ F \ T \ ( \{ \text{part}, \text{prät} \} ) \} \| A P \ \| \\
\text{Struktur nach Insertion von Agr und Fusion von T und Agr unter Schwesterschaft:} & \quad \{ ce \ T \ F P \ D \ P \ ( \{ +3, +pl \} ) \} \| t \ F \ T \ ( \{ \text{part}, \text{prät} \} ) \} \| A P \ ( \{ +3, +pl \} ) \} \| A P \ \| \\
\end{align*}
\]

13.2. Bemerkungen zur Satzstruktur

1. Der Schritt in (84-b) wird oft als Resultat von Senkung (lowering) in der Syntax ange- 
   sehen (so von Chomsky (1995, ch.2)). Hier ist es jedoch eine genuin morphologische 
   Veranschaulichung unter Adjazenz, die V und T verbindet (Halle & Marantz (1993, 134)).
2. Die Insertion von Agr in (84-c) verletzt die Inklusivitätsbedingung (Inclusiveness Condition) von Chomsky (1995; 2001), derzufolge nach Beginn einer Derivation 
   keine neuen, noch nicht in der Numeration vorhandenen Elemente mehr eingeführt 
   werden dürfen.
   - Andererseits deckt sich das Fehlen von Agr in der Syntax mit der Annahme in 
• “Agr morphemes are added to heads at morphological structure (MS) in accordance with language-particular requirements about what constitutes a morphologically well-formed word in that language.” (Halle & Marantz (1993, 135)).

• Die morpho-syntaktischen Merkmale werden vom Subjekt auf das eingesetzte Agr-Morphem kopiert.

13.3. Paradigma der Verbflexion im Englischen
Abzuleitendes Paradigma für Verbflexion im Englischen:

```
Verb
+part
+prät

play-ed play-ing

[+pl] [+pl] [+1] [+2] [+3]
play-ed play-Ø play-Ø play-s play-Ø
```

13.4. Vokabularelemente für englische Verbflexion

(85) Vokabularelemente für fusionierte T/Agr-Morpheme im Englischen:

a. /-n/ ↔ [+part, +prät] / X + wobei X = ~hew, ~prove, go, beat, ...

b. Ø ↔ [+prät] / Y + wobei Y = beat, drive, bind, sing, ...

c. /-t/ ↔ [+prät] / Z + wobei Z = dwell, buy, send, ...

d. /-d/ ↔ [-prät]

e. /-ing/ ↔ [+part]

f. /-z/ ↔ [+3, -pl]

g. Ø ↔ [ ]

Notation:

~ = Verben, die optional /-d/ oder /-n/ nehmen.

13.5. Bemerkungen zu den Vokabularelementen

• Spezifizität:

  - Per Annahme zählen kontextuelle Merkmale bei der Ermittlung von Spezifizität nicht mit.

  - Für die Ordnung in (85-def) reicht das einfachste Spezifizitätskonzept (Größe von Merkmalsmengen) nicht (Annahme: [+3, -pl] ist nicht spezifischer als [+prät]; wenn dem so wäre, würde ja auch im Präteritum ein /-z/ bei der 3.Pers.Sg. erwartet). Hier hilft entweder eine universelle Hierarchie wie Tempusmerkmale > Aspektmerkmale > Φ-Merkmale, oder eine extrinsische Ordnung.

• Nullmarker:

  - Der Nullmarker Ø kommt hier zweimal vor; einmal als unspezifizierter Default-Marker, ein anderes Mal als spezifischer Marker. Letzteres mag man für problematisch halten. Halle & Marantz (1993, 127, 133f.) sagen dazu:

    “Since in language there is an arbitrary relation between the morpho-syntactic and phonological features of a Vocabulary item (Saussure’s arbitraire du signe), it is not surprising that the relationship between morpho-syntactic and phonological features is one-to-many. Thus, phonological Ø is the phonological realization of two distinct sets of features in [(85)].” (p. 127)

    “We recognize at least two types of zero morphemes, leaving open the question of whether these are actually distinct. [...] It may be that Universal Grammar provides a zero spell-out as the default phonological realization of a morpheme in the unmarked case. This possibility in no way undermines the existence of zero morphemes.” (pp. 133-134).

    (Dass hier zweimal von “zero morpheme” die Rede ist, ist u.U. missverständlich: Gemeint sind ja nicht die abstrakten f-Morpheme, in die hinein Einsetzung erfolgt, sondern die Vokabularelemente, die f-Morpheme realisieren.)

13.6. Phonologische Korrekturen: Readjustment Rules

Beobachtung:

Damit ist die Analyse noch nicht ganz am Ende; in vielen Fällen müssen noch phonologische Korrekturen am soweit durch Syntax und Morphologie determinierten Ergebnis vorgenommen werden. Dies leisten readjustment rules.

(86) Notwendigkeit weiterer Veränderungen:

a. (i) beat – beat – beat-en

   drive – drove – driv-en

   break – broke – brok-en

   fall – fell – fall-en

   (ii) put – put – put

   sing – sang – sung

   bind – bound – bound

   come – came – come

b. dwell – dwel-t – dwel-t

leave – lef-t – lef-t

send – sen-t – sen-t

buy – bough-t – bough-t

c. (i) prove – prove-d – prov-en

   do – di-d – do-ne

   "Agr morphemes are added to heads at morphological structure (MS) in accordance with language-particular requirements about what constitutes a morphologically well-formed word in that language.” (Halle & Marantz (1993, 135)).
(87) Readjustment rules:

a. Reim → /u/ / X [+prät],
   wobei X-Reim = shall, will, can, stand.

b. Reim → /i/ / Y [+prät,–part],
   Reim → /2/ / Y [+prät,+part], [+prät,+3,-pl],
   wobei Y-Reim = do.

c. Reim → /e/ / Z [+prät], [+prät,+3,-pl],
   wobei Z-Reim = say.

d. V → [+hinten,+gerundet] / W ___ U [+prät],
   wobei WVU = sell, tell.

e. C → Ø / Q ___ [+prät], <[–prät,+3,-pl]>, wobei QC = make, <have>.

13.7. Suppletion

Grundannahme:
Sehr viel morphonologische Stammvariation ist vorhersagbar; echte, willkürliche Suppletion gibt es kaum. In den wenigen Fällen, wo es echte Suppletivformen gibt (wie bei go – went), liegen zwei unterschiedliche Vokabularelemente vor. Diese haben dieselben substantiven Merkmale; aber sie unterscheiden sich so, dass eines der beiden Elemente (went) noch die kontextuellen Merkmale [±prät,–part] aufweist.

(Das Fehlen von massivem Gebrauch von Suppletivformen wird im Übrigen als Argument gegen Andersons (1992) inferentiell-realisationalen Ansatz betrachtet: “Since suppletion is not of central importance in the morphology of English or of any other language, the approach did not seem to us to be on the right track” (p. 113).)

III. Distributed Morphology 2

Fission and Impoverishment

Refs.: Frampton (2002)

14. 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 [±1], [±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.

(88) 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) (fission), but rather as in Noyer (1992) (also see Trommer (1999h,a)).

(89) Fission (Halle & Marantz (1993)):
a. Fission separates a feature bundle β from a terminal node (morpheme) Mα, such that two terminal nodes M1 and M2 come into existence.
b. M1 has the features β; M2 has the features of Mα – β.

(90) Fission (Noyer (1992)): If insertion of a vocabulary item V with the morpho-syntactic features β takes place into a fissioned morpheme M with the morpho-syntactic features α, then α is split up into β and α–β, such that (a) and (b) hold:
a. α–β is available for further vocabulary insertion.
b. β is not available for further vocabulary insertion.

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).

(91) 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).
Terminological remark: Frampton calls this principle the “Principle of Decreasing Specificity” (PDS).

Specificity of vocabulary items: A vocabulary item $V_i$ is more specific than a vocabulary item $V_j$ iff $V_i$ has more morpho-syntactic features than $V_j$.

15. Syncretism in English Verb Inflection

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

(93) a. be  b. work

Generalizations:
- In past tense contexts, there is a syncretism of 1.Pers.Sg. and 3.Pers.Sg.
- 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 (1991a, 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.

(95) Decomposition of inflection markers in Wiese’s work:

<table>
<thead>
<tr>
<th></th>
<th>±demonstrative</th>
<th>±addressing</th>
</tr>
</thead>
</table>

(96) Persons in Wiese’s system:

<table>
<thead>
<tr>
<th></th>
<th>±d,±a</th>
<th>= 1. Pers.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±d,+a</td>
<td>= 2. Pers.</td>
</tr>
<tr>
<td></td>
<td>–d,+a</td>
<td>= – (1. Pers. incl.)</td>
</tr>
</tbody>
</table>

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

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

(97) Decomposition of person features in Frampton’s analysis:

<table>
<thead>
<tr>
<th></th>
<th>±1</th>
<th>±2</th>
</tr>
</thead>
</table>

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].

(98) Persons in Frampton’s system:

<table>
<thead>
<tr>
<th></th>
<th>±1</th>
<th>±2</th>
</tr>
</thead>
</table>

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:
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.
Vocabulary items: ‘be’:

- /am/ ↔ [+1, –2, –pl, –past]
- /ı/ ↔ [–2, –pl, –past]
- /are/ ↔ [–past]
- /was/ ↔ [–2, –pl, +past]
- /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. (99-d)) rather than as a system-wide generalization.

Assumptions about syntactic structure

(100) a. Simplified clause structure before head movement:

\[
[AgrP \quad Agr \quad TP \quad T' \quad T \quad VP ... V ... ]
\]

b. Result of head movement:

\[
[AgrP \quad T \quad V T' \quad Agr]
\]

Note:
This generates the abstract paradigms in (101). (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.)

(101) Specifications that need to be realized by vocabulary items, version 1:

- V + [–past] + ...

Assumption:
(101) is simplified by impoverishment.

(102) Impoverishment for plural contexts in English:

\[
[\pm1, \pm2] \rightarrow O \big/ [\pm1, \pm2]
\]

(103) Specifications that need to be realized by vocabulary items, version 2 (after impoverishment):

- V + [–past] + ...

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).

16. Syncretism in Old English Verb Inflection

(104) Weak verbs: d¯em·en ‘(deem)’

<table>
<thead>
<tr>
<th>Pres.</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, –2, –pl]</td>
<td>d¯em-e</td>
</tr>
<tr>
<td>[–1, +2, –pl]</td>
<td>d¯em-est</td>
</tr>
<tr>
<td>[–1, –2, –pl]</td>
<td>d¯em-eþ</td>
</tr>
<tr>
<td>[+1, –2, +pl]</td>
<td>d¯em-aþ</td>
</tr>
<tr>
<td>[–1, +2, +pl]</td>
<td>d¯em-aþ</td>
</tr>
<tr>
<td>[–1, –2, +pl]</td>
<td>d¯em-aþ</td>
</tr>
</tbody>
</table>

(105) Strong verbs: singan ‘(sing)’

<table>
<thead>
<tr>
<th>Pres.</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, –2, –pl]</td>
<td>sing-e</td>
</tr>
<tr>
<td>[–1, +2, –pl]</td>
<td>sing-est</td>
</tr>
<tr>
<td>[–1, –2, –pl]</td>
<td>sing-eþ</td>
</tr>
<tr>
<td>[+1, –2, +pl]</td>
<td>sing-aþ</td>
</tr>
<tr>
<td>[–1, +2, +pl]</td>
<td>sing-aþ</td>
</tr>
<tr>
<td>[–1, –2, +pl]</td>
<td>sing-aþ</td>
</tr>
</tbody>
</table>

(106) Suppletive verbs: sindon ‘(be)’

<table>
<thead>
<tr>
<th>Pres.</th>
<th>Past</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, –2, –pl]</td>
<td>eam</td>
</tr>
<tr>
<td>[–1, +2, –pl]</td>
<td>eart</td>
</tr>
<tr>
<td>[–1, –2, –pl]</td>
<td>is</td>
</tr>
<tr>
<td>[+1, –2, +pl]</td>
<td>sindon</td>
</tr>
<tr>
<td>[–1, +2, +pl]</td>
<td>sindon</td>
</tr>
<tr>
<td>[–1, –2, +pl]</td>
<td>sindon</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.

(107) Impoverishment:

- [–past] becomes a privative feature [past], [–past] is deleted.
- [+pl] becomes a privative feature [pl], [–pl] is deleted.
- [±1] → O [past]
- [±1, ±2] → O [±pl].

Note:
(107-cd) are the important rules.
(It is not fully clear to me whether (107-ab) are needed at all. Frampton introduces these rules as ‘privativization rules’, but is seems that we are dealing with impoverishment rules...
Consequence:
From (101), we don’t just get (103); rather, we get the abstract paradigm (108). (108) exhaustively defines the possible insertion contexts for Old English verb inflection markers.

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

2. V + [past] + [+2] [+2]

Vocabulary items:

1. /wæs/ ↔ sindon [+2,past]
2. /wær/ ↔ sindon [+2]
3. Ø ↔ [past]/Vstrong
4. /d/ ↔ [past]
5. /e/ ↔ [–2]/Vstrong,[past]
6. /eþ/ ↔ [+1, –2]
7. /est/ ↔ [–2]
8. /e/ ↔ [–2]
9. /on/ ↔ [pl]/[past]
10. /aþ/ ↔ [pl]

Problem:
Why are no inflection markers inserted with suppletive forms of sindon in the present tense?

Solution:
Sindon (= V) and Agr fuse when they are adjacent (i.e., if T[past] does not intervene).

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

2. V + [past] + [+2] [+2]

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).

17. Syncretism in German Verb Inflection

Weak verbs: believe

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

Strong verbs: sing

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

Suppletive verbs: be

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

Impoverishment rules, German:

1. [+past] becomes a privative feature [past], [–past] is deleted.
2. [+pl] becomes a privative feature [pl], [–pl] is deleted.
3. [+1] → Ø/[past]
4. [+1] → Ø/[pl]

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

2. V + [past] + [+2] [+2]

41
Vocabulary items:

a. $\emptyset$ $\leftrightarrow$ [past]/$V_{\text{strong}}$

b. /te/ $\leftrightarrow$ [past]

c. /e/ $\leftrightarrow$ [+1,–2]

d. /t/ $\leftrightarrow$ [–1,–2]

e. /n/ $\leftrightarrow$ [–2,pl]

f. /t/ $\leftrightarrow$ [–2,pl]

g. /st/ $\leftrightarrow$ [+2]

(118) a. $V + [\pm 1, \pm 2, \pm \text{pl}, \pm \text{fem}]$

b. $V + [\text{past}] + [\pm 2, \pm \text{pl}, \pm \text{fem}]$

18. Kabyle-Berber

Language: Afro-Asiatic, 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.

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.

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Note:

For every vocabulary item, it must be listed whether it is a suffix or a prefix (indicated by a hyphen accompanying the exponent in question).

(121) Vocabulary items:

a. /i-/ $\leftrightarrow$ [–1,–2,–pl,–fem]

b. /-n/ $\leftrightarrow$ [–1,–2,+pl]

c. /n-/ $\leftrightarrow$ [+1,+pl]

d. /-/ $\leftrightarrow$ [+1]

e. /-m/ $\leftrightarrow$ [+2,+pl]

f. /-d'/ $\leftrightarrow$ [+2]

g. /t-/ $\leftrightarrow$ [–1]

h. /-t/ $\leftrightarrow$ [+fem]/[–1,+pl]

Note:

The system recognizes both discontinuous bleeding and fission.

- Discontinuous bleeding: An exponent may block another exponent even though the two markers have a different status as suffix or prefix: There is competition for a single (abstract, morphematic) position (a functional category). Thus, /t-/ is discontinuously bled by /-n/ (and regularly by /i-/); /-/ is discontinuously bled by /n-/.

- Fission: An exponent may co-occur with another exponent even though there is only a single (abstract, morphematic) position (a functional category), irrespectively of their status as suffix or prefix: Feature decomposition, subanalysis. Thus, /t-/ can co-occur with /-d'/ because the two exponents realize different primitive features ([–1] vs. [+2]). In contrast, the /-t/ suffix (basically a [+fem] exponent) instantiates extended exponence and must therefore resort to a secondary (contextual) feature specification (so as to preclude it from showing up in first person contexts).

19. Extension of Frampton’s analysis in Müller (2006a,b)

(5) a. Weak verb inflection: believe

b. Strong verb inflection: call

c. Suppletive verb inflection: sein

(123) Two impoverishment rules for verb inflection in German:

a. $[\pm 1] \rightarrow \emptyset/[–2, \pm \text{pl}, \pm \text{past}]$
b. \( [\pm 1] \to \emptyset / [\pm 2, \pm 3, \pm 4] \)

(124) Marker inventory:

a. /te/ \( \leftrightarrow [+\text{past}, –\text{strong}] \)

b. /s/ \( \leftrightarrow [+2, –\text{pl}] \)

c. /n/ \( \leftrightarrow [–2, +\text{pl}] \)

d. /t/ \( \leftrightarrow [–1] \)

e. /(e)/ \( \leftrightarrow [\emptyset] \)

(125) Vocabulary insertion into impoverished \( T \) morphemes in German

<table>
<thead>
<tr>
<th>( T )</th>
<th>( +\text{past} )</th>
<th>( +\text{strong} )</th>
<th>( +\text{past} )</th>
<th>( +\text{strong} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+1, –2, –pl]</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
</tr>
<tr>
<td>[+1, +2, –pl]</td>
<td>/s/-/t/</td>
<td>/s/-/t/</td>
<td>/s/-/t/</td>
<td>/s/-/t/</td>
</tr>
<tr>
<td>[+1, –2, –pl]</td>
<td>/t/</td>
<td>/t/</td>
<td>/t/</td>
<td>/t/</td>
</tr>
<tr>
<td>[+2, –pl]</td>
<td>/n/</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>
<td>/t/</td>
</tr>
<tr>
<td>[+1, –2, +pl]</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
</tr>
</tbody>
</table>

20. Appendix: Pike on German Verbs

20.1. 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

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

<table>
<thead>
<tr>
<th>1.sg b</th>
<th>2.sg b</th>
<th>3.sg t</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.pl z</td>
<td>3.pl z</td>
<td></td>
</tr>
<tr>
<td>inf z</td>
<td></td>
<td></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, meiner, etc.).

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

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

Subanalysis in Current Morphological Theories

Question:

Do we have to assume that the verb forms in (126) are morphological constructions (i.e., not decomposable)?

Answer:

Probably not:

Subanalysis is pursued in many current morphological theories (see Müller (2008) for detailed argumentation):

- 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; 1997c))
- Network Morphology (Brown & Hippisley (2012))
- Nanosyntax (Caha (2009))
- Optimality (cf. the material in second part of this course)

20.2. Pike’s (1965) Subanalysis of German Verb Inflection in Distributed Morphology

(127)

\[
\begin{array}{c}
\text{V}_{\text{sein}} \\
\text{Agr} \\
\text{Th}
\end{array}
\]
IV. Paradigm Function Morphology

Ref.: Stump (2001)

21. Annahmen

(129) **Grundannahme:**

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

(130) Traditionelle Terminologie:


(131) Paradigmen (Behauptung):

In dieser Theorie sind Paradigmen keine Epiphänomene; vielmehr “konstituieren sie ein zentrales Prinzip der morphologischen Organisation”. Paradigmen sind das Ergebnis von Paradigmenfunktionen

(132) 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 Paradigmenzelle besetzt

(133) **Realisierungsregeln:**

Paradigmenfunktionen werden durch speziellere Realisierungsregeln definiert.

(134) Informelles Beispiel:

Der Wert der Paradigmenfunktion (<Mutter-,{dativ,plural}>) ergibt sich aus dem Ergebnis der Anwendung zweier Realisationsregeln – einer, die die Umlautvariante des Stamms wählt, und einer, die -n suffiziert.

Terminologie:

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

(135) **Regelblöcke:**

b. Regeln im selben Blick konkurrieren miteinander; nur die spezifischste Regel kann applizieren (Paninis Prinzip; Spezifizitätsprinzip).
c. Regeln in verschiedenen Blöcken konkurrieren nicht; so treten in einer Wortform verschiedene Exponenten hintereinander.

Bemerkung:

Die Exponenten kommen durch Regeln in eine Wortform und haben keinen eigenständigen Status. Die Theorie ist also *amorphematisch* (vgl. Anderson (1992)).

Slogan: **Paradigmenfunktionen sind statische Wohlegeformtheitsbedingungen für Zellen.**
(136) **Wohlgeformte Menge morphosyntaktischer Eigenschaften:**
Eine Menge \( \tau \) von morphosyntaktischen Eigenschaften für ein Lexem der Kategorie C ist wohlgeformt in einer Sprache L nur dann, wenn \( \tau \) die folgenden Bedingungen in L erfüllt.

a. Für jede Eigenschaft \( F: \forall \tau \) 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 \( v_1, v_2 \) als mögliche Werte hat, gilt: Wenn \( v_1 \neq v_2 \) und \( F:v_1 \in \tau \), dann \( F:v_2 \notin \tau \).

(137) **Extension:**
Falls \( \sigma \) und \( \tau \) wohlgeformte Mengen morphosyntaktischer Eigenschaften sind, ist \( \sigma \) eine Extension von \( \tau \) gdw. (a) und (b) gelten.

a. Für jedes atomwertige Merkmal \( F \) und jeden erlaubten Wert \( v \) für \( F \) gilt: Wenn \( F:v \in \tau \), dann \( F:v \in \sigma \).

b. Für jedes mengenwertige Merkmal \( F \) und jeden erlaubten Wert \( p \) für \( F \) gilt: Wenn \( F:p \in \tau \), dann \( F:p \in \sigma \), wobei \( p \) eine Extension von \( p \) ist.

(138) **Unifikation:**
Falls \( \sigma \) und \( \tau \) wohlgeformte Mengen morphosyntaktischer Merkmale sind, ist die Unifikation \( \rho \) von \( \sigma \) und \( \tau \) die kleinsten wohlgeformten Menge von morphosyntaktischen Eigenschaften, so dass \( \rho \) eine Extension sowohl von \( \sigma \) als auch von \( \tau \) ist.

(139) a. \( \{\text{TNSpres.gr}:\{\text{PER.1,NUM:p}\}\} \) ist Extension von \( \{\text{AGR}:\{\text{PER.1,NUM:p}\}\} \) und \( \{\text{AGR}:\{\text{NUM:p}\}\} \}, \{ \}, \text{usw.}

b. \( \{\text{TNSpres.mood}:\text{ind}\cdot\text{AGR}:\{\text{PER.1,NUM:p}\}\} \) ist die Unifikation von \( \{\text{TNSpres.gr}:\{\text{PER.1}\}\} \) und \( \{\text{TNSpres.mood}:\text{ind}\cdot\text{AGR}:\{\text{NUM:p}\}\} \).

(140) **Eigenschaftskookurrenzenrestriktionen** (bulgarische Verbformen; Ausschnitt):
Eine Menge \( \tau \) von morphosyntaktischen Eigenschaften für ein Lexem der Kategorie V ist wohlgeformt nur, wenn \( \tau \) eine wohlgeformte Extension \( \sigma \) hat, so dass gilt:

a. \( \sigma \) ist eine Extension von \( \{\text{vform}:\text{fin}\}\) gdw. ein zulässiges \( \alpha \) gilt: \( \sigma \) ist eine Extension von \( \{\text{mood}:\alpha\} \). (Wenn Finitetheit, dann Modus \( \text{Ind oder Konj} \))

b. Wenn \( \sigma \) eine Extension von \( \{\text{mood}:\text{imp}\} \) ist, dann ist \( \sigma \) eine Extension von \( \{\text{agr}:\text{per.2}\} \). (Wenn Imperativ, dann 2. Person)

c. Für jedes zulässige \( \alpha \) gilt: \( \sigma \) ist eine Extension von \( \{\text{mood}:\text{indic}\} \) oder von \( \{\text{vform}:\text{pple}\} \). (Wenn V hat Tempus wenn es Ind. oder Partizip ist)

d. Für jedes zulässige \( \alpha \) gilt: \( \sigma \) ist eine Extension von \( \{\text{agr}:\{\text{gen}:\alpha\}\} \) gdw. \( \sigma \) eine Extension von \( \{\text{vform}:\text{pple}\} \), und \( \sigma \) ist eine Extension von \( \{\text{agr}:\{\text{pers}:\alpha\}\} \) gdw. \( \sigma \) eine Extension von \( \{\text{vform}:\text{fin}\} \). (Wenn Genus, dann Partizip; wenn Person, dann Finitetheit)

(141) **Vollständigkeit** von Mengen morphosyntaktischer Merkmale:
Eine Menge \( \sigma \) von morphosyntaktischen Merkmalen für ein Lexem einer Kategorie ist vollständig gdw. (a) und (b) gelten:

a. \( \sigma \) ist wohlgeformt.

b. Für jede Menge morphosyntaktischer Merkmale \( \tau \) (so dass \( \sigma \) nicht eine Extension von \( \tau \) ist) gilt: die Unifikation von \( \tau \) und \( \sigma \) ist nicht wohlgeformt.

**Definitionen 3**

**Paradigmefunktionen:**
Eine Paradigmefunktion ist eine Funktion in der Menge der FPSPs, die auf einem Wurzelpaar \( <X,\sigma> \) appliziert (wobei X die Wurzel eines Lexems L ist und \( \sigma \) eine vollständige Menge morphosyntaktischer Eigenschaften für L ist) und eine \( \sigma \)-Zelle \( <Y,\sigma> \) im Paradigma von L ergibt.

(142) **Format von Paradigmefunktionen:**
\( \text{PF}(<X,\sigma>) = <Y,\sigma> \)

**Realisierungsregeln** (‘realization rules’, ‘rules of exponence’):
Eine Realisierungsregel ist eine Funktion in der Menge der FPSPs. Im Unterschied zu einer Paradigmefunktion muss aber das Argument nicht unbedingt ein Wurzelpaar sein, und der Wert muss nicht unbedingt eine Paradigmennelle sein.

(143) **Format von Realisierungsregeln:**
\( \text{RR}_{n,\tau,c}(<X,\sigma>) = <Y,\sigma> \)

**Terminologie:**
- \( n \): Blockindex
- \( \tau \): Eigenschaftsmengenindex (die wohlgeformte Menge morphosyntaktischer Eigenschaften, die die Regel durch ihre Anwendung realisiert; \( \sigma \) muss Extension von \( \tau \) sein)
- \( \text{Unterspezifikation} \)
- \( C \): Klassenindex (Klasse der Lexeme, deren Paradigmen die Regel mit definieren kann)
- \( Y \): im Default Y, aber Möglichkeit der Überschreibung durch morphonologische Regeln

22. **Bulgarische Verbflexion**

(144) **Vier imperfektive Verben im Bulgischen:**

a. \( \text{KRAD} \) (’stehlen’): 1. St. = krad, 2. St. = krad

b. \( \text{igráj} \) (’spielen’): 1. St. = igráj, 2. St. = igrá

c. \( \text{KOVA} \) (’fälschen’): 1. St. = kon, 2. St. = kova

d. \( \text{dáva} \) (’geben’): 1. St. = dáva, 2. St. = dáva

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

Zwei abstrakte binäre Flexionsklassenmerkmale: \( \{\pm t, c\}, \{\pm c, \pm t\}\)

- \( \text{|-t|} \): 1./2. Stamm: identisch zur Wurzel
- \( \text{|-t|} \): 1. Stamm: C, 2. Stamm: V

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

(145) a. \( \text{KRAD} \) (’stehlen’): [+t, +c]

b. \( \text{igráj} \) (’spielen’): [–t, +c]

c. \( \text{KOVA} \) (’fälschen’): [–t, –c]
d. DAVA (’geben’): [–t,–c]

Paradigmen der bulgarischen Verhflexion

(146) Abstrakte Paradigmen des Indikativen ohne morphologische Regeln:

<table>
<thead>
<tr>
<th>Konjugation</th>
<th>KRAD</th>
<th>DAVA</th>
<th>IGRAJ</th>
<th>KOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Präens 1sg</td>
<td>krad-e-σ</td>
<td>dava-e-σ</td>
<td>igraj-e-σ</td>
<td>kova-e-σ</td>
</tr>
<tr>
<td>2sg</td>
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<td>igraj-e-σ</td>
<td>kova-e-σ</td>
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<td>igraj-e-σ</td>
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<td>kova-e-st</td>
</tr>
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<td>kova-o-x-me</td>
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<td>dava-o-x-st</td>
<td>igrajá-o-x-st</td>
<td>kova-o-x-st</td>
</tr>
</tbody>
</table>

Realisierungsgesetze

(147) a. Block A:
   A1: RR_A([TNS=aro],V)((<X,σ>) = def <Y',σ>, wobei Y der 2. Stamm von X ist.
   A2: RR_A([Y],V)((<X,σ>) = def <Y',σ>, wobei Y der 1. Stamm von X ist.

b. Block B & Block C:
   B1: RR_B([TNS=pre],V),(<X,σ>) = def <X'σ>.
   B2: RR_B([TNS=impo],V),(<X,σ>) = def <X'σ>.
   B3: RR_B([TNS=rop],V),(<X,σ>) = def <X'σ>.
   B4/C1 Wenn W = B oder C:
   C2: RR_C([TNS=rop],V),(<X,σ>) = def <X'σ>.

c. Block D:
   D1: RR_D([TNS=pre],AGR{PER1,NUM=sg},V),(<X,σ>) = def <X'σ>.
   D2: RR_D([TNS=pre],AGR{PER1,NUM=sg},[CONJ=–t,–c],V),(<X,σ>) = def <X'σ>.
   D3: RR_D([TNS=pre],AGR{PER2,NUM=sg},V),(<X,σ>) = def <X'σ>.
   D4: RR_D(AGR{PER3,NUM=sg},(<X,σ>) = def <X'σ>.
   D5: RR_D([TNS=pre],AGR{PER1,NUM=pl},[CONJ=+t],[CONJ=C],V),(<X,σ>) = def <X'σ>.
   D6: RR_D(AGR{PER1,NUM=pl},V),(<X,σ>) = def <X'σ>. 

(148) Verweisregel (’rule of referral’; informelle Variante):

Regelanwendung 1: Spezifizität

(149) Paninis Prinzip:
Es sei σ eine vollständige Menge von morphosyntaktischen Eigenschaften für Lexeme der Kategorie V. Dann ist PF((<X,σ>) = def Nar_D(Nar_C(Nar_A((<X,σ>))))

(150) Nar_n-Notation:
Falls RR_n,T,C die engste Regel in Block n ist, die auf (<X,σ>) anwendbar ist, so repräsentiert ‘Nar_n(<X,σ>)) das Resultat der Anwendung von RR_n,T,C auf (<X,σ>.

(151) Enge und Anwendbarkeit (vereinfacht):
   a. RR_n,T,C ist engere als RR_n,T,C gdw. σ eine Extension von τ ist und σ ≠ τ.
   b. RR_n,T,C ist anwendbar auf (<X,σ) gdw. RR_n,T,C(<X,σ) ist definit.

(152) Regel-Argument-Kohärenz:
RR_n,T,C(<X,σ) ist definit gdw. (a) σ eine Extension von τ ist (s.o.); (b) L-Index(X) ∈ C ist; und (c) σ eine wohlgeformte Menge von morphosyntaktischen Eigenschaften für L-Index(X) ist.

Regelanwendung 2: Identitätsfunktion

(153) Default der Identitätsfunktion:
RR_n([1],V,<X,σ>) = def <X,σ>

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

(154) Beispiel:
   a. σ = {VFORM:fin, VCE:act, TNS:pres, PRES:no, MOOD:indic, AGVR:PER1,NUM=pl} 
   b. Nar_C([krade,σ]) = RR_C([1],[<krade,σ>]) = [krade,σ]

Regelanwendung 3: Verweisregeln und Synkretismus

(155)  *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:

(156)  *Verweisregel* (saubere Variante):
   Angenommen, (a)–(c) sind der Fall:
   a. \( \tau \) ist eine beliebige vollständige Extension von \{\text{PRET:yes}, \text{AGR:\{PER:2,NUM:SG\}}\}.
   b. \( n \) ist ein beliebiger Regelblock in A-D.
   c. \( \sigma' = \sigma / \{\text{AGR:\{PER:3\}}\} \) (lies: \( \sigma \) modifiziert durch \{\text{AGR:\{PER:3\}}\})

Dann gilt:

\[
\text{RR}_{n,r,V}(X,\sigma) = \text{def} < Y,\sigma', \text{wobei } \text{Nara}(X,\sigma') = < Y,\sigma'>
\]

### Konkrete Paradigmen des Indikativs inkl. Morphologie

<table>
<thead>
<tr>
<th>Konjugation</th>
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<th>DÁVA</th>
<th>IGRÁJ</th>
<th>KOVA</th>
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<td>krád-3l-x-a</td>
<td>dava-x-a</td>
<td>igrá-3l-x-a</td>
</tr>
</tbody>
</table>

Anmerkung:
Für jede Realisierungsregel gibt es eine ungeordnete Menge \( F_R \) von morphophonologischen Regeln, die bei jeder Anwendung die Evaluation der Realisierungsregel beschränken.

### Morphophonologische Regeln und Metageneralisierungen

(157)  
   Regeln (\( F_R \)): Falls \( \text{RR}_{n,r,V}(X,\sigma) = \text{def} < Y',\sigma' \), so gilt:
   a. Wenn der L-Index(X) \( \in \{\text{CONJ:-T,-C}\} \) und \( Y = X|\text{Vokal}|Z \), dann fehlt [Vokal] in \( Y' \).
   b. Wenn \( X = W|\text{Vokal}|1 \) und \( Y = X|\text{Vokal}|2|Z \), dann fehlt [Vokal] in \( Y' \), und [Vokal] wird betont in \( Y' \) gw. [Vokal] in \( Y \) betont wird.
   c. Wenn \( X = W|\text{Vokal}|1 \) und \( Y = X|\text{Vokal}|2|Z \), dann fehlt [Vokal] in \( Y' \).
   d. Wenn \( Y \) unbetont ist, dann wird \( Y' \) auf seiner letzten Silbe betont.
   e. Wenn \( X = WC \) (\( C \) ein Velar mit \( Č \) als alveopalatalem Gegenstück), \( Y = XVZ \), und \( V \) ein vorderer Vokal, dann hat \( Y' \) \( Č \) anstelle von \( C \).
   f. Wenn \( Y = W|Z \), dann hat \( Y' \) ein \( é \) anstelle von \( Č \).
   g. Wenn \( Y = W|A|VZ \) und \( V \) ist ein vorderer Vokal, dann hat \( Y' \) ein \( é \) anstelle von \( Č \).
   h. Wenn \( Y = W|A|Z \), dann hat \( Y' \) \( á \) (mit Palatalisierung eines unmittelbar vorangehenden Konsonanten) anstelle von \( Č \).

(158)  
   *Metageneralisierungen*:
   a. Für jede Regel \( R \) in Block B, C oder D gilt: (157-ae) \( \in F_R \).
   b. Für jede Regel \( R \) in Block B, C oder D gilt: (157-b) \( \in F_R \) gw. R eine Extension von \{\text{TNS:pres}\} realisiert; ansonsten: (157-c) \( \in F_R \).
   c. Falls \( R \) in Block B ist, gilt: (157-d) \( \in F_R \).
   d. Falls \( R \) in Block D ist, gilt: (157-fh) \( \in F_R \).
   e. (157-g) \( \in F_{D4,:}F_{B1} \).

### 23. 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, dass noch mehr gesagt werden muss.

*Beispiel:*
Realisationsregeln für argumentkodierende Präfixe im Georgischen in (159) (Stump (2001, 70)). (Das System der Argumentkodierung im Georgischen ist notorisch komplex; hier wird nur ein ganz kleiner Ausschnitt abgeführt.)

(159)  
   a. \( \text{RR}_{\text{pref}}(A|\text{AGR:sa-}\{\text{PER:1}\})\), \( \chi(X,\sigma) = \text{def} < X',\sigma > \)
   b. \( \text{RR}_{\text{pref}}(A|\text{AGR:ob-}\{\text{PER:1}\})\), \( \chi(X,\sigma) = \text{def} < mX',\sigma > \)
   c. \( \text{RR}_{\text{pref}}(A|\text{AGR:ob-}\{\text{PER:1,NUM:PL}\})\), \( \chi(X,\sigma) = \text{def} < gX',\sigma > \)
   d. \( \text{RR}_{\text{pref}}(A|\text{AGR:ob-}\{\text{PER:2}\})\), \( \chi(X,\sigma) = \text{def} < gX',\sigma > \)

*Problem:*
Was ist die korrekte V-Realisierung für "Ich werde dich töten"? Die morphosyntaktischen Merkmalsmengen von (159-a) und (159-d) stehen nicht zueinander in einem Extensionsverhältnis; also sollten beide passen. Empirisich ist aber korrekt, dass (159-d) angewendet wird und so (159-a) blockiert.

<table>
<thead>
<tr>
<th>Präverb Präfix Stamm Suffix</th>
<th>mo-</th>
<th>g-</th>
<th>klav</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>mo- v- klav</em></td>
<td>'Ich werde dich töten'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mo- g- klav -t</td>
<td>'Ich werde euch töten'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Lösungen für das Dilemma**

(161)  
   *Extrinsische Regelmäßigkeit* (Anderson (1992)):
Regel (159-d) appliziert per Stipulation vor Regel (159-a).

(162) **Expanderter Modus** (Stump (2001)): Regeln können aufgebläst werden und sind dann maximal spezifisch.

(163) **Regelformate:**

a. **Unexpanderter Modus:**

\[ \text{RR}_{n,c}(\langle X, \sigma \rangle) = \text{def} \; <Y', \sigma > \]

b. **Expanderter Modus:**

\[ \text{RR}_{n,c}(\langle X, \sigma \rangle) = \text{def} \; <Y', \sigma > \]

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

Konklusion: Regel (159-d) im Georgischen arbeitet im expanderierten Modus:

(164) \[ \text{RR}_{\text{pref.} \rightarrow \text{<AGR>:{PER:2}}} (\langle X, \sigma \rangle) = \text{def} \; <gX', \sigma > \]

### 24. Synkretismus

#### Typen von Synkretismus

**Erste Unterscheidung:**

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

**Zweite Unterscheidung:**

- **Unidirektionaler Synkretismus**

- **Bidirektionaler Synkretismus**

- **Unstipulierter Synkretismus**

- **Stipulierter (z.B. symmetrischer) Synkretismus**

**Unidirektionaler Synkretismus**

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

- In allen Tempora können Formen der 3.Pers.Sg. eine Endung -e haben.

**Verweisregel** (mit expanderndem Modus):

Wenn \( n \) ein beliebiger Regelblock in A-D ist, dann gilt:

\[ \text{RR}_{n,\text{dep}.\langle \text{<AGR>:{PER:2,num:sg}} \rangle} \rightarrow \nu \langle X, \sigma \rangle = \text{def} \; <Y, \sigma >, \]

wobei

\[ \text{Nar}_{n,\langle X, \sigma /\text{<AGR>:{PER:3}} \rangle} = <Y, \sigma > /\text{<AGR>:{PER:3}} > \]

**Bidirektionaler Synkretismus 1**

**Verbformen:**


- Manchmal ist die 3.Pl. der abhängige Teil: a *umplea*, a *şti*. (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 *şint* taucht auch sonst im Plural auf.)

**Präsenz-Indikativ-Formen einiger rumänischer Verben:**

<table>
<thead>
<tr>
<th>Konjugation</th>
<th>1</th>
<th>2</th>
<th>4</th>
<th>4</th>
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<tr>
<td>1sg</td>
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<td>inv</td>
<td>ţimpl-</td>
<td>ţști-</td>
<td>ţșint-</td>
</tr>
</tbody>
</table>

**Bidirektionaler Synkretismus 2**

**Annahmen:**

- Jede Verweisregel \( \text{RR}_{n,c} \) hat eine Verweisdome D, mit C als Teilmengen von D.
- Die Existenz einer Verweisregel impliziert die Existenz einer inversen Verweisregel, gemäss (167).

(167) **Bidirektionales Verweisprinzip:**

Die Existenz einer Verweisregel \( '\text{RR}_{n,c} \langle X, \sigma > = \text{def} < Y, \sigma > \) , wobei

\[ \text{Nar}_{n,\langle X, \sigma /\rho \rangle} = < Y, \sigma /\rho > ' \]

mit Verweisdome D impliziert die Existenz einer zweiten Verweisregel \( '\text{RR}_{n,c} \langle X, \sigma > = \text{def} < Y, \sigma > , wobei \]

\[ \text{Nar}_{n,\langle X, \sigma /\tau \rangle} = < Y, \sigma /\tau > ' \]

mit Verweisdome D.

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

**Bidirektionaler Synkretismus 3**

**Erste Annahme:**

Falls \( n = 0 \) oder 1: \( \text{RR}_{n,\langle \text{agr}{su} :\text{<PER:1,num:sg}} \rangle, a fi \langle X, \sigma > = \text{def} < Y, \sigma > , wobei \]

\[ \text{Nar}_{n,\langle X, \sigma /\text{agr}{su} :\text{<PER:3,num:pl}} \rangle = < Y, \sigma /\text{agr}{su} :\text{<PER:3,num:pl}} > \]

Verweisdome: V

(169) **Implizierte Verweisregel:**

Falls \( n = 0 \) oder 1: \( \text{RR}_{n,\langle \text{agr}{su} :\text{<PER:3,num:pl}} \rangle, a fi \langle X, \sigma > = \text{def} < Y, \sigma > , wobei \]

\[ \text{Nar}_{n,\langle X, \sigma /\text{agr}{su} :\text{<PER:1,num:sg}} \rangle = < Y, \sigma /\text{agr}{su} :\text{<PER:1,num:sg}} > \]

Verweisdome: V
(170) **Metaregel für symmetrischen Synkretismus:**
\[ \text{RR}_{n,\tau,C}(<X,\sigma>) = \text{def} <Y,\sigma> \leftrightarrow \text{RR}_{n,\tau/p,\rho,C}(<X,\sigma>) = \text{def} <Y,\sigma> \]

(171) **Metaregel für Hua:**
Es sei \( \tau \) eine Extension von \{AGR(su)\}: \{PER:2, NUM:sg\}. Dann:
\[ \text{RR}_{II,\tau,V}(<X,\sigma>) = \text{def} <Y,\sigma> \leftrightarrow \text{RR}_{II,\tau/\{AGR(su)\},V}(<X,\sigma>) = \text{def} <Y,\sigma> \]

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

(172) a. \([+1,-2],[+pl]\]
    b. \([-1,+2],[–pl]\]
    c. \(\alpha\)-Notation: \([\alpha_1,-\alpha_2],[\alpha_{pl}]\]

25. **Appendix: Pike’s (1965) Subanalysis of German Verb Inflection in Paradigm Function Morphology**

(173) \( \text{RR}_{n,\tau,C}(<X,\sigma>) = \text{def} <Y,\sigma> \)

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

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.sg</td>
<td>b</td>
<td>i</td>
<td>n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.sg</td>
<td>b</td>
<td>i</td>
<td>s</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>3.sg</td>
<td>i</td>
<td>s</td>
<td>t</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.pl</td>
<td>z</td>
<td>i</td>
<td>n</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>2.pl</td>
<td>z</td>
<td>a</td>
<td>i</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>3.pl</td>
<td>z</td>
<td>a</td>
<td>i</td>
<td>t</td>
<td></td>
</tr>
<tr>
<td>inf</td>
<td>z</td>
<td>i</td>
<td>n</td>
<td>t</td>
<td></td>
</tr>
</tbody>
</table>

(175) **Realization rules in Paradigm Function Morphology**

a. **Block A:**
   - **A1** \( \text{RR}_{A,\{AGR:\{PER:3,NUM:sg\}\},\text{sein}}(<X,\sigma>) = \text{def} <Y,\sigma>, \) where \( Y \) is \( X \)'s First Stem.
   - **A2** \( \text{RR}_{A,\{AGR:\{NUM:sg\}\},\text{sein}}(<X,\sigma>) = \text{def} <Y,\sigma>, \) where \( Y \) is \( X \)'s Second Stem.
   - **A3** \( \text{RR}_{A,\{\}\},\text{sein}}(<X,\sigma>) = \text{def} <Y,\sigma>, \) where \( Y \) is \( X \)'s Third Stem.

b. **Block B:**
   - **B1** \( \text{RR}_{B,\{AGR:\{PER:2,NUM:pl\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{a,\sigma}>. \)

c. **Block C:**
   - **C1** \( \text{RR}_{C,\{\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{i,\sigma}>. \)

d. **Block D:**
   - **D1** \( \text{RR}_{D,\{AGR:\{PER:2,NUM:pl\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{n,\sigma}>. \)
   - **D2** \( \text{RR}_{D,\{AGR:\{NUM:sg\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{i,\sigma}>. \)
   - **D3** \( \text{RR}_{D,\{\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{n,\sigma}>. \)
   - **D4** \( \text{RR}_{D,\{AGR:\{PER:1,NUM:sg\}\},\text{sein}}(<X,\sigma>) = \text{def} <Y_{\sigma}>, \) where \( \text{Nar}_{D,<X,\sigma>\{AGR:\{NUM:pl\}\}> = <Y_{\sigma}>. \)

e. **Block E:**
   - **E1** \( \text{RR}_{E,\{AGR:\{PER:1,NUM:sg\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{l,\sigma}>. \)
   - **E2** \( \text{RR}_{E,\{\}\},\text{sein}}(<X,\sigma>) = \text{def} <X_{l,\sigma}>. \)

(176) **Identity Function Default:**
\( \text{RR}_{n,\{\}\},U(<X,\sigma>) = \text{def} <X,\sigma> \)
V. Paradigm Economy


26. 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.

(177) 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))
d. Optimal Paradigms (McCarthy (2003) vs. Bobaljik (2003) – we will discuss this later in the course)

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.

(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.)

27. Excursus: Trans-Paradigmatic Syncretism and Decomposition of Inflection Class Features

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 (1962a), Jakobson (1962b), Neidle (1988), Franks (1995), and syntax-based in Bierwisch (1967), Wiese (1999), Müller (2002b); we adopt the latter view.

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>acc</td>
<td>dat</td>
<td>loc</td>
</tr>
<tr>
<td>+α</td>
<td>±α</td>
<td>+α</td>
<td>±α</td>
</tr>
<tr>
<td>+γ</td>
<td>±γ</td>
<td>+γ</td>
<td>±γ</td>
</tr>
</tbody>
</table>

(178) Decomposition of cases in Russian: [±subject], [±governed], [±oblique]

Note:
Trans-paradigmatic syncretism can be accounted in the same way by decomposing privative class features into more primitive, binary class features that are cross-classified (yielding natural classes of inflection classes); see Halle (1992) on Latvian noun inflection ([±marginal], [±marked] in addition to the ‘standard’ class features A, B); Nesset (1994) on Russian noun inflection ([±nom-end] and [±gen-end]); Oltra Massuet (1999) on verbal inflection in Catalan; Stump (2001) on verbal inflection in Bulgarian; Müller (2005) on Icelandic noun inflection; Trommer (2005a) on Amharic verbs. Also see Börjesson (2006) (Slovene noun declension), Opitz (2006) (Albanian noun declension), and Weisser (2006) (Croatian noun declension).

(179) Decomposition of inflection classes in Russian: [±α], [±γ]

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom</td>
<td>acc</td>
<td>dat</td>
<td>loc</td>
</tr>
<tr>
<td>+α</td>
<td>±α</td>
<td>+α</td>
<td>±α</td>
</tr>
<tr>
<td>+γ</td>
<td>±γ</td>
<td>+γ</td>
<td>±γ</td>
</tr>
</tbody>
</table>

(180) Inflation markers (singular):

a. /oj/: {[[N],[+α],[+γ]],[+subject, +governed, +oblique]}
b. /ju/: {[[N],[+α],[+γ]],[+subject, +governed, +oblique]}
c. /om/: {[[N],[+α],[+γ]],[+subject, +governed, +oblique]}
d. /e/: {[[N],[+α],[–γ]],[+subject, +governed, +oblique]}
e. /e/: {[[N],[+α],[–γ]],[+subject, +governed, +oblique]}
f. /o/: {[[N],[+α],[+γ]],[–governed]}
g. /O/: {[[N],[+α],[+γ]],[+governed]}
h. /i/: {[[N],[+α],[+γ]],[+governed]}
i. /u/: {[[N],[+α],[+γ]],[+governed]}
j. /a/: {[[N],[+α],[+γ]],[+governed]}

(2002b))

Underspecified class information is underlined in inflection marker specifications.

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 (2008)):

(181) **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 Blacking), the Syncretism Principle significantly restricts the number of possible inflection classes by itself:

(182) **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.

### 28. Paradigm Economy

#### 28.1. 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?

(183) **The Paradigm Economy Principle** (Carstairs (1987, 51)):
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” microinflections 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.

#### An impossible paradigm (Carstairs-McCarthy (1998)):

<table>
<thead>
<tr>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
<th>Class D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell 1</td>
<td>a</td>
<td>a</td>
<td>f</td>
</tr>
<tr>
<td>Cell 2</td>
<td>b</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>Cell 3</td>
<td>c</td>
<td>c</td>
<td>h</td>
</tr>
<tr>
<td>Cell 4</td>
<td>d</td>
<td>d</td>
<td>d</td>
</tr>
</tbody>
</table>

- number of inflection classes: 4
- greatest number of allomorph variation: 2

#### Hungarian present indefinite verb inflection

<table>
<thead>
<tr>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
<td>ok, ek, ök, on, em, ön</td>
</tr>
<tr>
<td>2 (a)sz, (e)sz</td>
<td>ol, el, ol</td>
</tr>
<tr>
<td>3</td>
<td>Ø, ik</td>
</tr>
<tr>
<td>Pl 1</td>
<td>unk, ünk</td>
</tr>
<tr>
<td>2 (o)tok, (e)tok, (ö)tok</td>
<td>atok, atek</td>
</tr>
<tr>
<td>3 (a)nak, (e)nek</td>
<td>anak, enek</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?

#### Some Hungarian verbs

<table>
<thead>
<tr>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
<td>olvas-ak</td>
</tr>
<tr>
<td>2</td>
<td>olvas-ok</td>
</tr>
<tr>
<td>3</td>
<td>olvas-Ω</td>
</tr>
<tr>
<td>Pl 1</td>
<td>olvas-unk</td>
</tr>
<tr>
<td>2</td>
<td>olvas-tok</td>
</tr>
<tr>
<td>3</td>
<td>olvas-nak</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>Pl 1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Conclusion:
Abstracting away from differences that are (morpho-) phonologically predictable, there are
only two (macro-) inflection classes: the normal conjugation and the ik conjugation (each with a back-vowel and a front-vowel version).

(187) Hungarian present indefinite conjugations: analysis

<table>
<thead>
<tr>
<th></th>
<th>Indicative</th>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sg 1</td>
<td>ok</td>
<td>om</td>
</tr>
<tr>
<td>Sg 2</td>
<td>ol</td>
<td>al</td>
</tr>
<tr>
<td>Sg 3</td>
<td>òk</td>
<td>on</td>
</tr>
<tr>
<td>Pl 1</td>
<td>unk</td>
<td>unk</td>
</tr>
<tr>
<td>Pl 2</td>
<td>(o)tok</td>
<td>(o)tok</td>
</tr>
<tr>
<td>Pl 3</td>
<td>(a)nak</td>
<td>(a)nak</td>
</tr>
</tbody>
</table>

Observation:
The Paradigm Economy Principle crucially relies on the notion of macro-paradigm (or macro-inflection class).

(188) 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).

(189) German noun inflection

<table>
<thead>
<tr>
<th>I: masc, neut</th>
<th>II: masc</th>
<th>III: neut, masc</th>
<th>IV: masc, neut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hundm ('dog')</td>
<td>Baumn ('tree')</td>
<td>Buchm ('book')</td>
<td>Straßnm ('ray')</td>
</tr>
<tr>
<td>nom/pl</td>
<td>Ø</td>
<td>Ø</td>
<td>(e)n</td>
</tr>
<tr>
<td>acc/pl</td>
<td>(e)n</td>
<td>(e)n</td>
<td>Ø</td>
</tr>
<tr>
<td>dat/pl</td>
<td>(e)n</td>
<td>(e)n</td>
<td>(e)n</td>
</tr>
<tr>
<td>gen/pl</td>
<td>(e)n</td>
<td>(e)n</td>
<td>(e)n</td>
</tr>
<tr>
<td>nom/sg</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>acc/sg</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>dat/sg</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
</tr>
<tr>
<td>gen/sg</td>
<td>(e)s</td>
<td>(e)s</td>
<td>(e)s</td>
</tr>
</tbody>
</table>

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.

(190) Macro-inflection classes for German noun declension

a. III ('er-plural')

b. II (so-called 'weak masculines')

c. IV/VI ('en-plural; gen/pg s for masc/neut; gen/pg Ø for fem')

d. I/VIII ('e-plural; gen/pg s for masc/neut; gen/pg Ø for fem')

e. I/VIII ('e-plural; gen/pg s for masc/neut; gen/pg Ø for fem')

Problem:
It seems that (190-de) must be combined into a single macroclass, with Umlaut 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').

(191) Russian noun inflection

a. Singular

<table>
<thead>
<tr>
<th></th>
<th>Ia/IIa</th>
<th>IIa/IIb</th>
<th>IIIa/IIb</th>
<th>IVA/IVb</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/sg</td>
<td>Ø</td>
<td>a</td>
<td>Ø</td>
<td>o</td>
</tr>
<tr>
<td>acc/sg</td>
<td>Ø/a</td>
<td>u</td>
<td>Ø</td>
<td>o</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>a</td>
<td></td>
</tr>
<tr>
<td>inst/sg</td>
<td>om</td>
<td>oj</td>
<td>ju</td>
<td>om</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>Case/Pl</th>
<th>ia/ib_m</th>
<th>Ia/Ib_f/m</th>
<th>Ia/Ib_f</th>
<th>Ia/Ib_b</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom/pl</td>
<td>y</td>
<td>y</td>
<td>i</td>
<td>a</td>
</tr>
<tr>
<td>acc/pl</td>
<td>y/ov</td>
<td>y/Ø</td>
<td>i/øj</td>
<td>a/Ø</td>
</tr>
<tr>
<td>dat/pl</td>
<td>am</td>
<td>am</td>
<td>jam</td>
<td>am</td>
</tr>
<tr>
<td>gen/pl</td>
<td>ov</td>
<td>Ø</td>
<td>ej</td>
<td>Ø</td>
</tr>
<tr>
<td>inst/pl</td>
<td>ami</td>
<td>ami</td>
<td>jami</td>
<td>ami</td>
</tr>
<tr>
<td>loc/pl</td>
<td>ax</td>
<td>ax</td>
<td>jax</td>
<td>ax</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.

28.2. No Blur

Background:

The No Blur Principle is proposed in Carstairs-McCarthy (1994) as a successor to his earlier Paradigm Economy Principle.

(192) **The No Blur Principle** (Carstairs-McCarthy (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).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Class</th>
<th>Case</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fa</td>
<td>vél (‘rhine’)</td>
<td>nom sg</td>
<td>vél-Ø</td>
</tr>
<tr>
<td>Fa’</td>
<td>drottning (‘queen’)</td>
<td>nom sg</td>
<td>drottning-Ø</td>
</tr>
<tr>
<td>Fi</td>
<td>mynd (‘picture’)</td>
<td>nom sg</td>
<td>mynd-Ø</td>
</tr>
<tr>
<td>Fe:1</td>
<td>geit (‘goat’)</td>
<td>nom sg</td>
<td>geit-Ø</td>
</tr>
<tr>
<td>Fe:2</td>
<td>vik (‘bay’)</td>
<td>nom sg</td>
<td>vik-Ø</td>
</tr>
<tr>
<td>nom pl</td>
<td>vél-ar drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar vik-ar</td>
</tr>
<tr>
<td>acc pl</td>
<td>vél-ar drottning-ar</td>
<td>mynd-ir</td>
<td>geit-ur vik-ur</td>
</tr>
<tr>
<td>dat pl</td>
<td>vél-um drottning-um</td>
<td>mynd-um</td>
<td>geit-um vik-um</td>
</tr>
<tr>
<td>gen pl</td>
<td>vél-a drottning-a</td>
<td>mynd-a</td>
<td>geit-a vik-a</td>
</tr>
</tbody>
</table>

Notes:

- Genitive singular and nominative plural are the leading forms (‘Kennformen’; cf. W urzel (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.
The complete system of inflection classes in Icelandic noun inflection (Kress (1982), Müller (2005)):

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Solution:
- No Blur holds only for a set of inflection classes of the same gender.
- However, this still does not seem to suffice: In masculine nom/pl contexts, neither ar (Ma, Mw) nor ir (Mi, Mu) unambiguously identifies inflection class.

Trans-paradigmatic syncretism and No Blur: This problem is indicative of a more general potential problem that is raised by the No Blur Principle (as well as by Noyer’s (2005) related Interclass Syncretism Constraint): Trans-paradigmatic syncretism is a recurring pattern of inflectional systems. This pattern has successfully been addressed by standard techniques (Jakobson (1936), Biervisch (1967)) involving feature decomposition and underspecification (which permits a reference by inflection marker specifications to natural classes of inflection classes). See Halle (1992), Oltra Massuet (1999), Wiese (1999), Stump (2001), Alexiadou & Müller (2008), Müller (2005), Trommer (2005a), Börjesson (2006), Opitz (2006), Weisser (2006). In all these approaches, more than one of the inflection markers competing for a given instantiation of a grammatical category fails to unambiguously identify inflection class, in violation of the No Blur Principle.

Conclusion:
(i) Paradigm Economy Principle and No Blur Principle (Noyer’s Interclass Syncretism Constraint) reduce the set of logically possible inflection classes (based on a given inventory of markers) to a very small set.
(ii) However, these constraints constantly face the danger of being too restrictive.
(iii) Furthermore, these constraints are incompatible with the view that paradigms are mere epiphenomena, and with the view that trans-paradigmatic syncretism can be accounted for by invoking class feature decomposition and underspecification.
(iv) This warrants looking for alternative ways of bringing about paradigm economy.

29. Claim

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 (196), (197), and (198), 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; 1997c)), or Paradigm Function Morphology (Stump (2001)).)

(196) 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.

(197) 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).
(198) **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; 1997c; 2004)), and in Paradigm Function Morphology (Stump (2001) calls the relevant constraint Panini’s Principle).

**Consequence:**

(i) Syncretism is systematic in the sense that ideally, only one specification of morphosyntactic features is associated with any given inflection marker.

(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, 99).)

**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 Syncretism, Elsewhere, and Blocking?

### 30. Illustration

(199) **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:**

(199-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 (199-b).)

**A system without restrictions:**

If, in a given domain (e.g., noun inflection), there are $n$ markers for $m$ 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.]

**Note:**

(i) The letters $a$, $b$, and $c$ stand for the three markers.

### Abstract example 1: 3 markers, 4 cases: $81 (= 3^4)$ possible inflection classes

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(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.

### 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: $(3-1) 	imes 4 - 1$

c. Inflection Class Economy Theorem, worst case scenario: 4 inflection classes: $3^4 - 1$

### Explanation of worst case scenarios, 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 classes.

### Explanation of worst case scenarios, No Blur Principle:

a. There is one default marker (say, $a$).

b. One class consists only of default markers ($aaaa$).

c. All the other inflection classes differ from this class by replacing one of the $a$’s with either $b$ or $c$ ($baaa$, $abaa$, $aab$, $aaab$, $acaa$, $aca$, $aca$, $aaca$, $aacc$), so that all classes respect the No Blur Principle.

d. Adding another class with more than one $b$, or more than one $c$, or a – perhaps minimal – combination of $b$’s and $c$’s (cf. $bbaa$, or $aacc$, or $aba$, etc.) will invariably lead to a violation of the No Blur Principle because either $b$ or $c$ (or both) will cease to be inflection-class specific.

e. In general, the No Blur Principle predicts that there can at most be $(n-1)\times m + 1$ inflection classes, for $n$ markers and $m$ instantiations of a grammatical category:
Every marker except for one – the default marker, hence “−1” – can appear for a given instantiation of a grammatical category only in one inflection class; and “+1” captures a class consisting exclusively of default markers.

Note: Assuming default markers that are specific with respect to instantiations of a grammatical category (such that, e.g., a is the default marker for the first instantiation, b for the second, c for the third, and perhaps again a for the fourth) instead of an extremely general default marker a, does not change things: This would be compatible with No Blur, but it could not increase the number of possible inflection classes. In the case at hand, the maximal set of inflection classes would include abca, baab, caac, acca, acca, abaa, abba, abcb, abcc.

Abstract example 2: 5 markers, 3 cases: 125 (= 5³) possible inflection classes

Predictions for example 2

a. Paradigm Economy Principle, worst case scenario:
5 inflection classes: the size of the inventory

b. No Blur Principle, worst case scenario:
13 inflection classes: (5−1)×3+1
(E.g., assuming a as a default marker, aab, baab, abaa, caabc, acca, aacc, daaa, aada, aada, abad, caba, aacc, acca, acca, abaa, abba, abcb, abcc.

Inflection Class Economy Theorem, worst case scenario:
16 inflection classes: 2²−1

Abstract example 3: 5 markers, 4 cases: 625 (= 5⁴) possible inflection classes

Predictions for example 3

a. Paradigm Economy Principle, worst case scenario:
5 inflection classes: the size of the inventory

b. No Blur Principle, worst case scenario:
17 inflection classes: (5−1)×4+1
(E.g., aaaa, baaa, abaa, aabb, caaa, acab, acaa, aaca, daaa, aada, aada, abad, caba, abca, abba, abaa, abba, abcb, abcc.
The Inflection Class Economy Theorem restricts possible inflection classes in a way that is roughly comparable to the Paradigm Economy and No Blur Principles.

31. Deriving the Inflection Class Economy 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.

(205) 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 incompatible with it.

(i) Syncretism ensures that each inflection class can be defined in terms of the markers that are active in it: For all competing markers \(\alpha\) and \(\beta\), it is fixed once and for all by the markers’ feature specifications (and independently of inflection classes) that either \(\beta\) is more specific than \(\alpha\), or \(\alpha\) is more specific than \(\beta\).

ii. Blocking ensures that each inflection class can be defined in terms of the markers that are active in it: For all competing markers \(\alpha\) and \(\beta\), it is fixed once and for all by the markers’ feature specifications (and independently of inflection classes) that either \(\beta\) is more specific than \(\alpha\), or \(\alpha\) is more specific than \(\beta\).

e. Hence, if the same set of markers is activated for two inflection classes \(I_1\) and \(I_2\), \(I_1\) must be identical to \(I_2\).

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 \(I_1\) and \(I_2\), \(I_1\) and \(I_2\) must be the same inflection class (because the same set of markers is then activated for \(I_1\) and \(I_2\), because a marker /\(x\)/ can only have one specification /\(x\)/, 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 \(I_1\); all except for marker \(a\) are compatible with class \(I_2\); all except for markers \(a\), \(b\) are compatible with class \(I_3\); 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:

(206) 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.

32. Examples

32.1. 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.

(207) Example 1 revisited:

a. 3 markers: \{a, b, c\}

b. 4 cases: 1, 2, 3, 4

c. Deactivation combinations: \{ {b, c}, {b}, {c}, {} \}

Observation:
Of the 81 inflection classes that would logically be possible under, only four remain, given Syncretism, Underspecification, and Blocking (i.e., the Inflection Class Economy Theorem). This result holds under any specificity-induced order of the markers, and under any assignment of case features to markers.
A possible assignment of case specifications to markers:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [12]
   (iii) /c/ ↔ [234]

b. Specificity:
   /b/ > /c/ > /a/

c. Deactivation combinations and inflection classes:
   \{b, c\} → aaaa
   \{b\} → accc
   \{c\} → bbaa
   \{\} → bbcc

Another possible assignment of case specifications to markers:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [234]
   (iii) /c/ ↔ [4]

b. Specificity:
   /c/ > /b/ > /a/

c. Deactivation combinations and inflection classes:
   \{b, c\} → aaaa
   \{b\} → cadc
   \{c\} → abbb
   \{\} → abbc

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.

32.2. A second example

Example 3 revisited:

a. 5 markers: \{a, b, c, d, e\}
b. 4 cases: 1, 2, 3, 4
a. Markers:  
(i) /a/ $\leftrightarrow$ [ ]  
(ii) /b/ $\leftrightarrow$ [234]  
(iii) /c/ $\leftrightarrow$ [134]  
(iv) /d/ $\leftrightarrow$ [123]  
(v) /e/ $\leftrightarrow$ [123]  

b. Specificity:  
/\d/ > /\e/ > /c/ > /b/ > /a/ > /\e/ > /\d/ > /c/ > /b/ > /a/  

c. Deactivation combinations  
& inflection classes:  
/\b/, /\c/, /\d/, /\e/ $\rightarrow$ aaaa  
/\b/, /\c/, /\d/ $\rightarrow$ aada  
/\b/, /\c/ $\rightarrow$ acae  
/\b/, /\d/ $\rightarrow$ aada  
/\b/, /\d/ $\rightarrow$ aada  
/\b/, /\d/ $\rightarrow$ aade  
/\b/, /\d/, /\e/ $\rightarrow$ baaa  
/\b/, /\d/, /\e/ $\rightarrow$ baba  
/\b/, /\d/, /\e/ $\rightarrow$ badc  
/\b/, /\d/, /\e/, /\f/ $\rightarrow$ badc  
/\b/, /\c/, /\d/, /\e/ $\rightarrow$ badc  
/\b/, /\c/, /\d/, /\e/, /\f/ $\rightarrow$ badc  

A third possible choice:  
A fourth possible choice:  

a. Markers:  
(i) /a/ $\leftrightarrow$ [ ]  
(ii) /b/ $\leftrightarrow$ [1]  
(iii) /c/ $\leftrightarrow$ [2]  
(iv) /d/ $\leftrightarrow$ [3]  
(v) /e/ $\leftrightarrow$ [4]  

b. Specificity:  
/e/ > /\d/ > /c/ > /b/ > /a/  

c. Deactivation combinations  
& inflection classes:  
/\b/, /\c/, /\d/, /\e/ $\rightarrow$ aaaa  
/\b/, /\c/, /\d/ $\rightarrow$ aada  
/\b/, /\c/ $\rightarrow$ acae  
/\b/, /\d/ $\rightarrow$ aada  
/\b/, /\d/ $\rightarrow$ aade  
/\b/, /\d/ $\rightarrow$ baad  
/\b/, /\d/, /\e/ $\rightarrow$ baaa  
/\b/, /\d/, /\e/ $\rightarrow$ baba  
/\b/, /\d/, /\e/ $\rightarrow$ badc  
/\b/, /\d/, /\e/, /\f/ $\rightarrow$ badc  
/\b/, /\c/, /\d/, /\e/ $\rightarrow$ badc  
/\b/, /\c/, /\d/, /\e/, /\f/ $\rightarrow$ badc  

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/, accomplished a single underspecified set of morpho-syntactic features 
(perhaps involving underspecified inflection class features, as suggested in Alexiadou & Müller (2008) in order to account for fact that this marker exhibits trans-paradigmatic 
synergetism).

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 
Chomsy (1965), Chomsky & Halle (1968) for the original concept, Noyer (1992), Harley 

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.

(215) 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 subanalyis, 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), 
Bierkandt (2006)): 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 
(Trommer (1999b)), each impoverishment rule also increases the set of n’s (for 
which the powerset is created) by one.
VI. Neurophysiological Evidence for Underspecification

Ref.: Opitz, Regel, Müller & Friederici (2013)

Question:
Is morphological underspecification detectable in language processing?

Answer:
Yes.

34. Background

Decomposition of gender features in German (Bierwisch (1967) – note that this differs subtly from the last handout):

- masculine = [+masc,–fem]
- feminine = [–masc,+fem]
- neuter = [–masc,–fem]
- [ ] = [+masc,+fem]

Decomposition of case features in German (Bierwisch (1967)):

- nominative = [–obj,–obl]
- accusative = [+obj,–obl]
- dative = [+obj,+obl]
- genitive = [–obj,+obl]

Morphological Realization: Specificity and Compatibility

Inventory of exponents for pronominal inflection (based on Blevins (1995))

- /n/ ↔ [+pl, +obj, +obl] (dat.pl.)
- /m/ ↔ [+fem, +obj, +obl] (dat.masc.sg./neut.sg.)
- /s/ ↔ [+fem, +obl] (gen.masc.sg./neut.sg.)
- /r/ ↔ [+obl] (dat.masc.sg. or neut.sg.)
- /n/ ↔ [+masc, +fem, +obj, +obl] (acc.masc.sg.)
- /s/ ↔ [+fem] (nom./acc.neut.sg.)
- /e/ ↔ [ ] (nom./acc.fem.sg./pl.)


A morphological exponent M is chosen for a syntactic context (or paradigm cell) S if (a) and (b) hold.

- M is compatible with S.
- M is the most specific exponent among those that satisfy (219-a).

Compatibility:

A morphological exponent M is compatible with a syntactic context (or paradigm cell) S if M realizes a subset of the morpho-syntactic feature/value pairs of S.

Specificity:

A morphological exponent M₁ is more specific than a morphological exponent M₂ if M₁ realizes more features than M₂.

A Neurophysiological Study

The Event-Related Potential Violation Paradigm

Opitz, Regel, Müller & Friederici (2013):

- If underspecification is real, Compatibility vs. Specificity should also be an inherent part of the language processing system. One should therefore be able to observe separable effects for the violation of each of the criteria.
- The Event-Related Potential (ERP) violation paradigm can be used to test this hypothesis in the domain of strong adjective inflection in German.
- Prediction: There should be differences in brain potentials between two incorrect conditions whenever they represented different types of violation (of Compatibility and Specificity).
- Result: The findings strongly support underspecification: An ERP-component related to morpho-syntactic integration (viz., left anterior negativity; LAN) was modulated by violations of Specificity versus Compatibility.
- Furthermore: The neurophysiological evidence helps to distinguish between two kinds of morphological underspecification that have been proposed: It argues for maximal rather than minimal underspecification.

35. Experiment

Premise:

- Since pronominal inflection involves only closed-class items which are presumably stored as full forms in the mental lexicon, the experimental design made the choice of the strong adjective paradigm mandatory.
- This is unproblematic since the two paradigms are identical except for genitive masculine/neuter singular contexts, where pronominal inflection has an exponent -es and strong adjective inflection has an exponent -en, with exactly the same role in the system.
- The study focuses on accusative exponents where there is no difference; one can thus look at underspecification-based analyses of pronominal inflection as analyses of strong adjective inflection by extension.

Material: PPs with accusative NPs of all three genders

- durch schlicht-e Struktur
  by plain- FEM.SG.ACC structure. FEM
- durch schlicht-en Geschmack
  by plain- MASC.SG.ACC taste. MASC
- durch schlicht-es Design
  by plain- NEUT.SG.ACC design.neut
Maximal vs. Minimal Underspecification

Two kinds of (extensionally equivalent) underspecification approaches:

- **Maximal underspecification**: minimal number of features on a morphological exponent; reduces complexity of the lexical component.

- **Minimal underspecification**: maximal number of features on a morphological exponent that still accounts for syncretism; might reduce complexity of the processing component; simple learning algorithms exist (Harley (2001), Pertsova (2007), based on intersecting the sets of the different (fully specified) environments; as soon as a minimally underspecified exponent can be postulated, the algorithm stops).

Prediction:

1. With maximal underspecification, ungrammatical exponents will, as a tendency, more often be blocked by Specificity.

2. With minimal underspecification, ungrammatical exponents will, as a tendency, more often be blocked by Compatibility.

3. Exponents that are blocked in the same way in one approach may therefore be blocked in different ways in the other approach.

4. We expect an identical ERP profile in the first case but not in the second case.

(223) Inventory of exponents in Blevins (1995), with maximal underspecification

a. /n/ ↔ [+pl, +obj, +obl] (dat.pl.)
b. /m/ ↔ [+fem, +obj, +obl] (gen.masc.sg./neut.sg.)
c. /s/ ↔ [–fem, +obl] (gen.masc.sg./neut.sg.)
d. /r/ ↔ [+obl] (dat./gen.fem.sg./gen.pl.)
e. /n/ ↔ [+masc, –fem, +obj] (acc.masc.sg.)
f. /r/ ↔ [+masc, –fem] (nom./acc.fem.sg.)
g. /s/ ↔ [–fem] (nom./acc.neut.sg.)
h. /e/ ↔ [–obl] (nom./acc.neut.sg.)

(224) Inventory of exponents in Blevins (1995), with minimal underspecification

a. /n/ ↔ [+pl, +obj, +obl] (dat.pl.)
b. /m/ ↔ [+fem, +obj, +obl, –pl] (gen.masc.sg./neut.sg.)
c. /s/ ↔ [+fem, +obl, –pl] (gen.masc.sg./neut.sg.)
d. /r/ ↔ [+obl] (dat./gen.fem.sg./gen.pl.)
e. /n/ ↔ [+masc, –fem, +obj, –pl] (acc.masc.sg.)
f. /r/ ↔ [+masc, –fem, –obl, –pl] (nom./acc.fem.sg./pl.)
g. /s/ ↔ [–fem] (nom./acc.neut.sg.)
h. /e/ ↔ [–obl] (nom./acc.neut.sg.)

Predictions under Maximal Underspecification

Two types of illicit agreement, with maximal underspecification (as in (223)):

a. for feminine phrases:
   - identical kind of violation (Compatibility)
   - context features: [+masc, –fem, –obl, +obj]
   - correct marker: –e
   - incompatible (incorr.1): -(e)n [+masc, –fem, –obl, +obj]
   - incompatible (incorr.2): -(e)s [–fem]

b. for masculine phrases:
   - identical kind of violation (Specificity)
   - context features: [+masc, –fem, –obl, +obj]
   - correct: -(e)n [+masc, –fem, –obl, +obj]
   - compatible (incorr.1): -(e)s [–fem]
   - compatible (incorr.2): –e

c. for neuter phrases:
   - different kind of violation (Compatibility vs. Specificity)
   - context features: [+masc, –fem, –obl, +obj]
   - correct: -(e)n [+masc, –fem, –obl, +obj]
   - incompatible (incorr.1): -(e)s [–fem]
   - compatible (incorr.2): –e

Predictions under Minimal Underspecification

Two types of illicit agreement, with minimal underspecification (as in (224)):

a. for feminine phrases:
   - identical kind of violation (Compatibility)
   - context features: [+masc, –fem, –obl, +obj, –pl]
   - correct marker: –e
   - incompatible (incorr.1): -(e)n [+masc, –fem, –obl, +obj, –pl]
   - incompatible (incorr.2): -(e)s [–fem]

b. for masculine phrases:
   - different kind of violation (Compatibility vs. Specificity)
   - context features: [+masc, –fem, –obl, +obj, –pl]
   - correct: -(e)n [+masc, –fem, –obl, +obj, –pl]
   - incompatible (incorr.1): -(e)s [–masc, –fem, –obl, –pl]
   - compatible (incorr.2): –e

c. for neuter phrases:
   - different kind of violation (Compatibility vs. Specificity)
   - context features: [+masc, –fem, –obl, +obj, –pl]
   - correct: -(e)n [+masc, –fem, –obl, +obj, –pl]
   - incompatible (incorr.1): -(e)s [–masc, –fem, –obl, –pl]
   - compatible (incorr.2): –e

Predictions:

(A) No, (B) Maximal, (C) Minimal Underspecification
Predictions: assumed processing differences for different incorrect markers

<table>
<thead>
<tr>
<th>noun gender</th>
<th>without underspec.</th>
<th>with underspecification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>categorical</td>
<td>maximal</td>
</tr>
<tr>
<td>feminine</td>
<td>(corr. e)</td>
<td>s = n</td>
</tr>
<tr>
<td>neuter</td>
<td>(corr. s)</td>
<td>e = n</td>
</tr>
<tr>
<td>masculine</td>
<td>(corr. n)</td>
<td>e = s</td>
</tr>
</tbody>
</table>

Notational conventions:
1 signals a violation of Specificity; 2 signals a violation of Compatibility; $\alpha = \beta$ indicates the same type of violation/the same processing; and $\alpha < \beta$ indicates a different type of violation/different processing

36. Method

Items:
- 180 nouns (60 masculine, 60 feminine, 60 neuter)
- matched for length, frequency, plausibility, familiarity, derived/non-derived
- each item in 3 different correctness conditions (correct, incorrect1, incorrect2)
- = 540 experimental items
- 3 randomized lists, 240 items each list:
  - all 180 nouns (60 correct, 60 incorr1, 60 incorr2)
  - 60 correct fillers

Experimental design/conditions

<table>
<thead>
<tr>
<th>masculine NP</th>
<th>neuter NP</th>
<th>feminine NP</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘without new discount’</td>
<td>‘without new genre’</td>
<td>‘without new probe’</td>
</tr>
</tbody>
</table>

Correct: ohne neuen Rabatt
Incorrect 1: ohne neuen Genre
Incorrect 2: ohne neue Genre

Participants
- 42 German native speakers
- 21 male, 21 female
- all right-handed

Procedure
- visual word-by-word presentation: 400ms each word, 300ms ISI
- recording of EEG (51 electrodes according to the international 10-20 system)
- compared ERP for the processing of the noun (establishing/validation of agreement)
- grammaticality judgement after each trial (producing behavioural data)

Technical details
- grand averages were obtained for 1200ms epochs beginning 200 ms prior to the presentation of the critical stimuli (i.e., the nouns)
- time windows for analysis: 300-550ms; 600-900ms
- 4 Regions Of Interest (ROI), each containing 6 electrodes:
  - left anterior: F5, F3, FC5, C5, C3
  - right anterior: F4, F6, FC4, FC6, C4, C6
  - left posterior: CP5, CP3, P3, PO7, PO3
  - right posterior: CP4, CP6, P6, FO4, FO8 (midline)

Presentation

Results: Electrophysiological Data; Left-Anterior Negativity

<table>
<thead>
<tr>
<th>Marker</th>
<th>Anterior Sites</th>
<th>Posterior Sites</th>
<th>Midline Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>df</td>
<td>F</td>
<td>df</td>
</tr>
<tr>
<td>Gender x Marker</td>
<td>4.164</td>
<td>6.13***</td>
<td>1.416</td>
</tr>
</tbody>
</table>

Feminine
- Marker: 2.82 14.23***
- Gender x Marker: 4.164 6.13***

Neuter
- Marker: 2.82 17.17***
- Gender x Marker: 4.164 2.49(*)

Masculine
- Marker: 2.82 11.26***
- Gender x Marker: 4.164 2.37(*)

Effects of the step-down ANOVAs for anterior and posterior sites and the ANOVAs for the midline sites of the 300-550 ms latency window
Abbreviations used in this table: cor = correct; incor1 = incorrect1; incor2 = incorrect2; (*) = p < .10; * = p < .05; ** = p < .01; *** = p < .001; n.s. = not significant.

Results: Electrophysiological Data; P600

<table>
<thead>
<tr>
<th>Marker</th>
<th>df</th>
<th>F</th>
<th>df</th>
<th>F</th>
<th>df</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>2.82</td>
<td>n.s.</td>
<td>2.82</td>
<td>10.07***</td>
<td>2.82</td>
<td>6.146**</td>
</tr>
<tr>
<td>Gender x Marker</td>
<td>4.164</td>
<td>3.72**</td>
<td>4.164</td>
<td>n.s.</td>
<td>4.164</td>
<td>2.44(*)</td>
</tr>
</tbody>
</table>

**Feminine**

- Marker: 2.82 2.71(*) 2.82 5.42**
- cor vs incor1: 1.41 n.s.
- cor vs incor2: 1.41 n.s.
- incor1 vs incor2: 1.41 9.40**

**Neuter**

- Marker: 2.82 n.s.
- cor vs incor1: 1.41 n.s.
- cor vs incor2: 1.41 n.s.
- incor1 vs incor2: 1.41 n.s.

**Masculine**

- Marker: 2.82 4.88** 2.82 5.21**
- cor vs incor1: 1.41 9.25**
- cor vs incor2: 1.41 n.s.
- incor1 vs incor2: 1.41 n.s.

Effects of the step-down ANOVAs for anterior and posterior sites and the ANOVAs for the midline sites of the 600-900 ms latency window

37. Discussion: Two Main Results

(230) Background

a. Left-Anterior Negativity (LAN): indicative of morpho-syntactic violations (but see below for a qualification)

b. P600: indicative of reanalysis and repair

- LAN:
  1. In feminine contexts, where /e/ is correct, the two incorrect exponents /n/ and /s/ produce the same effect.
2. In *neuter* contexts, where /s/ is correct, the two incorrect exponents /s/ and /e/ produce different effects. (This is the main result of the study.)

3. In *masculine* contexts, where /n/ is correct, the two incorrect exponents /s/ and /e/ produce the same effect. Surprisingly, the correct marker /n/ also produces this effect. (This is also an interesting result.)

- **P600**: This effect showed up in the same way with all incorrect exponents.
- The LAN effects with *incorrect* forms in *neuter* contexts gives rise to a direct argument for underspecification.
- The LAN effect with *correct* forms in *masculine* contexts gives rise to a more indirect argument for underspecification.

### 38. Comparing Incorrect Conditions for Each Gender

#### (231) Predictions and results

<table>
<thead>
<tr>
<th>noun gender</th>
<th>without underspec.</th>
<th>with underspecification</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>categorical</td>
<td>maximal</td>
<td>minimal</td>
</tr>
<tr>
<td>feminine</td>
<td>s = n</td>
<td>s² = n²</td>
<td>s = n</td>
</tr>
<tr>
<td>neuter</td>
<td>e = n</td>
<td>e¹ &lt; n²</td>
<td>e &lt; n*</td>
</tr>
<tr>
<td>masculine</td>
<td>e = s</td>
<td>e¹ = s¹</td>
<td>e = e</td>
</tr>
</tbody>
</table>

**Conclusions:**

- The different LAN effect with /e/ and /n/ in neuter contexts strongly argues for the reality of a difference between *Compatibility* and *Specificity*, i.e., for underspecification.
- The absence of a LAN effect with /e/ and /s/ in masculine contexts strongly argues for *maximal* rather than *minimal* underspecification.

### 39. An Effect of Feature Matching

**Question:** Why is there a LAN effect for correct masculine forms that is indistinguishable from the LAN effect for the two incorrect forms?

**Answer:** This is an effect of feature matching.

#### (232) Proposal:

- a. [PP P |xP A N ] is parsed incrementally.
- b. P is read in: [+obj, –obl] (= acc) is available at this point.
- c. A is encountered. Gender information on A becomes available if there is any); [+masc, –fem] with /n/, [+fem] with /s/, and no gender feature with /e/. A’s case specification (if there is any) is now accessible. P-A agreement is carried out, comparing the case features of P and A. If there are no conflicts, potentially missing case features of the preposition are copied onto the adjective, yielding full case specifications on A.

- d. N enters the structure. It has specified gender information and fully specified number information, but no case information whatsoever yet. A-N agreement is carried out; the morpho-syntactic features of N are matched with the morpho-syntactic features of A.

**Agreement Evaluation**

#### (233) Sizes of feature sets in well-formed NPs before A-N agreement

<table>
<thead>
<tr>
<th>a. durch</th>
<th>schlichten</th>
<th>Geschmack</th>
</tr>
</thead>
<tbody>
<tr>
<td>by</td>
<td>plain.MASC</td>
<td>taste.MASC</td>
</tr>
<tr>
<td>[–obl, +obj]</td>
<td>[+masc, –fem]</td>
<td>[+masc, –fem]</td>
</tr>
</tbody>
</table>

← most features compared: 4/2

<table>
<thead>
<tr>
<th>b. durch</th>
<th>schlichtes</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>by</td>
<td>plain.NEUT</td>
<td>design.NEUT</td>
</tr>
<tr>
<td>[–obl, +obj]</td>
<td>[–fem]</td>
<td>[–masc, –fem]</td>
</tr>
</tbody>
</table>

← fewer features compared: 3/2

<table>
<thead>
<tr>
<th>c. durch</th>
<th>schlichte</th>
<th>Struktur</th>
</tr>
</thead>
<tbody>
<tr>
<td>by</td>
<td>plain.FEM</td>
<td>structure.FEM</td>
</tr>
<tr>
<td>[–obl, +obj]</td>
<td>[–fem]</td>
<td>[–masc, +fem]</td>
</tr>
</tbody>
</table>

← fewest features compared: 2/2

**Conclusions:**

- The LAN effect with correct masculine forms is due to the fact that the most features need to be compared in incremental agreement, outweighing the LAN effect with the incorrect forms here.
- This provides a second, albeit indirect, argument for morphological underspecification: Underspecification actually facilitates processing (as it facilitates lexical storage).
VII. Differential Marking and Three-Way Systems as Morphological Allomorphy

Ref.: Aissen (2003), Keine & Müller (2011; 2014), Müller & Thomas (2014)

40. Background

Note:
This is the start of the optimality-theoretic part of the course.

Observation:
Optimality Theory crucially relies on a competition of candidate forms (which are assembled in candidate sets). Furthermore, candidate sets can in principle easily be infinite. This is often taken to raise computational complexity issues.

Reaction:
This qualm arises from a misapprehension about the kind of thing that grammars are. It is not incumbent upon a grammar to compute, as Chomsky has emphasized repeatedly over the years. A grammar is a function that assigns structural descriptions to sentences; what matters formally is that the function is well-defined. The requirements of explanatory adequacy (on theories of grammar) and descriptive adequacy (on grammars) constrain and evaluate the space of the hypotheses. Grammatical theorists are free to contemplate any kind of formal device in pursuit of these goals; indeed, they must allow themselves to range freely if there is to be any hope of discovering decent theories. Concomitantly, one is not free to impose arbitrary additional meta-constraints (e.g. ‘computational plausibility’) which could conflict with the well-defined basic goals of the enterprise. In practice, computationalists have always proved resourceful. All available complexity results for known theories are stunningly distant from human processing capacities ... yet all manner of grammatical theories have nonetheless been successfully implemented in parsers, to some degree or another, with comparable efficiency. ... There are neither grounds of principle nor grounds of practicality for assuming that computational complexity considerations, applied directly to grammatical formalisms, will be informative.”

Prince & Smolensky (1993, 197; 2004, 233)

Note:
 Whereas there are alternative approaches to phonology and syntax that do without the concept of competition, this is not actually the case in (inflectional) morphology: Current approaches to inflectional morphology regularly rely on underspecification. Therefore, the concept of competition is present throughout, as is a means for competition resolution. The most important difference between optimality-theoretic and other approaches to morphology will then be the exact mechanism to resolve the competition – optimal constraint profile in one case, highest degree of specificity in the other.

Strategy:
Against the background of the structure of grammar assumed in Distributed Morphology, Optimality Theory could in principle be relevant in three relevant domains:

[1] Syntax

[2] Syntax/Morphology Interface: Post-syntactic morphological operations that precede vocabulary insertion (i.e., that precede genuine morphological exponence)


[1] is not the topic of this course.

[2] is the more conservative view: Optimality Theory as a theory of interfaces. (See, e.g., Pesetsky (1997; 1998) for this position.)

[3] is the more radical view: Optimality Theory directly covers morphological realization (plus, typically, what is otherwise handled in [2].)

Note:
I will address [2] in the present lecture; the rest of the course then focusses on [3].

Claims:

- Differential argument encoding should be analyzed as a purely morphological phenomenon that is based on selective post-syntactic case feature deletion.
- Three-way case systems should be analyzed as a purely morphological phenomenon that is based on selective post-syntactic case feature deletion.
- Post-syntactic case feature deletion is brought about by optimization procedures rather than by impoverishment rules: The latter would have to refer to unnatural classes.

41. Optimality Theory

Optimality Theory (OT) has been developed since the early nineties, by Alan Prince, Paul Smolensky, John McCarthy and others. At first, the focus was mainly on phonology; but the approach has since been extended to morphology, syntax, semantics, and pragmatics. The most comprehensive (and best) exposition of the theory is still Prince & Smolensky (1993; 2004).

(234) Basic assumptions of Optimality Theory:

a. **Universality**: Constraints are universal.
b. **Violability**: Constraints are violable.
c. **Ranking**: Constraints are ranked.
d. **Competition**: The wellformedness of a linguistic expression LE cannot solely be determined on the basis of LE’s internal properties. Rather, external factors (more precisely, the competition of LE with other linguistic expressions) determine whether LE is grammatical or not. LEs are candidates.

Note:
LE stands for a grammatical unit that is subject to an optimization procedure deciding on its wellformedness. LE is the basic unit of a grammatical domain (phonology, morphology, syntax, semantics).
Optimality:
A candidate $C_i$ is optimal with respect to some constraint ranking $<\text{Con}_1 \gg \text{Con}_2 \gg ... \gg \text{Con}_n >$ iff there is no other candidate $C_j$ in the same candidate set that has a better constraint profile.

Constraint profile:
$C_j$ has a better constraint profile than $C_i$ if there is a constraint $\text{Con}_k$ such that (i) and (ii) hold:
a. $C_j$ satisfies $\text{Con}_k$ better than $C_i$.
b. There is no constraint $\text{Con}_l$ that is ranked higher than $\text{Con}_k$, and for which $C_i$ and $C_j$ differ.

Note:
$C_j$ satisfies a constraint $\text{Con}$ better than $C_i$ if $C_j$ violates $\text{Con}$ less often than $C_i$. (This includes the case where $C_j$ does not violate $\text{Con}$ at all, whereas $C_i$ does.)

Candidate set:
Two candidates are in the same candidate set iff they go back to the same input (‘underlying representation’).

Structure of an optimality-theoretic grammar

- Faithfulness constraints demand that input and output are identical with respect to some property
  - DEP: no addition of items in the output.
  - MAX: no deletion of items in the output.
  - IDENT: no change of items in the output.
- Markedness constraints impose requirements on outputs that may necessitate a deviation from the input.

Note:
Optimality-theoretic competitions are often illustrated by tables, so-called tableaux.

$T_1$ The basic principle

Generalization:
The optimal output is the candidate that has its first star furthest to the right in a tableau.

$T_2$: Parametrization

Note:
Optimality theory was developed out of so-called “Harmonic Grammar” approaches → theory of neural networks. (Further reading: Prince & Smolensky (2004, ch. 10), Smolensky & Legendre (2006, part I). I will come back to Harmonic Grammar at the end of the course.) Main innovation: Quality before quantity; no number of violations of a lower-ranked constraint can outweigh a single violation of a higher-ranked constraint. This property is also known as strict domination.
\[ T_3: \text{Irrelevance of constraint violation numbers as such} \]

\[
\begin{array}{ccc}
\text{A} & \text{B} & \text{C} \\
\ast\ast \ast\ast & \ast\ast\ast\ast\ast & \ast\ast\ast\ast\ast\ast \\
\ast\ast & \ast\ast\ast\ast & \ast\ast\ast\ast\ast \\
\ast & \ast\ast & \ast\ast\ast \\
\ast & \ast\ast & \ast\ast \\
\end{array}
\]

Caveat:
OT has introduced a means to undermine the irrelevance of constraint violation quantity as such: (reflexive) local conjunction (see Smolensky (1996; 2006); and Legendre et al. (1998), Fischer (2001), Aissen (1999; 2002), Keine (2009), and Keine & Müller (2011; 2014) for some syntactic applications of local conjunction.

(240) Local Conjunction:
 a. Local conjunction of two constraints \(\text{Con}_1, \text{Con}_2\) with respect to a local domain \(\text{D}\) yields a new constraint \(\text{Con}_1 \& \text{Con}_2\) that is violated iff there are two separate violations of \(\text{Con}_1\) and \(\text{Con}_2\) in a single domain \(\text{D}\).
b. Universal ranking: \(\text{Con}_1 \& \text{Con}_2 \gg \{\text{Con}_1, \text{Con}_2\}\)
c. If \(\text{Con}_1 = \text{Con}_2\), local conjunction is reflexive.
d. Notation: \(B^2 = B \& B, B^3 = B^2 \& B, \text{etc.}\)

\[ T_3: \text{A consequence of reflexive local conjunction} \]

\[
\begin{array}{ccc}
\text{C}^\ast & \text{A} & \text{B} & \text{C} \\
\ast\ast & \ast\ast\ast\ast & \ast\ast\ast\ast\ast\ast\ast\ast \\
\ast & \ast\ast\ast\ast & \ast\ast\ast\ast\ast \\
\ast & \ast\ast & \ast\ast\ast \\
\ast & \ast\ast & \ast\ast \\
\end{array}
\]

42. Differential Marking

42.1. Harmonic Alignment

(241) Harmonic Alignment (Prince & Smolensky (2004)):
Suppose given a binary dimension \(D_1\) with a scale \(X > Y\) on its elements \{X,Y\}, and another dimension \(D_2\) with a scale \(a > b > \ldots > z\) on its elements \{a,b,\ldots,x\}. The harmonic alignment of \(D_1\) and \(D_2\) is the pair of Harmony scales \(H_X, H_Y\):
 a. \(H_X: X/a > X/b > \ldots > X/z\)
b. \(H_Y: Y/z > \ldots > Y/b > Y/a\)
The constraint alignment is the pair of constraint hierarchies \(C_X, C_Y\):
 a. \(C_X: *X/a \gg \ldots \gg *X/b \gg *X/a\)
b. \(C_Y: *Y/a \gg *Y/b \gg \ldots \gg *Y/a\)

Proposal (Aissen (1999; 2003)):
By combining (i) harmonic alignment applied to the scales identified by Hale (1972) and Silverstein (1976) as in (242) and (ii) local conjunction with markedness constraints in an OT grammar, alternations between zero and non-zero exponence can be derived (differential subject marking, differential object marking).

(242) Scales:
 a. \(\text{GF scale (basic):}\)
   Subject > Object
   \("\text{Subject} = \"\text{specifier of vP}, \text{object = \"complement of V}: Chomsky (1965; 2001)\"
 b. \(\theta \text{ scale:}\)
   Agent > Patient
 c. \(\text{Person scale:}\)
   Local Pers. (1,2) > 3. Pers.
 d. \(\text{Prominence scale:}\)
   \(X > x\) (discourse-prominent argument > non-discourse-prominent argument)
 e. \(\text{Animacy scale:}\)
   \(\text{Hum(an)} > \text{Anim(ate)} > \text{Inan(imate)}\)
 f. \(\text{Definiteness scale:}\)
   \(\text{Pro(noun)} > \text{Name (PN)} > \text{Def(inite)} > \text{Indefinite Specific (Spec)} > \text{NonSpecific (NSpec)}\)

(243) Markedness constraints:
 a. \(*\text{OC} \text{ (Star-Zero(Case))}: (\text{is conjoined with a hierarchy of constraints})\)
   \("\text{penalizes the absence of a value for the feature CASE}"\)
b. \(*\text{STRUC}_C \text{ (Star-Structure(Case))}: (\text{is not conjoined with a hierarchy of constraints})\)
   \("\text{penalizes a value for the morphological category CASE}"\)

(244) A consequence for differential object marking:
\[ \leftarrow *\text{STRUC}_C \]
Kalkatungu: no objects case-marked
\[ *\text{Obj}/\text{Pro} \& *\text{OC} \gg \leftarrow *\text{STRUC}_C \]
Catalan: only pronominal objects case-marked
\[ *\text{Obj}/\text{PN} \& *\text{OC} \gg \leftarrow *\text{STRUC}_C \]
Pitjantjatjara: only pronominal and PN objects case-marked
\[ *\text{Obj}/\text{Def} \& *\text{OC} \gg \leftarrow *\text{STRUC}_C \]
Hebrew: only pronominal, PN, and definite objects case-marked
\[ *\text{Obj}/\text{Spec} \& *\text{OC} \gg \leftarrow *\text{STRUC}_C \]
Turkish: all objects case-marked except non-specific objects
\[ *\text{Obj}/\text{NSpec} \& *\text{OC} \gg \leftarrow *\text{STRUC}_C \]
Written Japanese: all objects case-marked
42.2. Two-Dimensional Differential Object Marking

DOM in El Cid Spanish:

![Diagram of DOM in El Cid Spanish]

42.3. Problem

Problem:
Aissen’s approach only permits yes/no decisions concerning morphological marking. This does not take into account the possibility that there might be degrees of morphological marking: iconicity.

Proposal:
Differential argument encoding results from harmonic alignment of scales, but it is a purely morphological phenomenon, not a syntactic phenomenon (as assumed in Aissen (1999; 2003)).

42.4. Impoverishment

Impoverishment Rules
(i) Impoverishment rules are a fundamental concept of Distributed Morphology. They are deletion transformations that remove morpho-syntactic features (which need to be realized by morphological exponents in a post-syntactic morphological component) before marker (= vocabulary item) insertion takes place (see Bonet (1991), Noyer (1998), Halle & Marantz (1993; 1994), Bobaljik (2002b), Rampton (2002)). As a consequence of impoverishment, inflectional morphology applies to reduced feature matrices, and there is a retreat to the general case: a less specific marker is inserted than would otherwise be expected.
(ii) Impoverishment can be viewed as insertion of highly specific zero exponents (see Trommer (1999b)).
(iii) Impoverishment can be viewed as being triggered by general filters blocking the co-occurrence of features (Noyer (1992)), or by interacting optimality-theoretic constraints with the same effect (Grimshaw (2001), Kiparsky (2001), Trommer (2001; 2006a), Wunderlich (2004), Lahne (2007b), Opitz (2007)).

Observation:
Aissen’s analyses can be reanalyzed in terms of impoverishment:
(i) As before, impoverishment is a post-syntactic operation that deletes morpho-syntactic features.
(ii) Deletion applies so as to satisfy complex faithfulness constraints created by harmonic alignment of scales.
(iii) On this view, impoverishment is essentially functionally motivated.

42.5. Iconicity

Background assumption:
Syncretism is derived by underspecification of exponents with respect to morpho-syntactic features (which may be more abstract than is motivated by syntactic considerations – e.g., [$\pm$obl], [$\pm$obl] as more primitive, decomposed case features whose cross-classification yields the four cases of German, with underspecification capturing natural classes of cases).

Observation (Wiese (1999; 2003; 2004)):
Iconicity holds of inflectional systems.

42.6. Proposal

Suggestion:
(i) Differential marking is not necessarily a categorical yes/no phenomenon; rather, it can be gradient phenomenon.
(ii) Differential marking is brought about by impoverishment. Impoverishment consists of post-syntactic deletion of morpho-syntactic features, triggered by faithfulness constraints derived from harmonic alignment of scales.

(iii) Impoverishment requires insertion of a less specific marker. It may lead to zero exponence winning (/Ø/ is often the elsewhere marker), but it may also lead to a selection of other markers that instantiate a “retreat to the general case”, and that are formally closer to zero exponence than the marker that would otherwise be expected (iconicity).

Basic assumptions:
(i) The organization of grammar is as assumed in Distributed Morphology: Syntax precedes inflectional morphology; and syntactic structures can be manipulated before morphological realization (‘vocabulary insertion’) takes place.
(ii) The only crucial difference is that impoverishment is brought about not by specific rules, but by a system of conflicting constraints (Grimshaw (2001), Kiparsky (2001), Trommer (2001; 2006a), Wunderlich (2004), Lahne (2007b), Opitz (2007)).

(248) Late vocabulary insertion (Halle & Marantz (1993)):
   a. Functional morphemes 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.

(249) 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).

(250) 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 \( F \) 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 \( F' \).

   a. Syntactic structures (inputs) are mapped onto structures that serve as the input to vocabulary insertion (outputs).
   b. This mapping is subject to optimization (Prince & Smolensky (2004)).
   c. Markedness constraints may force feature deletion, in minimal violation of faithfulness (MAX) constraints.
   d. Vocabulary insertion may face an impoverished structure.

42.7. Case Studies
42.7.1. Case Study: Differential Encoding of Objects in Mannheim German
Refs.: Behaghel (1911), Karch (1975), Müller (2003), and literature cited there

42.7.1.1 The Phenomenon Observation:
(i) In all varieties of German, feminine, neuter, and plural NPs are morphologically indistinguishable in nominative and accusative environments.
(ii) In the variety of German spoken in and around Mannheim (and elsewhere in Palatine and Rhine areas), the same holds for non-pronominal masculine NPs: “Rheinischer Akkusativ” (see Behaghel (1911), Karch (1975)).
(iii) The pattern is not extended to personal pronouns.
(iv) Thus, Hale/Silverstein scales seem to be at work.
(v) This suggests a unified approach: a unified approach is not available if the theory of differential argument encoding can only account for a difference between zero and non-zero encoding (the nominative forms of German determiner inflection are not zero).

(252) Case marking of non-pronominal objects in Mannheim German:
   a. Ich wünsche Ihnen [NP ein-Ø schön-er Tag] noch
      I wish youdat a-NOM nice-NOM day PRT
   b. Wir haben [NP pädagogisch-er Planungstag ]
      we have pedagogical-NOM planning day
   c. Ich hab auch [NP ein-Ø schön-er Ball ], meinst du, blöSS du hast [NP
      I have also a-NOM nice-NOM ball, think you, just you have
      ein-er ]?
      a-NOM
d. Man müsste mal wieder so richtig [NP einer ] drauf machen
      one should PRT again PRT really one-NOM on it make
      ‘We should really have a night on the town again.’
   e. Hol mir mal [NP der Eimer ]
      fetch me PRT the-NOM bucket

(253) Case marking of pronominal objects in Mannheim German:
Hol en/*er mir mal her
fetch he-ACC/*he-NOM me-DAT PRT PRT

42.7.1.2 Analysis: Recall Wiese’s (1999) underspecification analysis of determiner inflection in Standard German (see Bierwisch (1967), Blevins (1995), Wunderlich (1997b), Wiese (1999), Trommer (2005b) for alternative suggestions, most of which could just as well be adopted for present purposes).

(254) Case | Gender/Number
--- | ---
NOM: [-obl, -gov] | MASC: [+masc, -fem]
ACC: [-obl, +gov] | FEM: [-masc, +fem]
DAT: [+obl, +gov] | NEUT: [+masc, +fem]
GEN: [+obl, -gov] | PL: [-masc, fem]
Vocabulary items for determiner inflection in German

(a) /m/ \(\leftrightarrow [+\text{masc}, +\text{obl}, +\text{gov}]\) (Dat./Masc./Sg./Neut./Sg.)
   /s/ \(\leftrightarrow [+\text{masc}, +\text{obl}]\) (Gen./Masc./Sg./Neut./Sg.)
   /s/ \(\leftrightarrow [+\text{masc}, +\text{fem}]\) (Nom./Acc./Neut./Sg.)

(b) /n/ \(\leftrightarrow [+\text{masc}, +\text{gov}]\) (Acc./Masc./Sg.)
   /r/ \(\leftrightarrow [+\text{masc}]\) (Nom./Masc./Sg.)
   /r/ \(\leftrightarrow [+\text{obl}, +\text{fem}]\) (Dat./Gen./Fem./Sg.)
   /n/ \(\leftrightarrow [+\text{obl}, +\text{gov}]\) (Dat./Pl.)
   /r/ \(\leftrightarrow [+\text{obl}]\) (Gen./Pl.)

(c) /e/ \(\leftrightarrow \) (Nom./Acc./Fem./Sg./Pl.)

Scales

(a) GF scale (basic):
   Subject > object

(b) Definiteness scale:
   Pro(noun) > Name (PN) > Definite > Indefinite Specific (Spec) > NonSpecific (NSpec)

Constraint alignment:

*Obj/Pro \(\gg\) *Obj/PN \(\gg\) *Obj/Def \(\gg\) *Obj/Spec \(\gg\) *Obj/NSpec

Note:
(i) *Obj/Pro & Max-C is violated if a case feature of a VP-internal pronoun is deleted post-syntactically (before morphological realization).
(ii) *Obj/PN & Max-C is violated if a case feature of a VP-internal proper name NP is deleted post-syntactically (before morphological realization).

A conflicting constraint that triggers case feature deletion (a special version of *StrucC;)

*[-gov]

Ranking:

a. *Obj/Pro & Max-C \(\gg\)
   b. *[-gov] \(\gg\)
   c. *Obj/PN & Max-C \(\gg\) *Obj/Def & Max-C \(\gg\) *Obj/Spec & Max-C \(\gg\)
   *Obj/NSpec & Max-C

Consequences:
(i) *[-gov] is maintained with object pronouns. (Personal pronouns follow essentially the same system of inflection as determiners: e-r-ih-n/e-n parallels dies-er-dies-en; see Wiese (2001a), Fischer (2006).)
(ii) *[-gov] is deleted with all other (structurally case marked) objects. Here, /n/ cannot be inserted anymore, and the more general marker /r/ must be chosen.

Question:
Why does this not lead to deletion of *[-gov] in dative contexts? (It doesn’t because masculine/neuter /n/ is not replaced with less specific /s/ with non-pronominal NPs, and plural /n/ is not replaced with /r/ either: *Ich danke dieses Mann, *Ich danke dieser Männer.)

Answer:
*Obj” means Comp(V), but dative arguments show up as Spec(V). The *Spec(V)/X & Max-C constraints are all higher-ranked than *[-gov].

42.7.2. Another Case Study:
Differential Encoding of Objects in Finnish


42.7.2.1 The Phenomenon Observation:
(i) Finnish objects can be structurally case-marked by four different exponents, only one of which is zero: /t/, /n/, /a/, /Ø/.
(ii) The principles that determine choice of the correct exponents are exactly the ones that Aissen (1999; 2003) shows to underlie zero/non-zero alternations in differential argument encoding.
(iii) This strongly suggests a unified approach; but a unified approach is not available if the theory of differential argument encoding can only account for a difference between zero and non-zero encoding.

Conclusion:
Differential case marking of objects in Finnish is best treated as a morphological phenomenon. (Note: To some extent, suggestions along these lines can already be found in Kiparsky (2001) and Wunderlich (2000), and what follows owes a lot to these works. However, the analysis below is much more radical in its treatment of objective case, and also fairly different in several other respects.)

(260) Case marking of objects in Finnish (Kiparsky (2001)):

a. Tuo-n häntä
   bring-1.sg he-ACC
   ‘I’ll bring him.’

b. Tuo-n karhu-n
   bring-1.sg bear-GEN
   ‘I’ll bring the/a bear.’

c. Tuo-Ø karhu-Ø
   bring-IMP bear-NOM
   ‘Bring the/a bear!’

d. Etsi-n karhu-a
   seek-1.sg bear-PART
   ‘I’m looking for the/a bear.’

(261) Structural case markers (singular) (traditional grammar):

<table>
<thead>
<tr>
<th>nouns: ‘bear’</th>
<th>pronouns: ‘you’</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>/Ø/</td>
</tr>
<tr>
<td>ACC</td>
<td>/Ø/</td>
</tr>
<tr>
<td>GEN</td>
<td>/n/</td>
</tr>
<tr>
<td>PART</td>
<td>/a/</td>
</tr>
</tbody>
</table>

(262) Structural case markers (singular) (Kiparsky’s (2001) reconstruction):

<table>
<thead>
<tr>
<th>nouns: ‘bear’</th>
<th>pronouns: ‘you’</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>/Ø/</td>
</tr>
<tr>
<td>ACC</td>
<td>–</td>
</tr>
<tr>
<td>GEN</td>
<td>/n/</td>
</tr>
<tr>
<td>PART</td>
<td>/a/</td>
</tr>
</tbody>
</table>
Generalizations (Kiparsky (2001)):
(i) Objects of predicates that give rise to an *unbounded* (atelic) interpretation always take the partitive exponent.
(ii) Objects of predicates that give rise to a *bounded* (telic) (resultative, or quasi-resultative) interpretation take the partitive marker if they have a "quantitatively indeterminate denotation."
(iii) Otherwise, objects of the latter predicates take the accusative marker if they are personal pronouns;
(iv) and they take the genitive marker if they are non-pronominal, and c-commanded by an overt subject.
(v) In all other cases, a structurally case-marked object NP takes the nominative marker.

Conclusion:
(i) Pronouns are marked differently from other NPs.
(ii) Non-specific NPs are marked differently from other NPs.
(iii) This suggests harmonic alignment with the definiteness scale.

42.7.2.2 Analysis Claim:
(i) There is only one kind of object case in (260): accusative.
(ii) Marker variation is a morphological phenomenon resulting from impoverishment.

- NOM: [+gov, –obl, +subj]
- GEN: [+gov, +obl, ±subj]
- ACC: [+gov, –obl, –subj]

(264) Scales
- GF scale (basic):
  - Subject > object
    - (Spec(V) > Comp(V))
- Definiteness scale:
  - Pro(noun) > Name (PN) > Definite > Indefinite Specific (Spec) > NonSpecific (NSpec)
- Boundedness scale:
  - Bounded > unbounded (Bd > NBd)

(265) Constraint alignments:
- a. *Obj/Pro ⇒ *Obj/PN ⇒ *Obj/Def ⇒ *Obj/Spec ⇒ *Obj/NSpec
- b. *Obj/Bd ⇒ *Obj/NBd

Local conjunction of members of the two constraint hierarchies preserves order. It ultimately yields two-dimensional differential argument encoding.

(266) Local conjunction:
- a. *Obj/Pro & *Obj/Bd ⇒ *Obj/PN & *Obj/Bd ⇒ *Obj/Def & *Obj/Bd ⇒ *Obj/Spec & *Obj/Bd ⇒ *Obj/NSpec & *Obj/Bd

b. *Obj/Pro & *Obj/NBd ⇒ *Obj/PN & *Obj/NBd ⇒ *Obj/Def & *Obj/NBd ⇒ *Obj/Spec & *Obj/NBd ⇒ *Obj/NSpec & *Obj/NBd

(267) Notational variant (simplification):
- a. *Obj/Pro/Bd ⇒ *Obj/PN/Bd ⇒ *Obj/Def/Bd ⇒ *Obj/Spec/Bd ⇒ *Obj/NSpec/Bd
- b. *Obj/Pro/NBd ⇒ *Obj/PN/NBd ⇒ *Obj/Def/NBd ⇒ *Obj/Spec/NBd ⇒ *Obj/NSpec/NBd

(268) Order-preserving local conjunction with Max-CASE (formerly *ØC):
- a. *Obj/Pro/Bd & Max-C ⇒ *Obj/PN/Bd & Max-C ⇒ *Obj/Def/Bd & Max-C ⇒ *Obj/Spec/Bd & Max-C ⇒ *Obj/NSpec/Bd & Max-C
- b. *Obj/Pro/NBd & Max-C ⇒ *Obj/PN/NBd & Max-C ⇒ *Obj/Def/NBd & Max-C ⇒ *Obj/Spec/NBd & Max-C ⇒ *Obj/NSpec/NBd & Max-C

Note:
(i) *Obj/Pro/Bd & Max-C is violated if a case feature of a VP-internal pronoun in a clause with a bounded interpretation of the predicate is deleted post-syntactically (before morphological realization).
(ii) *Obj/NSpec/NBd & Max-C is violated if a case feature of a VP-internal indefinite non-specific NP in a clause with an unbounded interpretation of the predicate is deleted post-syntactically (before morphological realization).
(iii) Constraints of this type are gradient – multiple violations add up.

(269) Conflicting constraints that trigger case feature deletion (versions of *STRUCC):
- a. *[-obl] 
- b. *[-gov] 
- c. *[- subj] 

(270) Ranking:
- a. I: *Obj/Pro/Bd & Max-C ⇒ *Obj/PN/Bd & Max-C ⇒ *Obj/Def/Bd & Max-C ⇒ *Obj/Spec/Bd & Max-C ⇒ *Obj/NSpec/Bd & Max-C
- b. *[-obl] ⇒ *[-gov] ⇒ *[- subj]
(271) The overall picture:

Accusative specification: [+gov,–obl,–subj]

(272) Impoverishment effects with object case derived:

a. [–obl] \rightarrow Ø/\neg(Pro,Bd)

b. [+gov] \rightarrow Ø/\neg(Nbd\lor(NSpec,Bd))

Note: (272) reveals that, in a canonical impoverishment approach (that does not rely on optimization), it would be difficult to characterize the relevant environments as natural classes – negation and disjunction are needed (at least this holds as long one does not postulate a more fine-grained feature structure underlying the various categories).

(273) Vocabulary items:

a. /t/ ↔ [+gov,–obl,–subj]

b. /n/ ↔ [+gov]

c. /a/ ↔ [–subj]

d. /Ø/ ↔ [ ]

Note:

(i) Assuming that the genitive is defined as [+gov,+obl,+subj], /n/ cannot be characterized by [+gov,–subj] (because then the syncretism cannot be captured).

(ii) Under this assumption, a partial hierarchy of features [+gov] > [–subj] must then be assumed to ensure the correct choice of exponent in II contexts.

(274) Sample optimizations 1: /t/

<table>
<thead>
<tr>
<th>Input: Type I</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+gov,–obl,–subj],[Pro],[Bd]</td>
<td>*–obl</td>
<td>*+gov</td>
<td>*–subj</td>
</tr>
</tbody>
</table>

\[ O_1: [+gov,–obl,–subj] \]

\[ O_2: [+gov,–obl] \]

\[ O_3: [+gov,–subj] \]

\[ O_4: [–obl,–subj] \]

\[ O_5: [+gov] \]

\[ O_6: [–obl] \]

\[ O_7: [–subj] \]

\[ O_8: [ ] \]

Consequence:

Output O_1: [+gov,–obl,–subj] is optimal; there is no impoverishment. Therefore, /t/ is the most specific vocabulary item that fits, and it is inserted.

(275) Sample optimizations 2: /n/

<table>
<thead>
<tr>
<th>Input: Type II</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+gov,–obl,–subj],[Def],[Bd]</td>
<td>*–obl</td>
<td>*+gov</td>
<td>*–subj</td>
</tr>
</tbody>
</table>

\[ O_1: [+gov,–obl,–subj] \]

\[ O_2: [+gov,–obl] \]

\[ O_3: [+gov,–subj] \]

\[ O_4: [–obl,–subj] \]

\[ O_5: [+gov] \]

\[ O_6: [–obl] \]

\[ O_7: [–subj] \]

\[ O_8: [ ] \]

Consequence:

Output O_3: [+gov,–subj] is optimal; there is impoverishment (post-syntactic deletion of [–obl]) Therefore, /t/ cannot be inserted anymore (because of the Subset Principle), and there is a (minimal) retreat to the more general case: The next-specific marker /n/ is inserted.

(276) Sample optimizations 3: /a/

<table>
<thead>
<tr>
<th>Input: Type III</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+gov,–obl,–subj],[Ns culp],[Nbd]</td>
<td>*–obl</td>
<td>*+gov</td>
<td>*–subj</td>
<td></td>
</tr>
</tbody>
</table>

\[ O_1: [+gov,–obl,–subj] \]

\[ O_2: [+gov,–obl] \]

\[ O_3: [+gov,–subj] \]

\[ O_4: [–obl,–subj] \]

\[ O_5: [+gov] \]

\[ O_6: [–obl] \]

\[ O_7: [–subj] \]

\[ O_8: [ ] \]

Consequence:

Output O_7: [–subj] is optimal; impoverishment deletes [+gov] and [–obl], but no more than
that. Therefore, /a/ is the most specific marker that fits (blocking /Ø/).

**Note:**
Zero exponent results from massive impoverishment (a deletion of all case features). Simplifying a bit, it shows up when there is no overt subject argument present (e.g., in imperatives). Again, this would seem to suggest a clear functional motivation. There are two analytic possibilities; the first one is adopted here for the sake of simplicity. (Both solutions presuppose that whether a subject argument is overtly present or not can be read off syntactic structures, before post-syntactic morphology takes place.)

(i) Objects do not participate in harmonic alignment in the first place when they are not accompanied by an overt subject. Hence, sole objects do not obey any of the constraints in I-III, and the *[case] constraints demand full deletion of case features.

(ii) Sole objects participate in harmonic alignment and thus fall under I-III. However, there is an undominated constraint that demands deletion of case features in object positions when no (relevant) subject is present.

(277) **Sample optimizations 4: */Ø/**

<table>
<thead>
<tr>
<th>Input: Type IV</th>
<th>[*-obl, subj], [no subject]</th>
<th>[*-obl]</th>
<th>[*+gov]</th>
<th>[*-sub]</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁: [*+gov, -obl, subj]</td>
<td><img src="image1.png" alt="image" /></td>
<td><img src="image2.png" alt="image" /></td>
<td><img src="image3.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₂: [*+gov, -obl]</td>
<td><img src="image4.png" alt="image" /></td>
<td><img src="image5.png" alt="image" /></td>
<td><img src="image6.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₃: [*+gov, subj]</td>
<td><img src="image7.png" alt="image" /></td>
<td><img src="image8.png" alt="image" /></td>
<td><img src="image9.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₄: [*obl, subj]</td>
<td><img src="image10.png" alt="image" /></td>
<td><img src="image11.png" alt="image" /></td>
<td><img src="image12.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₅: [*+gov]</td>
<td><img src="image13.png" alt="image" /></td>
<td><img src="image14.png" alt="image" /></td>
<td><img src="image15.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₆: [*obl]</td>
<td><img src="image16.png" alt="image" /></td>
<td><img src="image17.png" alt="image" /></td>
<td><img src="image18.png" alt="image" /></td>
<td></td>
</tr>
<tr>
<td>O₇: [*sub]</td>
<td><img src="image19.png" alt="image" /></td>
<td><img src="image20.png" alt="image" /></td>
<td><img src="image21.png" alt="image" /></td>
<td></td>
</tr>
</tbody>
</table>

**Consequence:**
Output O₅: [ ] is optimal; impoverishment deletes all case features. Therefore, */Ø/** is the only remaining marker that fits – a full retreat to the general case.

**Final remark:**
The system reveals iconicity, as argued by Wiese (1999) for German: /t/ is less sonorous than /n/, which is less sonorous than /a/ (assuming the initial t that shows up with a in certain morpho-phonologically defined contexts to be truly epenthetic, and irrelevant to the abstract system as such); */Ø/** is least marked. This corresponds to the exponents’ degree of specificity.

42.7.3. Yet Another Case Study: Differential Encoding of Objects in Cavineña

**Ref.:** Guillaume (2008, 569ff., 603f.) (Bolivia, Tacanan family, <1,200 speakers)

42.7.3.1 The Phenomenon Observation:
Two dative/genitive markers can appear: -kwe and -ja. The choice depends on person and number features of the stem—*kwe* can only be attached to local persons (i.e., first or second person) in the singular. All other combinations select -ja.

This constitutes a case of differential object marking since singular first or second person objects are highly marked. All other combinations are marked less in terms of Hale/Silverstein scales. We argue that it is not a coincidence that for such highly marked objects a phonologically more complex case exponent is chosen. Phonological complexity of markers and hierarchical markedness are again correlated.

(278) **Distribution of markers:**

<table>
<thead>
<tr>
<th>Person</th>
<th>SG</th>
<th>DL</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>e-Ø-kwe</td>
<td>ya-tse-ja</td>
<td>e-kwana-ja</td>
</tr>
<tr>
<td>2</td>
<td>mi-Ø-kwe</td>
<td>me-tse-ja</td>
<td>mi-kwana-ja</td>
</tr>
<tr>
<td>3</td>
<td>tu-Ø-ja</td>
<td>ta-tse-ja</td>
<td>tu-na-ja</td>
</tr>
<tr>
<td>3PRROX</td>
<td>riya-Ø-ja</td>
<td>re-tse-ja</td>
<td>re-na-ja</td>
</tr>
</tbody>
</table>

(279) **Dative/genitive markers in Cavineña:**

a. E-kwe ani-kware [ maletero ari-dáC=keRC |S]
   \hspace{1cm} 1SG-DAT sit-REM.PAST bag big-ASF=LIG
   \hspace{1cm} 'I had a big bag (lit. a big bag sat to me).'

b. Sergio-ja ani-ya [ ata Ramón bakani |S]
   \hspace{1cm} Sergio-DAT sit-IMP.FV relative Ramón name
   \hspace{1cm} 'Sergio had a relative called Ramón (lit. a relative called Ramón was sitting to
   \hspace{1cm} Sergio).'

c. Tune=tna-ja =tu-ke =Ø_A be-ti-wa budariO
   \hspace{1cm} then \hspace{1cm} =3PL-DAT =3SG-FM (=1SG.ERG) bring-GO.TEMP-PERF banana
   \hspace{1cm} 'I will go and bring bananas for them.'

(280) a. **Person scale**
   \hspace{1cm} Loc(al) (1/2) \(\succ\) N(on)loc(al)

b. **Number scale**
   \hspace{1cm} Sg \(\succ\) Non-sg

c. **GF scale**
   \hspace{1cm} Subj \(\succ\) Obj

(281) **Ranking:**

a. *Obj/Loc/Sg & Max-C \(\succ\) *Obj/Loc/Non-sg & Max-C

b. *Obj/Nloc/Sg & Max-C \(\succ\) *Obj/Nloc/Non-sg & Max-C

**Note:**
We assume that the dative consists of the subfeature in (282). The relevant markers -kwe and -ja are analysed as in (283). The phonological markedness of these exponents correlates with their morpho-syntactic markedness; they thus obey iconicity.

(282) **DATIVE: */obl, +obj/**

(283) **Marker specification**

a. */-kwe/ ↔ */obl, +obj/**

b. */-ja/ ↔ */obl/**

42.7.3.2 **Analysis** A markedness constraint penalizing the presence of a case feature */obl/** is then inserted into the ranking (281), triggering case feature deletion for all highly marked objects (i.e. those high on both the person and the number scale). After this case feature is deleted, insertion of -kwe is no longer possible. The system therefore falls back to
a more general marker (-ja).

(284) Markedness constraint

(285) Ranking:

\[ *\text{Obj/Loc/Non-sg} \& \text{Max-C} \implies *[-obl] \implies \{ *\text{Obj/Non-sg} \& \text{Max-C}, *\text{Obj/Non-local/Non-sg} \& \text{Max-C} \} \]

Note:
As in Finnish, an explicit statement of the context of the impoverishment rule would involve a disjunction: The case feature [-obl] has to be deleted if the object is either non-singular or non-local. Since these two contexts arguably do not form a natural class, two impoverishment rules are effectively needed in standard approaches. If, however, the context in which impoverishment applies is derived by local conjunction of scales, the case feature is deleted in all environments that are dominated by the markedness constraint *[+obl]. (285) shows that this comprises exactly the context that proved problematic for an approach employing explicit statements of contexts—i.e. if the object is either non-singular or non-local or both. The approach developed here is therefore preferable on conceptual grounds.

The Cavineña data clearly conform to what is expected from the point of view of Hale/Silverstein hierarchies—more marking for unexpected objects. These data are nevertheless surprising if scales can only lead to a total reduction in morphological marking.

42.8. Outlook and Conclusion

Outlook:
The same kind of analyses can be given for various other cases of scale-driven non-zero/non-zero alternations with structural cases:

- differential encoding of subjects and objects in Dyirbal (Carnie (2005), Haspelmath (2007), based on Dixon (1972; 1994))
- differential encoding of subjects and objects in Djanu (Legate (2008), Morphy (1983a))
- differential encoding of subjects in Kambera (Klamer (1998a;b), Georgi (2008))
- direct-inverse Marking (Blake (1994), Macaulay (2005))
- differential encoding of objects in Russian (Comrie (1978))
- differential encoding of objects in Proto-Indo-European (Filimonova (2005))

Consequences for the modelling of interfaces:

- Impoverishment rules are ultimately functionally motivated and implemented via harmonic alignment of scales.
- Optimality Theory emerges as a theory of the morphology-syntax interface, much as in Pesetsky (1998); syntax and morphology as such can be assumed to work without violable and ranked constraints.

43. Three-Way Systems

43.1. Background

(286) a. Ergative system

(287) Transitive context

Parameter:
The parameter distinguishing ergative and accusative systems exclusively concerns v: Both upward and downward case assignment must be possible in principle, but there is a preference for upward case assignment in ergative systems, and a preference for downward case assignment in accusative systems.

Note:
Ergative and accusative systems work in exactly the same way in intransitive contexts: Only T remains as a case-assigning head here. This corresponds directly to tendencies of morphological marking: The case associated with T is typically morphologically less marked than verbal case assigned by v.
Intransitive unaccusative and unergative contexts

a. TP
   T′
   vP
   nom
   – v′
   abs
   V
   DP
   int

b. TP
   T′
   vP
   nom
   DP
   ext
   v′
   abs
   v
   VP
   –

Active systems:

- Option (i): v can be the case-assinging head in unergative contexts.
- Option (ii): Unergative structures can be hidden transitives.

Three-way systems:

\[
\begin{array}{c|c}
\text{DP}_{\text{ext}}-V_i & \text{DP}_{\text{int}}-V_i \\
\text{nom}/\text{abs} & \text{erg}/\text{acc}
\end{array}
\]

Three-way encoding in Antekerrepenhe (Central Australia) (Bittner & Hale (1996a)):

a. Arengke-le
dog-erg
aye-nheme-
acc
ke-kebite-
pst
'The dog bit me.'
b. Apwerte-le
stones-ins
atheI-
erg
arengke-nhedog-
acc
we-kepelt-
pst
'I pelted the dog with stones.'
c. Arengke
dog-nom
nterre-kerun-
pst
'The dog ran.'

Note:
Three-way systems are potentially problematic for the type of analysis sketched above, where two case assigners (T, v) are responsible for two structural cases and each of \{erg, acc\} is identified with exactly one case of the other system.

Observation:
Three-way systems are cross-linguistically rare. They qualify as non-canonical from a typological perspective (Corbett (2005); Corbett & Fedden (2014)).

Note:
This argues against approaches where structural case assignment in transitive contexts is relational (Marantz (1991), Bittner & Hale (1996b), Wunderlich (1997a; 2006), Kiparsky (1999), Stiebels (2002), McFadden (2004), Schäfer (2012), Baker (2015)).

Proposal:
Three-way systems are regular (ergative or accusative) two-way systems in syntax; the phenomenon can and should be relocated to morphology.

Independent evidence: case as a syntactic category vs. case as a morphological marking

- One and the same morphological case exponent may correspond to two different syntactic cases; see Legate (2008) on zero marking, which may be morphological default marker or a syntactic nominative, depending on the language.
- One and the same syntactic case may correspond to two different morphological case exponents in a given language; see Keine & Müller (2011; 2014) on scale-based differential object marking as a morphological phenomenon (scale-driven allomorphy).

Observation:
Three-way systems typically also involve scale effects (such that, e.g., only non-prototypical DP_{int} arguments receive what looks like an accusative, or only non-prototypical DP_{ext} arguments bear what looks like an ergative). The situation in Nez Perce: Accusative for DP_{int} of V_i, ergative for DP_{ext}-3rd-person of V_i, and nominative for DP_{int}, DP_{ext} of V_i, and for DP_{ext}-1st/2nd-person of V_i.

Three-way encoding in Nez Perce (Rude (1985), Woolford (1997)):

a. Kaa and wéet'u'not
núun-e1
pl-acc
ká'lajust
hinéesqicxne3
nom.pl.do
take.care.of.
perf
'And he just didn't take care of us.' (Rude (1985, 93))
b. 'Iceyéeye-nm
coyote-erg
xáxaasnagrizzly-acc
hináaswapci'yawna
nom.pl.do
take.care.of.
perf
'Coyote killed the grizzlies.' (Rude (1985, 88))
c. (i) Núun
we
∅
papáayna
1/2
nom
-pl.nom
arrive.
perf
'We arrived.'
(ii) núun
we
epe'wíye1/2
tr
shoot.
perf
'We shot him.' (Rude (1985, 85))

Goal:
We extend the morphological approach to differential object marking in terms of scale-driven impoverishment developed in Keine & Müller (2011; 2014) (on the basis of Aissen (1999; 2003)) to three-way systems. Only one important new assumption is required: In addition to the standard prominence scales related to person, animacy, and definiteness (going back to Hale (1972) and Silverstein (1976)), there is also a transitivity scale which participates in harmonic alignment processes that eventually bring about post-syntactic impoverishment.

43.2. Theoretical assumptions

Background:
The reconstruction of the optimality-theoretic analysis developed in Aissen (2003) as a post-
syntactic impoverishment operation at the syntax/morphology interface in Keine & Müller (2014).

(292) **Feature decomposition of cases**
   a. ergative/accusative: [+gov–obl] (assigned by v)
   b. absolutive/nominative: [+gov, –obl] (assigned by T)

(293) **Scales:**
   a. **Person scale:**
      Local Pers. (1.2) > 3. Pers.
   b. **Animacy scale:**
      Hum(an) > Anim(ate) > Inan(inmate)
   c. **Definiteness scale:**
      Pro(noun) > Name (PN) > Def(inite) > Indefinite Specific (Spec) > NonSpecific (NSpec)
   d. **Transitivity scale:**
      \( v_{\text{trans}} > v_{\text{intrans}} \)

**Note:**
(293-abc) go back to Hale (1972), Silverstein (1976), and Aissen (2003). (293-d) is new. It presupposes that transitive and intransitive \( v \) can be distinguished, in both ergative and accusative languages. This is straightforward if \( v \) is uniformly the inactive head in intransitive contexts.

(294) **Harmonic Alignment** (Prince & Smolensky (2004)):
Suppose given a binary dimension \( D_1 \) with a scale \( X > Y \) on its elements \{X,Y\}, and another dimension \( D_2 \) with a scale \( a > b > ... > z \) on its elements \{a,b,...,z\}. The harmonic alignment of \( D_1 \) and \( D_2 \) is the pair of Harmony scales \( H_X, H_Y \): a. \( H_X: X/a > X/b > ... > X/z \)
   b. \( H_Y: Y/z > ... > Y/b > Y/a \)
   The constraint alignment is the pair of constraint hierarchies \( C_X, C_Y \): a. \( C_X: *X/z \gg ... \gg *X/b \gg *X/a \)
   b. \( C_Y: *Y/a \gg *Y/b \gg ... \gg *Y/z \)

(295) **A binary scale:** The DP case scale:
\( \text{DP}_{[+gov]} > \text{DP}_{[-gov]} \)

(296) **Consequences of harmonic alignment:**
   a. \( *\text{DP}_{[+gov]}/v_i \gg *\text{DP}_{[-gov]}/v_t \)
   b. \( *\text{DP}_{[-gov]}/v_t \gg *\text{DP}_{[-gov]}/v_i \)

(297) **Local conjunction** (Smolensky (1995))
Local conjunction is a mechanism which conjoins two distinct constraints to form a new constraint. The new constraint is violated if both conjoined constraints are violated. Local conjunction of members of the two constraint hierarchies preserves order.

(298) **Further constraints:**
   a. MAX(case):
      Preserve case features.
   b. *[–gov]:
      Avoid the feature *[–gov].

**Note:**
MAX(case) can be conjoined with a constraint hierarchy derived from harmonic alignment; *[–gov] cannot be conjoined with a constraint hierarchy. (This is exactly as in Aissen (2003), Keine & Müller (2014).)

(299) **Local conjunction:**
\( *\text{DP}_{[-gov]}/v_t \gg \text{MAX}(\text{case}) \gg *\text{DP}_{[-gov]}/v_i \) & \( \text{MAX}(\text{case}) \)
**Input sensitivity:** \( *\text{DP}_{[-gov]}/v_t \) & \( \text{MAX}(\text{case}) \) is violated by a post-syntactic (pre-vocabulary insertion) representation if there is a nominative/absolute DP in a transitive clause that has its *[–gov] feature deleted. Thus, it must be ensured that a case feature like *[–gov] that is deleted (thereby violating MAX(case)) can still be accessed so as to determine the violation (i.e., *[–gov] is needed to characterize the class of DPs that are subject to the constraint).

**Assumption:** Constraints like \( *\text{DP}_{[-gov]}/v_t \) & \( \text{MAX}(\text{case}) \) are not only output-sensitive, but also input-sensitive (Trommer (2006a)). Thus, *[–gov] in “*DP_{[-gov]}/v_t” refers to the input (i.e., the syntactic representation where feature deletion is not yet an issue), whereas *[–gov] in “MAX(case)” refers to the output (i.e., the post-syntactic representation in which feature deletion may or may not have applied).

(300) **A ranking that gives rise to selective feature deletion and differential marking:**
\( *\text{DP}_{[-gov]}/v_t \gg \text{MAX}(\text{case}) \gg *[–gov] \gg *\text{DP}_{[-gov]}/v_i \) & \( \text{MAX}(\text{case}) \)

**Prediction:**
The feature *[–gov] will be preserved post-syntactically in transitive contexts but deleted in intransitive contexts. Subsequent vocabulary insertion can then lead to a *[–gov]-marked exponent as a case marker for DP in transitive contexts, but given that vocabulary insertion obeys the Subset Principle (Halle & Marantz (1993), Halle (1997)), it will have to resort to an underspecified (typically zero) exponent not bearing *[–gov] in intransitive contexts.

(301) **An impoverishment rule as an alternative:**
\[ *[–gov] \rightarrow \emptyset / \text{DP} \]

**No:**
- (301) simply stipulates the context in which deletion takes place, (300) derives this context.
- (300) (again in contrast to (301)) predicts that there can be no language where deletion of *[–gov] takes place in transitive but not in intransitive contexts.
- Three-way systems typically also involve (other) scale effects; so it remains to be shown how harmonic alignment and local conjunction with the other scales can be brought into the picture. It will turn out that the optimization approach captures these multi-dimensional scale effects in a fairly straightforward way whereas a standard, rule-based
impoverishment approach will face what look like insurmountable obstacles because the deletion contexts do not form natural classes.

**Locality:**
In order to evaluate a constraint like *DP_{[–gov]/v_t} & MAX_{(case)}* or *DP_{[–gov]}/v_i & MAX_{(case)}*, both the properties of the DP (either DP_{ext} or DP_{int}) and the properties of v must be taken into account. This suggests that the local domain for constraint evaluation at the interface is the phase (see Chomsky (2001)), with feature deletion and vocabulary insertion applying cyclically.

43.3. Case studies
43.3.1. Kham

43.3.1.1 Data

(302) Distribution of case markers in Kham (Tibeto-Burman) (Watters (2002))

<table>
<thead>
<tr>
<th>1st</th>
<th>2nd</th>
<th>3rd, definite</th>
<th>3rd, indefinite</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP_{ext}/V_t</td>
<td>-∅</td>
<td>-∅</td>
<td>-/ye</td>
</tr>
<tr>
<td>DP_{ext/int}/V_t</td>
<td>-∅</td>
<td>-∅</td>
<td>-∅</td>
</tr>
<tr>
<td>DP_{int}/V_t</td>
<td>-∅</td>
<td>-∅</td>
<td>-∅</td>
</tr>
</tbody>
</table>

**Syntax:**
Kham exhibits a standard ergative system in the syntax, with -/ye as the canonical ergative marker and -/lai as the canonical absolutive marker.

**Morphology:**
The simple person-based split in ergative contexts, and the more complex transitivity-/definiteness-based split in absolutive contexts, are instances of allomorphic variation reducible to scale-driven optimization.

43.3.1.2 Absolutive marking

(303) Absolutive allomorphy in Kham: Interleaving of [*–gov]*

(305) Absolutive allomorphy in Kham: Interleaving of [*–gov]*

**Note:**
All the constraints in (305) demand case feature preservation. At this point, the ranking of the conflicting constraint demanding case feature deletion becomes relevant: [*–gov] leads to zero-marking for DPs with the feature combinations identified by the constraints that are ranked below it. In Kham, this constraint must be ranked above *DP_{[–gov]/Spec/v_t} & MAX_{(case)}* and *DP_{[–gov]/Def/v_t} & MAX_{(case)}*, and below *DP_{[–gov]/Pro/v_t} & MAX_{(case)}* and *DP_{[–gov]/Pro/v_t} & MAX_{(case)}*, thereby separating the system in (305) into two discrete areas I and II. The absolutive case feature [*–gov] is preserved in area I and removed in area II, which leads to the fully specified exponent /lai/ in I configurations and to the elsewhere exponent /∅/ in II configurations.

**Scale-driven optimization vs. stipulated impoverishment rules:**

- One would have to postulate two separate impoverishment rules, as in (306), since the contexts in which [*–gov] deletion takes place (viz., intransitive clause and indefinite interpretation of DP) cannot be referred to as a natural class.
- (306) would give rise to redundancies with indefinite (specific or non-specific) DPs in intransitive contexts.

(306) a. [*–gov] → /∅ /DP_{[–gov]/v_t} |
   b. [*–gov] → /∅ /DP_{[–def]}

43.3.1.3 Ergative marking

(307) Harmonic alignment of case scale and person scale plus local conjunction with MAX_{(case)}:

*DP_{[–gov]/3} & MAX_{(case)} → *DP_{[+gov]}/loc & MAX_{(case)}
43.3.2. Dyapu

### Data

Distribution of case markers in Dyapu (Pama-Nyungan) (Morphy 1983b)

<table>
<thead>
<tr>
<th>Syntax:</th>
<th>DP ext-Vt</th>
<th>DP inext-Vt</th>
<th>DP int-Vt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pron -HUt -HUt</td>
<td>¬ ¬</td>
<td>¬ ¬</td>
<td>¬ ¬</td>
</tr>
<tr>
<td>-DHu -DHu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-NHA -NHA -Ø</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Morphology:

Overt absolutive marking is suspended in intransitive contexts and for non-human objects; overt ergative marking does not show up on prononinal transitive subjects.

#### Absolutive marking

The relevant scales determining the distribution of morphological case exponents are the transitivity scale and the animacy scale. Both are harmonically aligned with the basic case scale, yielding (310-a) and (310-b) for absolutive contexts.

### Harmonic alignment of case scale with transitivity and animacy scales:

- a. \( \text{*DP}_{[-gov]}/Vt \gg \text{*DP}_{[-gov]}/v_i \)
- b. \( \text{*DP}_{[-gov]}/Hum \gg \text{*DP}_{[-gov]}/Anim \gg \text{*DP}_{[-gov]}/Inan \)

Local conjunction among the members of these constraint hierarchies with fixed internal order produces the strict rankings in (311).

### Two-dimensional local conjunction of both constraint alignments:

- a. \( \text{*DP}_{[-gov]}/Hum/v_t \gg \text{*DP}_{[-gov]}/Anim/v_t \gg \text{*DP}_{[-gov]}/Inan/v_t \)
- b. \( \text{*DP}_{[-gov]}/Hum/v_i \gg \text{*DP}_{[-gov]}/Anim/v_i \gg \text{*DP}_{[-gov]}/Inan/v_i \)
- c. \( \text{*DP}_{[-gov]}/Hum/v_t \gg \text{*DP}_{[-gov]}/Hum/v_i \)
- d. \( \text{*DP}_{[-gov]}/Anim/v_t \gg \text{*DP}_{[-gov]}/Anim/v_i \)
- e. \( \text{*DP}_{[-gov]}/Inan/v_t \gg \text{*DP}_{[-gov]}/Inan/v_i \)

Finally, order-preserving local conjunction with \( \text{MAX(case)} \) gives rise to the two-dimensional system in (312).

### Ergative marking

Harmonic alignment of case scale and definiteness scale:

- a. \( \text{*DP}_{[-gov]}/\text{Nspec} \gg \text{*DP}_{[-gov]}/\text{Spec} \gg \text{*DP}_{[+gov]}/\text{Def} \gg \text{*DP}_{[+gov]}/\text{PN} \gg \text{*DP}_{[+gov]}/\text{Pron} \)

Local conjunction with \( \text{MAX(case)} \) and interleaving of \( *[+gov] \) between \( *\text{DP}_{[+gov]}/\text{PN} \& \text{MAX(case)} \) and \( *\text{DP}_{[+gov]}/\text{Pron} \& \text{MAX(case)} \) yields a distribution of the overt ergative exponent /DHu/ that involves all \( \text{DP}_{ext} \) arguments of transitive contexts except for pronouns.

### Distribution of case markers in Nez Perce

<table>
<thead>
<tr>
<th>Syntax:</th>
<th>DP ext-Vt</th>
<th>DP inext-Vt</th>
<th>DP int-Vt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 pronouns</td>
<td>¬(n(i))m</td>
<td>¬(n(i))m</td>
<td>(n(i))m</td>
</tr>
<tr>
<td>3 pronouns</td>
<td>¬</td>
<td>¬</td>
<td>¬</td>
</tr>
<tr>
<td>Proper names</td>
<td>¬</td>
<td>¬</td>
<td>¬</td>
</tr>
<tr>
<td>Common nouns</td>
<td>¬</td>
<td>¬</td>
<td>¬</td>
</tr>
</tbody>
</table>
43.3.4 Ergative marking

(316) Harmonic alignment of case scale and transitivity scale: *DP_{[+gov]/v_t} & MAX(case) \gg *DP_{[+gov]/v_i} & MAX(case)

(317) Absolutive allomorphy in Nez Perce: Interleaving of *[–gov]:
*DP_{[+gov]/v_i} & MAX(case) \(\{1/\text{ne}/\)

43.3.3.3 Ergative marking

(318) Harmonic alignment of case scale and person scale:
*DP_{[+gov]/3} & MAX(case) \gg *DP_{[+gov]/loc} & MAX(case)

(319) Ergative allomorphy in Nez Perce: Interleaving of *[+gov]:
*DP_{[+gov]/3} & MAX(case) \(\{1/\text{nim}/\)

43.3.4. Dyirbal

43.3.4.1 Data

(320) Distribution of Case markers in Dyirbal (Dixon (1972; 1994)))

<table>
<thead>
<tr>
<th>DP ext/V_t</th>
<th>1st/2nd prons</th>
<th>3rd prons</th>
<th>proper names</th>
<th>common nouns</th>
</tr>
</thead>
<tbody>
<tr>
<td>-[0]</td>
<td>-ggu</td>
<td>-ggu</td>
<td>-ggu</td>
<td>-ggu</td>
</tr>
<tr>
<td>-[1/3/v]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

43.3.4.2 Ergative marking

(321) Harmonic alignment of case scale and person scale:
*DP_{[+gov]/3} & MAX(case) \gg *DP_{[+gov]/loc} & MAX(case)

(322) Ergative allomorphy in Dyirbal: Interleaving of *[+gov]:
*DP_{[+gov]/3} & MAX(case) \(\{1/\text{ggu}/\)

*DP_{[+gov]/loc} & MAX(case) \(\{1/\text{ggu}/\)

Note:
This accusative system is thus completely identical to the system of ergative allomorphy in Nez Perce.
evidence for the status of the pertinent DPs as absolutive/nominative (i.e., [–gov,–obl], assigned by T). More generally, we expect to find evidence for a morphological approach in terms of case allomorphy based on identical syntactic behaviour of the non-zero-marked and zero-marked DPs; in the same way, different syntactic behaviour might provide counter-evidence against the proposal. Here I will discuss only one case (there are many more, cf. Müller & Thomas (2014)): topic chaining in Dyirbal.

(324) Case matching in Dyirbal topic chaining constructions (Dixon (1972; 1994)):

\[ \text{CP}_1 \text{ numa yabu-\text{ggu}} \text{ bura-n } \quad \text{CP}_2 \text{ pro } \text{banan-gu-n}^\text{u} \]

father-ABS mother-ERG see-NONFUT pro-ABS return-NONFUT

‘Mother saw father and he/*she returned.’

Observation ((325-b)):
(i) An absolutive argument in an intransitive second conjunct is coreferent with a na-marked object in a transitive first conjunct.
(ii) An absolutive argument in an intransitive second conjunct cannot be coreferent with a zero-marked subject in a transitive first conjunct.
(iii) This shows that the na-marked object bears absolutive case, and that the zero-marked subject bears ergative case.

(325) An argument for a standard ergative system (Morgenroth & Salzmann (2013)):

a. \[ \text{CP}_1 \text{ yana-na } \text{banan-gu-n}^\text{u} \]
\[ \text{CP}_2 \text{ pro } \text{bura-n} \]

we-ABS return-NONFUT you all-ERG pro-ABS see-NONFUT

‘We returned and you all saw us.’

b. \[ \text{CP}_1 \text{ n}^\text{u} \text{ura-}\text{na } \text{yana-bura-n} \]
\[ \text{CP}_2 \text{ pro } \text{banan-gu-n}^\text{u} \]

you all-ERG we-ABS see-NONFUT pro-ABS return-NONFUT

‘You all saw us and we returned.’

VIII. Optimality Theory 1: Morphematic Approaches

A question:
How can instances of syncretism be derived in optimality theory?

Note:
The approaches presented in this section all rely on underspecification and incorporate the compatibility/specificity requirements of standard underspecification approaches. In addition, however, they envisage the possible interference by other constraints (of diverse provenance), thereby introducing more flexibility.

44. Background: Syncretism by Underspecification

P_{12}: Determiner inflection in German

<table>
<thead>
<tr>
<th>Case</th>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>er</td>
<td>es</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>ACC</td>
<td>en</td>
<td>es</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>DAT</td>
<td>em</td>
<td>em</td>
<td>er</td>
<td>en</td>
</tr>
<tr>
<td>GEN</td>
<td>es</td>
<td>es</td>
<td>er</td>
<td>er</td>
</tr>
</tbody>
</table>

**Syncretism:**
There are only five different exponents for 16 (or, in fact, 24) paradigm cells.

Standard approach (Jakobson (1962a;b), Bierwisch (1967)):

1. Morpho-syntactic features are decomposed into combinations of more primitive features
2. Common primitive features define natural classes of instantiations of grammatical categories (case, number, person, tense, gender, etc.)
3. Underspecification of exponents with respect to these features makes reference to natural classes possible and thereby derives instances of syncretism.

Note:

(326) Subset Principle
A vocabulary item V is inserted into a functional morpheme M iff (i) and (ii) hold:

(i) The morpho-syntactic features of V are a subset of the morpho-syntactic features of M.
(ii) V is the most specific vocabulary item that satisfies (i).
(327) **Specificity of vocabulary items**
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 $F'$.

---

**Case Study: Determiner Inflection in German**


### (328) Feature Decomposition (Bierwisch (1967), Wiese (1999)):

<table>
<thead>
<tr>
<th>Case</th>
<th>Gender/Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM:</td>
<td>[–obl, –gov]</td>
</tr>
<tr>
<td>ACC:</td>
<td>[–obl, +gov]</td>
</tr>
<tr>
<td>DAT:</td>
<td>[–obl, +gov]</td>
</tr>
<tr>
<td>GEN:</td>
<td>[–obl, +gov]</td>
</tr>
</tbody>
</table>

### (329) Underspecified Exponents:

- a. $[+masc, +obl, +gov] \leftrightarrow /m^{1}\$ (dat. masc./ neut.sg.)
- b. $[+masc, +obl] \leftrightarrow /s^{2}\$ (gen. masc./ neut.sg.)
- c. $[+masc, +fem] \leftrightarrow /s^{3}\$ (nom. acc. neut.sg.)
- d. $[+masc, +gov] \leftrightarrow /n^{4}\$ (acc. masc.sg.)
- e. $[+masc] \leftrightarrow /r^{5}\$ (nom. masc.sg.)
- f. $[+obl, +fem] \leftrightarrow /r^{6}\$ (dat. fem.sg.)
- g. $[+obl, +gov] \leftrightarrow /n^{7}\$ (dat. pl.)
- h. $[+obl] \leftrightarrow /e^{8}\$ (gen. pl.)
- i. $\ldots \leftrightarrow /e^{9}\$ (nom. acc. fem.sg./ pl.)

### (330) Feature Hierarchy:

$[+masc] > [+obl] > [+fem] > [+gov]$. 

---

**P13: Competition of exponents**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nom</td>
<td>$i^{0}$, $e^{0}$</td>
<td>$i^{0}$, $i^{0}$, $e^{0}$</td>
<td>$i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$</td>
</tr>
<tr>
<td>Acc</td>
<td>$i^{0}$, $i^{0}$, $e^{0}$</td>
<td>$i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$</td>
</tr>
<tr>
<td>Dat</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
</tr>
<tr>
<td>Gen</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
<td>$i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$, $i^{0}$</td>
</tr>
</tbody>
</table>

- The analysis envisages 9 exponents, which leaves a few unresolved syncretisms (which Wiese then independently derives): 2 exponents /n/, 2 exponents /s/, 3 exponents /r/. 
- Without further assumptions, it is difficult to derive more instances of syncretism; 8 exponents is the minimum in standard approaches.

### (331) Constraints:

<table>
<thead>
<tr>
<th></th>
<th>IDENT-F:</th>
<th>MAX(MASC):</th>
<th>MAX(OBL):</th>
<th>MAX(FEM):</th>
<th>MAX(GOV):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morpho-syntactic features of input and output cannot have different values.</td>
<td>[masc] of the input is realized on the exponent in the output.</td>
<td>[obl] of the input is realized on the exponent in the output.</td>
<td>[fem] of the input is realized on the exponent in the output.</td>
<td>[gov] of the input is realized on the exponent in the output.</td>
</tr>
<tr>
<td></td>
<td>MAX(MASC):</td>
<td>MAX(OBL):</td>
<td>MAX(FEM):</td>
<td>MAX(GOV):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[masc] of the input is realized on the exponent in the output.</td>
<td>[obl] of the input is realized on the exponent in the output.</td>
<td>[fem] of the input is realized on the exponent in the output.</td>
<td>[gov] of the input is realized on the exponent in the output.</td>
<td></td>
</tr>
</tbody>
</table>

### (332) Gen:

Gen brings about realization of sets of fully specified features by morphological exponents.

---

### (333) Constraints:

- a. IDENT-F: 
  - Morpho-syntactic features of input and output cannot have different values.
- b. MAX(MASC): 
  - [masc] of the input is realized on the exponent in the output.
- c. MAX(OBL): 
  - [obl] of the input is realized on the exponent in the output.
- d. MAX(FEM): 
  - [fem] of the input is realized on the exponent in the output.
- e. MAX(GOV): 
  - [gov] of the input is realized on the exponent in the output.

### (334) Ranking:

IDENT-F $\gg$ MAX(MASC) $\gg$ MAX(OBL) $\gg$ MAX(FEM) $\gg$ MAX(GOV)

### (335) Native masculine singular contexts:

<table>
<thead>
<tr>
<th></th>
<th>IDENT-F</th>
<th>MAX(MASC)</th>
<th>MAX(OBL)</th>
<th>MAX(FEM)</th>
<th>MAX(GOV)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
<tr>
<td></td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
<td>$i^{0}$</td>
</tr>
</tbody>
</table>

---

**Note:**

An output that violates IDENT-F (i.e., compatibility) cannot be optimal as long as there is an elsewhere marker in the system, which cannot violate IDENT-F by definition.
Nominative feminine singular contexts:

\[
\begin{array}{|c|c|c|c|c|}
\hline
I: & \text{[–masc,+fem,–obl,–gov]} & \text{Max(masc)} & \text{Max(obl)} & \text{Max(fem)} & \text{Max(gov)} \\
\hline
\ [+\text{masc,+obl,+gov}] & \leftrightarrow & /m/ & 1 & * \\
\ [+\text{masc,+obl}] & \leftrightarrow & /s/ & * & + \\
\ [+\text{masc,+fem}] & \leftrightarrow & /s/ & * & + \\
\ [+\text{masc,+gov}] & \leftrightarrow & /n/ & * & + \\
\ [+\text{obl,+fem}] & \leftrightarrow & /t/ & * & + \\
\ [+\text{obl,+gov}] & \leftrightarrow & /n/ & * & + \\
\ [+\text{obl}] & \leftrightarrow & /t/ & * & + \\
\ hline
\end{array}
\]

Accusative neuter singular contexts:

\[
\begin{array}{|c|c|c|c|c|}
\hline
I: & \text{[+masc,+fem,+obl,+gov]} & \text{Max(masc)} & \text{Max(obl)} & \text{Max(fem)} & \text{Max(gov)} \\
\hline
\ [+\text{masc,+obl,+gov}] & \leftrightarrow & /m/ & 1 & * \\
\ [+\text{masc,+obl}] & \leftrightarrow & /s/ & * & + \\
\ [+\text{masc,+fem}] & \leftrightarrow & /s/ & * & + \\
\ [+\text{masc,+gov}] & \leftrightarrow & /n/ & * & + \\
\ [+\text{obl,+fem}] & \leftrightarrow & /t/ & * & + \\
\ [+\text{obl,+gov}] & \leftrightarrow & /n/ & * & + \\
\ [+\text{obl}] & \leftrightarrow & /t/ & * & + \\
\ hline
\end{array}
\]

46. Optimal Clitics in Grimshaw (2001)

Background assumptions (see Grimshaw (2001)):

- The input is a complete morpho-syntactic feature specification.
- The candidates are the set of pronouns in a language.
- The optimal output is the clitic with the lexical representation that best matches the input specification.
- Candidates can be (and are often) underspecified.

\[\text{P14: Italian Clitics}\]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ACC</td>
<td>mi</td>
<td>tu</td>
<td>lo</td>
<td>la</td>
<td>ci</td>
<td>vi</td>
</tr>
<tr>
<td>DAT</td>
<td>mi</td>
<td>tu</td>
<td>gli</td>
<td>le</td>
<td>ci</td>
<td>vi</td>
</tr>
<tr>
<td>ACC-REF</td>
<td>mi</td>
<td>tu</td>
<td>lo</td>
<td>la</td>
<td>ci</td>
<td>vi</td>
</tr>
<tr>
<td>DAT-REF</td>
<td>mi</td>
<td>tu</td>
<td>gli</td>
<td>le</td>
<td>ci</td>
<td>vi</td>
</tr>
</tbody>
</table>

Evidently, there is a lot of syncretism that needs to be accounted for.

Fully specified and underspecified lexical entries:

\[
\begin{array}{|c|}
\hline
\text{lo} & \text{-R 3 sg masc acc} \\
\text{la} & \text{-R 3 sg fem acc} \\
\text{li} & \text{-R 3 pl masc acc} \\
\text{le} & \text{-R 3 pl fem acc} \\
\text{gli} & \text{-R 3 sg masc dat} \\
\text{le} & \text{-R 3 sg fem dat} \\
\text{mi} & \text{R 1 sg G C} \\
\text{ti} & \text{R 2 sg G C} \\
\text{ci} & \text{R 1 pl G C} \\
\text{vi} & \text{R 2 pl G C} \\
\text{si} & \text{+R P N G C} \\
\ hline
\end{array}
\]

Note: “X” means “no specification for X”.

Competitions

\[\text{T1: First and second-person reflexive inputs}\]

\[
\begin{array}{|c|c|c|c|c|c|}
\hline
\text{I:} & \text{[+R 2 pl masc acc]} & \text{Faith} & \text{Faith} & \text{Faith} & \text{Faith} & \text{Faith} \\
\hline
\text{O1: si} & \leftrightarrow & \text{[+R P N G C]} & * & * & * & * \\
\text{O2: vi} & \leftrightarrow & \text{[R 2 pl G C]} & * & * & * \ hline
\end{array}
\]

Note: FaithRefl must be split up into two separate constraints; otherwise O3 would wrongly be predicted to be optimal.

\[\text{Conclusion}\]

- The approach looks a lot like a typical (e.g., Distributed Morphology) underspecification-based approach to syncretism.
- Input ∼ fully specified context of a functional head in DM.
Outputs $\sim$ (often) underspecified vocabulary items.

- The main difference: A more flexible way to resolve marker competition (as in Wunderlich (2004)).
- For concreteness, Specificity is decomposed into an ordered set of faithfulness constraints.

Problem:
- It is not clear to me where the underspecified exponents come from if they are not in the input. Does GEN insert them out of nowhere?
- The simplest assumption might be that underspecified exponents are also in the input, together with the complete morpho-syntactic specification.
- Conclusion: There is underspecification in the input in this approach.
- (Interestingly, in his concise reconstruction of Grimshaw’s analysis, McCarthy (2002, 81) does not invoke underspecification. Here, syncretism is assumed to be derivable from neutralization of input differences in the feature system, but the analysis is not carried out in detail.)

47. An Alternative to Impoverishment: Don & Blom (2006)

Ref.: Don & Blom (2006)

Goal: Don and Blom develop a more principled alternative to impoverishment rules (i.e., to stipulated underspecification of syntactic contexts before vocabulary insertion).

Assumptions:
- The output of syntax provides the input for morphological exponence, conceived of a realization of morpho-syntactic feature bundles.
- Morphological realization involves optimality-theoretic evaluation of all combinations of stems and affixes, where affixes are inherently associated with morpho-syntactic features, as in Distributed Morphology.
- Affixes that do not match the syntactic feature specifications are typically, but not necessarily filtered out as suboptimal: Their use involves faithfulness violations.
- Features like [past] and [plural] are privative.

(340) Verb inflection in Dutch (past tense)

<table>
<thead>
<tr>
<th></th>
<th>noem ('call')</th>
<th>loop ('walk')</th>
<th>zijn ('be')</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.sg</td>
<td>noem-de</td>
<td>liep</td>
<td>was</td>
</tr>
<tr>
<td>2.sg</td>
<td>noem-de</td>
<td>liep</td>
<td>was</td>
</tr>
<tr>
<td>3.sg</td>
<td>noem-de</td>
<td>liep</td>
<td>was</td>
</tr>
<tr>
<td>1.pl.</td>
<td>noem-de-en</td>
<td>liep-en</td>
<td>war-en</td>
</tr>
<tr>
<td>2.pl.</td>
<td>noem-de-en</td>
<td>liep-en</td>
<td>war-en</td>
</tr>
<tr>
<td>3.pl.</td>
<td>noem-de-en</td>
<td>liep-en</td>
<td>war-en</td>
</tr>
</tbody>
</table>

Observation:
Person is neutralized in the plural.

(341) Constraints
a. *COMPLEX:
Avoid complex affixes.
b. MAX([PLURAL]):
Realize a [plural] feature in the input by a [plural] exponent in the output.
c. MAX([PAST]):
Realize a [past] feature in the input by a [past] exponent in the output.
d. MAX([PERSON]):
Realize an [person] feature in the input by an [person] exponent in the output.
e. *AF-TO-AF:
Do not add affixes to affixed stems.

(342) Morphological exponents:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>/en/ ↔ [plur]</td>
</tr>
<tr>
<td>b.</td>
<td>/t(ke)/ ↔ [past]</td>
</tr>
<tr>
<td>c.</td>
<td>/Ø/ ↔ [1]</td>
</tr>
<tr>
<td>d.</td>
<td>/t/ ↔ [1]</td>
</tr>
<tr>
<td>e.</td>
<td>/st/ ↔ [plur,2] (hypothetical)</td>
</tr>
<tr>
<td>f.</td>
<td>/ü/ ↔ [2] (hypothetical)</td>
</tr>
</tbody>
</table>

(343) Ranking in Dutch:
MAX([PLURAL]), MAX([PAST]) $\gg$ *COMPLEX, *AF-TO-AF $\gg$ MAX([PERS])

T₆: Person neutralization in the plural (present tense)

<table>
<thead>
<tr>
<th></th>
<th>noem-[plur]</th>
<th>MAX([PLUR])</th>
<th>MAX([PAST])</th>
<th>*COMPL</th>
<th>*AF-TO-AF</th>
<th>MAX([PERS])</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₀:</td>
<td>noem-en</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

**Background:**

- Minimalist Morphology (Wunderlich 1996; 1997c) relies on underspecification and (something like) the Subset Principle (including the Specificity Condition): *Specificity, Compatibility*.

- In addition (Wunderlich 2004), the approach has a technical means that is comparable in its effects to impoverishment (as in Distributed Morphology) and rules of referral (as in Paradigm Functional Morphology; Stump 2001): 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).

**Case study:**

Genitive/accusative syncretism with animate nouns in Russian (see Wunderlich (2004)).

---

### Russian nouns with animacy split in forms that are used in accusative contexts

<table>
<thead>
<tr>
<th>Nominatives</th>
<th>Animates</th>
</tr>
</thead>
<tbody>
<tr>
<td>fem.</td>
<td>map</td>
</tr>
<tr>
<td>‘door’</td>
<td></td>
</tr>
<tr>
<td>‘table’</td>
<td></td>
</tr>
<tr>
<td>‘word’</td>
<td></td>
</tr>
<tr>
<td>‘squirrel’</td>
<td></td>
</tr>
<tr>
<td>‘mother’</td>
<td></td>
</tr>
<tr>
<td>‘student’</td>
<td></td>
</tr>
<tr>
<td>masc.</td>
<td></td>
</tr>
<tr>
<td>N.sg.</td>
<td>kart</td>
</tr>
<tr>
<td>dver’</td>
<td></td>
</tr>
<tr>
<td>stol</td>
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<tr>
<td>slov-o</td>
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<tr>
<td>bélk-a</td>
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<tr>
<td>mat’</td>
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<tr>
<td>student</td>
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</tr>
<tr>
<td>A.sg.</td>
<td>kart</td>
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<tr>
<td>dver’</td>
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<td>mäter</td>
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<tr>
<td>student</td>
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<tr>
<td>pl.</td>
<td>kart</td>
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<td>dver’</td>
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<td>stol</td>
<td></td>
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<td>slov</td>
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<td>bélk</td>
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<td>mäter</td>
<td></td>
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<tr>
<td>student</td>
<td></td>
</tr>
<tr>
<td>A.pl.</td>
<td>kart</td>
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<td>dver’</td>
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<tr>
<td>stol</td>
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<td>mäter</td>
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<td>student</td>
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<tr>
<td>G.pl.</td>
<td>kart</td>
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<td>dver’</td>
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<td>stol</td>
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<td>bélk</td>
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<tr>
<td>mäter</td>
<td></td>
</tr>
<tr>
<td>student</td>
<td></td>
</tr>
</tbody>
</table>

---

### Underspecification of Exponents

#### (345) Case features:

- a. Nom = ( )
- b. Acc = (+hr)N
- c. Gen = (+hr)N

#### (346) Exponents

- a. /-y/, +pl N.pl (class 1.2 & 3)
- b. /-a/ +pl/neuter N.pl (class 4)
- c. /-u/, (+hr)N / a A.sg (class 2)
- d. /-y/, (+hr)N / a ∨ Apl |
- e. /-a/, +hr / C / a A/G.sg (class 1 & 4)
- f. C / +pl,+hr / a ∨ a | A/G.pl (class 2 & 4)
- g. /-ej/, +pl,+hr / Apl |
- h. /-ov/, +pl,+hr A/G.pl (class 1)

### The System Without Optimality Theory

#### (347) Lexical entries for some Russian case affixes

<table>
<thead>
<tr>
<th></th>
<th>inanimates</th>
<th>animates</th>
</tr>
</thead>
<tbody>
<tr>
<td>N.sg.</td>
<td>aj</td>
<td>Pat</td>
</tr>
<tr>
<td>A.sg.</td>
<td>/-u/, (+hr)N</td>
<td>/-a/, +hr</td>
</tr>
<tr>
<td>N.pl.</td>
<td>/-y/, +pl</td>
<td>/-y/, +pl</td>
</tr>
<tr>
<td>A.pl.</td>
<td>C / /ej/, /ov/</td>
<td>C / /ej/, /ov/</td>
</tr>
</tbody>
</table>

---

**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 in an optimality-theoretic approach.

(348) Constraints
a. *(+hr)/V inanim. Do not realize the feature [+hr] in accusative contexts of inanimate nouns.
b. MAX(+hr). Realize the feature [+hr].
c. Ranking of the constraints:
   *(+hr)/V inanim ⇒ MAX(+hr) ⇒ *(+hr)/V anim

(349) More constraints
a. MAX(+hr)/ –pl, a]
b. Specificity
   Choose the affix with the more specific selectional information.
c. Compatibility
   Do not insert a form in a context in which the categorial specifications are incompatible.

(350) Ranking of the constraints
SPEC, COMP, MAX(+hr)/–pl, a] ⇒ *(+hr)/V –anim ⇒ MAX(+hr)

“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 /-u/).”

Competitions 1: Inanimate Nouns

(351) Selection of optimal forms in an accusative singular context
a. Inanimate class 2 nouns (a]

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>karta</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kart-y</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
| ☞ kart-u | | | | *

b. Inanimate class 1 nouns (masc)

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☞ stol</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| stol-a | | | | *
| stol-y | | | *! | |

Competitions 2: Animate Nouns

(352) a. Animate class 1 nouns (masc)

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>student</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| ☞ student-a | | | | *
| student-y | | | *! | |

b. Animate class 3 nouns (PAl)

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
</table>
| ☞ mat' | | | | *
| mater'-i | | | *! | |

The Situation so Far

(353) 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 no affix is available (class 3)</td>
<td>appears because an affix is available (class 2)</td>
</tr>
<tr>
<td>is blocked because an affix is available (class 2)</td>
<td>only underspecified affixes are available (class 1 and plural)</td>
</tr>
<tr>
<td>no affix is available (class 3)</td>
<td>two specific affixes are available (class 2)</td>
</tr>
<tr>
<td>class 2</td>
<td>class 1</td>
</tr>
<tr>
<td>class 3</td>
<td>class 1</td>
</tr>
<tr>
<td>class 4</td>
<td>class 2</td>
</tr>
</tbody>
</table>

Note:
This analysis can be extended to the plural.

Selection of optimal forms in an accusative plural context

(354) a. Inanimate class 2 nouns (a]

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
</table>
| ☞ kart-y | | | | *
| kart-ov | | | *! | |
| kart | | | | |

b. Animate class 2 nouns (a]

<table>
<thead>
<tr>
<th>SPEC</th>
<th>COMP</th>
<th>MAX(+hr)/</th>
<th>*(+hr)/V –anim</th>
<th>MAX(+hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☞ belk-i</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>belk-ov</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>belok</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion:

- Optimality Theory offers the possibility of a more fine-grained approach to effects that might otherwise be treated via impoverishment.
- Apart from that, Minimalist Morphology analyses of inflectional paradigms work in a way that is similar to non-optimality-theoretic approaches (underspecification, competition resolved by specificity).

49. Distributed Optimality: Trommer (2001; 2003; 2006a)

Distributed Optimality: Basic assumptions (Trommer (2001; 2003; 2006a)):

- Basically, a DM background is adopted: Insertion of vocabulary items into syntactic heads; vocabulary items are often underspecified.
- Insertion (realization) is subject to optimization.
- Inputs: fully specified syntactic structures; competing outputs: underspecified vocabulary items (or rather strings of vocabulary items).
- Faithfulness constraints demand realization of input features on vocabulary items; markedness constraints may block this.
- Markedness constraints can refer to input and output (“two-level markedness”)

Conclusion:

- Again, the approach crucially relies on underspecification.

A case study: Ainu (Trommer (2003))

(355) Subject and object agreement in Ainu:

a. eci-un-kore  
   2-O1p-give  
   “You (pl) give us”

b. e-en-kore  
   2sg-O1s-give  
   “You (sg.) give me”

(356) Participant reduction in 1→2 environments:

a. *ku-e (“I-you(sg)”)  
b. *ku-eci (“I-you(pl)”)  
c. *ci-e (“we-you(sg)”)  
d. *ci-eci (“we-you(pl)”)  
e. eci (for all these contexts)

(357) Relativized Parse constraints schema:

If A₁ ... Aₙ are distinct from B₁ ... Bₙ, and A₁ ≥ B₁ on a scale Sᵢ (1 ≤ i ≤ n), then there is a constraints \text{PARSE}[\text{Agr}(A₁...Aₙ)/[B₁...Bₙ)].

(358) Participant Uniqueness (PU):

For two adjacent [-3] agreement heads in the input, number should not be expressed in the output.

Competitions: See next page (or so).
### IX. Optimality Theory 2: A-Morphematic Approaches

#### 50. Introduction

**Claim:**

1. Inferential theories like those developed in Anderson (1992), Aronoff (1994), Stump (2001), and Corbett & Fraser (1993) or Baerman et al. (2005) differ from lexical theories (like Distributed Morphology (Halle & Marantz 1993; 1994), Harley & Noyer (2003)) or Minimalist Morphology (Wunderlich (1996; 1997c; 2004)) in that inflectional exponents are not assumed to have morpheme status, or to exist as separate objects. Rather, exponents are introduced by rules of exponence. Cf. (Stump (2001)):

   \[
   \text{(359) } [D2 \mid RR_{D_1(TNS_{\text{pres}}, AGR_{\{\text{PER}, 1, \text{NUM}, \text{sg}\}}), \text{CONJ}_-, \text{T}_-} C] \langle \text{<X}\sigma, \tau > \rangle =_{df} \text{<Xn}'\sigma, \tau >
   \]

2. However, even here inflectional exponents are correlated with morpho-syntactic feature specifications.

3. Therefore, inferential approaches are typically not as radically a-morphematic as is sometimes made out.

4. Accordingly, the gist of an inferential analysis can often be transferred to a lexical analysis without major changes (and vice versa), with most of the important differences being confined to suprasegmental exponents – e.g., umlaut –, or the technical means to override the effects of basic rules of exponence (in inferential approaches) or exponent entries (in lexical approaches) – e.g., rules of referral vs. impoverishment rules (which can produce similar effects, but are not necessarily equivalent).

5. A truly a-morphematic approach to inflectional morphology must give up the assumption that there is any inherent correlation between the form of an exponent and its function.

#### 51. Müller (2002b)

**Background:**

  
  "The functional lexicon is slave to the syntax."

- Aissen (1999; 2002), Müller (2002a): The need for case markers may arise in syntax, under a specific ranking of syntactic constraints. If it does, a case marker is called for; if it does not, the presence of a case marker is blocked (the case marker, by assumption, is not part of the syntactic input).

- Problems for morphematic approaches: What if a language has developed a full paradigm in the morphology that is always blocked in the syntax? What if a language requires case markers for syntactic reasons but the morphological component has simply failed to provide them?

---

<table>
<thead>
<tr>
<th>1-2 contexts</th>
<th>participant reduction</th>
<th>FC</th>
<th>PesF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L^{+} [nom]</td>
<td>L=</td>
<td>+nom</td>
</tr>
<tr>
<td>2</td>
<td>Pes(per) [num] [+1]</td>
<td>Pes([num]) [+1]</td>
<td>Pes([num]) [+1]</td>
</tr>
<tr>
<td><strong>1-2 contexts</strong></td>
<td>no participant reduction</td>
<td>FC</td>
<td>PesF</td>
</tr>
</tbody>
</table>
(360) Case:
The left edge of the minimal residue of an NP requires a case marker.

Assumption:
Case markers cannot be phonologically empty.

Determiner Inflection Again

$P_{15}$: Determiner inflection

<table>
<thead>
<tr>
<th>Case</th>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>er</td>
<td>es</td>
<td>e</td>
</tr>
<tr>
<td>ACC</td>
<td>en</td>
<td>es</td>
<td>e</td>
</tr>
<tr>
<td>DAT</td>
<td>em</td>
<td>em</td>
<td>er</td>
</tr>
<tr>
<td>GEN</td>
<td>es</td>
<td>es</td>
<td>er</td>
</tr>
</tbody>
</table>

As in morphematic analyses, the approach relies on underspecification and feature decomposition.

(361) Feature Decomposition:

<table>
<thead>
<tr>
<th>Case</th>
<th>Gender/Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM:</td>
<td>[- obl, -gov]</td>
</tr>
<tr>
<td>MASC:</td>
<td>[+ masc, -fem]</td>
</tr>
<tr>
<td>ACC:</td>
<td>[- obl, +gov]</td>
</tr>
<tr>
<td>FEM:</td>
<td>[+ masc, +fem]</td>
</tr>
<tr>
<td>DAT:</td>
<td>[- obl, +gov]</td>
</tr>
<tr>
<td>NEUT:</td>
<td>[+ masc, +fem]</td>
</tr>
<tr>
<td>GEN:</td>
<td>[- obl, +gov]</td>
</tr>
<tr>
<td>PL:</td>
<td>[+ masc, -fem]</td>
</tr>
</tbody>
</table>

Feature Co-Occurrence Restrictions

(362) Markedness Constraints

a. *VCM (Avoid Vocalic Case markers):
\[ \neg [- \text{masc}, -\text{obl}] \rightarrow \neg \text{Cm: [+consonantal, +sonorant].} \] *(e/)

b. *DCCM (Avoid Dorsal Consonantal Case markers):
\[ \neg [+\text{fem}, -\text{masc}] \wedge [+\text{gov}] \rightarrow \neg \text{Cm: [+dorsal, +consonantal].} \] *(R/)

c. *CORCM (Avoid Coronal Case markers):
\[ [+\text{masc}, +\text{obl}, +\text{gov}] \rightarrow \neg \text{Cm: [+coronal].} \] *(n/, s/)

d. *SONCM (Avoid Sonorant Case markers):
\[ [+\text{masc}, -\text{fem}, -\text{obl}] \wedge \neg [-\text{masc}] \rightarrow \neg \text{Cm: [+sonorant].} \] *(m/, n/, R/, e/)

These constraints correlate natural classes of exponents with natural classes of instantiations of grammatical categories.

- Natural classes of exponents are captured by phonological features.
- Natural classes of instantiations of grammatical categories are captured by decomposed morpho-syntactic features.

Effects of the Markedness Constraints

$P_2$: *VCM: */e/

<table>
<thead>
<tr>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>DAT</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GEN</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

$P_3$: *DCCM: */R/

<table>
<thead>
<tr>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAT</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>GEN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$P_4$: *CORCM: */n/, */s/

<table>
<thead>
<tr>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAT</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$P_5$: *SONCM: */m/, */n/, */R/, */e/

<table>
<thead>
<tr>
<th>M.SG</th>
<th>N.SG</th>
<th>F.SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DAT</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>GEN</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sonority-driven Marker Selection

- The markedness constraints encoding feature co-occurrence restrictions take over the role of rules of exponence.
- A low-ranked Sonority Hierarchy replaces the Specificity (Blocking, Elsewhere, Panini) Principle as a means to resolve a competition of markers and yields sonority-driven marker selection.
- If the idea is given up that exponents pair phonological form and morpho-syntactic features, with only the form remaining, a selection principle for cases of marker competition can only be sensitive to aspects of form, not to aspects of function.

(363) Inventory of declension markers in German
\{/s/, /m/, /n/, /r/, /e/\}

(364) SonHier (Sonority Hierarchy) (Prince & Smolensky (2004)):
\*s \gg \*m \gg \*n \gg \*r \gg \*e
Empirical domain: weak inflection (of adjectives and nouns) in German

- It is presupposed that the syntax defines contexts where weak inflection is needed. For these contexts, the morphological system generates the correct exponents.
- There are three exponents in German weak declension (of adjectives and nouns):
  1. /Ø/ (the “Grundform”)
  2. /e/ (minimal deviation from the Grundform, /e/ → @)
  3. /en/

“What morpho-syntactic features do [the exponents] express? My surprising answer is: none at all.” “There is a sense in which neither of the suffixes -e or -en here expresses case or number; neither deserves to be treated as possessing or realising a particular grammatical function.

Conclusion:
The ranked constraints (SDSPs) predict the distribution of the exponents; the exponents themselves do not have morpho-syntactic specifications associated with them.

Empirical Evidence: Weak Inflection in German

52. Carstairs-McCarthy (2008)

Background Assumptions of Carstairs-McCarthy (2008)

Empirical domain: weak inflection (of adjectives and nouns) in German
Paradigms of Weak Inflection of adjectives and nouns

A  |  N
---|---
 masc nom sg | /e/  |
    | masculine nom sg | /Ø/  |
 acc sg | n  |
    | acc sg | /n/  |
 dat sg | n  |
    | dat sg | /n/  |
 gen sg | n  |
    | gen sg | /n/  |
 fem nom sg | /e/  |
    | feminine nom sg | /Ø/  |
 acc sg | /e/  |
    | acc sg | /Ø/  |
 dat sg | n  |
    | dat sg | /n/  |
 gen sg | n  |
    | gen sg | /n/  |
 neut nom sg | /e/  |
    | neuter nom sg | /n/  |
 acc sg | /e/  |
    | acc sg | /n/  |
 dat sg | n  |
    | dat sg | /n/  |
 gen sg | n  |
    | gen sg | /n/  |
 pl nom sg | n  |
    | plural nom sg | /n/  |
 acc sg | n  |
    | acc sg | /n/  |
 dat sg | n  |
    | dat sg | /n/  |
 gen sg | n  |
    | gen sg | /n/  |

Constraints for Weak Inflection

(365) Attr-Adj≠Grf:
A weakly inflected attributive adjective does not show up in the Grundform (i.e., it is not /Ø/).

(366) NounFemSg=Grf:
An inflected feminine noun has zero exponence (it shows up in the Grundform).

(367) MascSgAcc≠Nom:
The accusative singular form of a weak masculine noun cannot be identical to the nominative form.

(368) Acc=Nom:
Weak accusative forms are identical to weak nominative forms.

(369) NomSg=Grf:
Nominative singular forms are Grundforms (i.e., they have zero exponence).

(370) NounAdjInfl-en:
Weak forms of nouns and adjectives have the exponent /-en/.

(371) Ranking:
Attr-Adj≠Grf, NounFemSg=Grf, MascSgAcc≠Nom ≥
Acc=Nom, NomSg=Grf ≥
NounAdjInfl-en

Competitions 1: Masc.Nom

- NomSg=Grf is a gradient constraint: /e/ is better than /en/.
- A slightly more general version of NounAdjInfl-en might be possible that requires

T9: der kluge Mensch

<table>
<thead>
<tr>
<th>/klug/</th>
<th>Attr-Adj</th>
<th>NounFemSg</th>
<th>MascSgAcc</th>
<th>Acc</th>
<th>NomSg</th>
<th>NounAdj</th>
</tr>
</thead>
<tbody>
<tr>
<td>/Ø/</td>
<td>≠Grf</td>
<td>≠Grf</td>
<td>≠Nom</td>
<td>≠Nom</td>
<td>=Grf</td>
<td>Infl-en</td>
</tr>
<tr>
<td>O1: klug</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: *klug-Ø</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3: *klug-Ø</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T10: der kluge Mensch

<table>
<thead>
<tr>
<th>/Mensch/</th>
<th>Attr-Adj</th>
<th>NounFemSg</th>
<th>MascSgAcc</th>
<th>Acc</th>
<th>NomSg</th>
<th>NounAdj</th>
</tr>
</thead>
<tbody>
<tr>
<td>/Ø/</td>
<td>≠Grf</td>
<td>≠Grf</td>
<td>≠Nom</td>
<td>≠Nom</td>
<td>=Grf</td>
<td>Infl-en</td>
</tr>
<tr>
<td>O1: Mensch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: Mensch-e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3: Mensch-en</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

only consonantal marking (with /n/ the sole, or the best, candidate).

- Mensch-e is not actually considered by Carstairs-McCarthy (2008). Either this candidate cannot be generated, or there is an undominated constraint that always blocks it. Otherwise, wrong predictions would arise for non-nominative contexts. In what follows, /e/ is ignored with nouns.

Competitions 2: Masc.Acc

T11: den klugen Menschen

<table>
<thead>
<tr>
<th>/klug/</th>
<th>Attr-Adj</th>
<th>NounFemSg</th>
<th>MascSgAcc</th>
<th>Acc</th>
<th>NomSg</th>
<th>NounAdj</th>
</tr>
</thead>
<tbody>
<tr>
<td>/Ø/</td>
<td>≠Grf</td>
<td>≠Grf</td>
<td>≠Nom</td>
<td>≠Nom</td>
<td>=Grf</td>
<td>Infl-en</td>
</tr>
<tr>
<td>O1: klug</td>
<td>***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: *klug-Ø</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3: *klug-Ø</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T12: den klugen Menschen

<table>
<thead>
<tr>
<th>/Mensch/</th>
<th>Attr-Adj</th>
<th>NounFemSg</th>
<th>MascSgAcc</th>
<th>Acc</th>
<th>NomSg</th>
<th>NounAdj</th>
</tr>
</thead>
<tbody>
<tr>
<td>/Ø/</td>
<td>≠Grf</td>
<td>≠Grf</td>
<td>≠Nom</td>
<td>≠Nom</td>
<td>=Grf</td>
<td>Infl-en</td>
</tr>
<tr>
<td>O1: Mensch</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: Mensch-e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3: Mensch-en</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Some constraints are trans-derivational: To find out whether or not a constraint is violated (and how often), one has to look at other existing (i.e., optimal) forms.
- Thus, in order to find out whether an accusative candidate respects MascSgAcc≠Nom or Acc=Nom, one has to find out what the optimal nominative form is.
- Since nothing like this holds for the nominative, there is no danger of circularity.
• The interaction might perhaps best be implemented within the Optimal Paradigms model (McCarthy (2005)): Optimization affects all forms of a paradigm as a whole.
• On this view, \(\text{Acc} = \text{Nom}\) is an OP faithfulness constraint, and \(\text{MascSgAcc} \neq \text{Nom}\) an OP anti-faithfulness constraint.

Competitions 3: Fem.Nom

\(T_{13}: \text{die kluge Frau}\)

<table>
<thead>
<tr>
<th>I. /klug/</th>
<th>FEM NOUN NOM SG</th>
<th>ATTR-ADJ</th>
<th>NOUNFEMSG</th>
<th>MASC SGA ACC</th>
<th>ACC</th>
<th>NOMSG</th>
<th>NOUNADJ</th>
<th>INFL-en</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. klug</td>
<td>(\neq \text{Grf})</td>
<td>= \text{Grf}</td>
<td>(\neq \text{Nom})</td>
<td>= \text{Nom}</td>
<td>= \text{Grf}</td>
<td>NOUNADJ</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

\(T_{14}: \text{die kluge Frau}\)

<table>
<thead>
<tr>
<th>I. /Frau/</th>
<th>FEM NOUN NOM SG</th>
<th>ATTR-ADJ</th>
<th>NOUNFEMSG</th>
<th>MASC SGA ACC</th>
<th>ACC</th>
<th>NOMSG</th>
<th>NOUNADJ</th>
<th>INFL-en</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frau</td>
<td>(\neq \text{Grf})</td>
<td>= \text{Grf}</td>
<td>(\neq \text{Nom})</td>
<td>= \text{Nom}</td>
<td>= \text{Grf}</td>
<td>NOUNADJ</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

• Except for the additional NOUNFEMSG=Grf violation in tableau \(T_{14}\), which does not affect the outcome, everything is as before.

Competitions 4: Fem.Acc

\(T_{15}: \text{die kluge Frau}\)

<table>
<thead>
<tr>
<th>I. /klug/</th>
<th>FEM NOUN NOM SG</th>
<th>ATTR-ADJ</th>
<th>NOUNFEMSG</th>
<th>MASC SGA ACC</th>
<th>ACC</th>
<th>NOMSG</th>
<th>NOUNADJ</th>
<th>INFL-en</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. klug</td>
<td>(\neq \text{Grf})</td>
<td>= \text{Grf}</td>
<td>(\neq \text{Nom})</td>
<td>= \text{Nom}</td>
<td>= \text{Grf}</td>
<td>NOUNADJ</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

\(T_{16}: \text{die kluge Frau}\)

<table>
<thead>
<tr>
<th>I. /Frau/</th>
<th>FEM NOUN NOM SG</th>
<th>ATTR-ADJ</th>
<th>NOUNFEMSG</th>
<th>MASC SGA ACC</th>
<th>ACC</th>
<th>NOMSG</th>
<th>NOUNADJ</th>
<th>INFL-en</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Frau</td>
<td>(\neq \text{Grf})</td>
<td>= \text{Grf}</td>
<td>(\neq \text{Nom})</td>
<td>= \text{Nom}</td>
<td>= \text{Grf}</td>
<td>NOUNADJ</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

• The analysis also covers plural formation (with minimal extensions).

53. Non-Optimality-Theoretic Reconstruction

• Both a-morphematic analyses can be executed without explicit constraint ranking and constraint violability.
• There is no inherent relation between optimality theory and a-morphematic inflectional morphology.


(373) Feature Co-Occurrence Restrictions (inviolable):

a. \(*VCM\) (Avoid Vocalic Case markers):
\[\neg [-\text{masc}, \text{obl}] \rightarrow \neg \text{Cm}: [-\text{consonantal}, +\text{sonorant}].\]
(b. \(*DcCm\) (Avoid Dorsal Consonantal Case markers):
\[\neg [+\text{fem}, -\text{masc}] \land [+\text{gov}] \rightarrow \neg \text{Cm}: [+\text{dorsal}, +\text{sonorant}].\]
(c. \(*CrCm\) (Avoid Coronal Case markers):
\[\neg [+\text{masc}, +\text{obl}, +\text{gov}] \rightarrow \neg \text{Cm}: [+\text{coronal}].\]
(d. \(*SonCm\) (Avoid Sonorant Case markers):
\[\neg [+\text{masc}, -\text{fem}, -\text{obl}] \land \neg [+\text{masc}] \rightarrow \neg \text{Cm}: [+\text{sonorant}].\]

(374) Sonority-driven Marker Selection (SMS):

An exponent \(\alpha\) is selected for a fully specified morpho-syntactic context \(\Gamma\) iff (a)-(c) hold:

a. \(\alpha\) is part of the inventory that belongs to \(\Gamma\)’s domain.
b. \(\alpha\) is not blocked in \(\Gamma\) by a FCR.
c. There is no other marker \(\beta\) such that (i)-(iii) hold:
   (i) \(\beta\) satisfies (374-a).
   (ii) \(\beta\) satisfies (374-b).
   (iii) \(\beta\) is more sonorous than \(\alpha\).

Reanalysis of Carstairs-McCarthy’s (2008) Approach

Basic assumption:

• SDSPs are reanalyzed as impoverishment rules.
• Impoverishment rules are often explicitly designed to capture system-wide generalizations (Noyer (1992, 1998), Bonet (1991), Halle & Marantz (1994), Frampton (2002), Bobaljik (2002a;2003), Müller (2005), and many others).

(375) Vocabulary items:

a. /e/ ↔ number
b. /n/ ↔ case, number

• Given the Specificity condition incorporated into the Subset Principle, /n/ is preferred to /e/ in contexts where it fits (i.e., in a sense it “emerges as the unmarked”), and /e/ is preferred to zero exponence.
• The analysis is thus not fully a-morphematic, but almost (the specifications in (375) are trivial).

(376) **Impoveryment rules:**

a. Feminine nouns in the singular show the Grundform:
   \[\text{[case, number]} \rightarrow \emptyset /\text{fem,+N}\]

b. Masculine nouns in the singular have no overt nominative marker:
   \[\text{[case, number]} \rightarrow \emptyset /\text{masc,nom,+N}\]

c. Singular adjectives have (generally) no consonantal marker in non-oblique contexts:
   \[\text{[case]} \rightarrow \emptyset /\text{–obl,–pl,+A}\]

   (as long as MascAccCase\(\neq\)\(\emptyset\) is respected).

(377) **Vocabulary insertion into impoverishment syntactic contexts**

<table>
<thead>
<tr>
<th></th>
<th>masc</th>
<th>fem</th>
<th>neut</th>
<th>pl</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom sg</td>
<td>/e/</td>
<td>/e/</td>
<td>/e/</td>
<td>/n/</td>
</tr>
<tr>
<td>acc sg</td>
<td>/n/</td>
<td>/e/</td>
<td>/e/</td>
<td>/n/</td>
</tr>
<tr>
<td>dat sg</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
</tr>
<tr>
<td>gen sg</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
<td>/n/</td>
</tr>
</tbody>
</table>

---

**X. Optimality Theory 3: Leading Forms**

**General idea:**
Some member of a paradigm may act as a “leading form” in the sense that it determines properties of another member of the paradigm.

**54. Wurzel on Leading Forms**


**Wurzels Annahme:**
Es gibt in komplexen Flexionsparadigmen sog. **Kennformen** (engl. *leading forms*).

• Kennformen sind gegenüber anderen Wortformen eines Paradigmas privilegiert.

• Kennformen signalisieren (relativ) eindeutig die Zugehörigkeit zu Flexionsklassen.

• Wenn man eine (oder mehrere) Kennformen kennt, kann man dan Rest des Formenbestandes des Paradigmas erschließen, mit Hilfe von Paradigmenstrukturbedingungen.

• Kennformen sind also im Lexikon gespeichert; alle anderen Formen können durch Regeln abgeleitet werden. Die Endung der Kennform wirkt als *Flexionsklassenmerkmal*.

• Kennformen können, müssen aber nicht *per se* Nominativformen (und auch nicht Singularformen) sein.


**378 Starke feminine Flexionsklassen im Isländischen**

<table>
<thead>
<tr>
<th></th>
<th>Fa</th>
<th>Fa’</th>
<th>Fi</th>
<th>Fc1</th>
<th>Fc2</th>
</tr>
</thead>
<tbody>
<tr>
<td>nom sg</td>
<td>vel-Ø</td>
<td>drottning-Ø</td>
<td>mynd-Ø</td>
<td>geit-Ø</td>
<td>vik-Ø</td>
</tr>
<tr>
<td>acc sg</td>
<td>vel-Ø</td>
<td>drottning-Ø</td>
<td>mynd-Ø</td>
<td>geit-Ø</td>
<td>vik-Ø</td>
</tr>
<tr>
<td>dat sg</td>
<td>vel-Ø</td>
<td>drottning-Ø</td>
<td>mynd-Ø</td>
<td>geit-Ø</td>
<td>vik-Ø</td>
</tr>
<tr>
<td>gen sg</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
<td>vik-ur</td>
</tr>
<tr>
<td>nom pl</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
<td>vik-ur</td>
</tr>
<tr>
<td>acc pl</td>
<td>vel-ar</td>
<td>drottning-ar</td>
<td>mynd-ar</td>
<td>geit-ar</td>
<td>vik-ur</td>
</tr>
<tr>
<td>dat pl</td>
<td>vel-um</td>
<td>drottning-um</td>
<td>mynd-um</td>
<td>geit-um</td>
<td>vik-um</td>
</tr>
<tr>
<td>gen pl</td>
<td>vel-a</td>
<td>drottning-a</td>
<td>mynd-a</td>
<td>geit-a</td>
<td>vik-a</td>
</tr>
</tbody>
</table>

Was sind die Kennformen?

Die Kennformen sind (v.a.) Nominativ- und Akkusativ-Plural-Formen, in einem Fall auch Genitiv-Singular-Formen.

Analyse der starken femininen Deklinationen bei Wurzel Generalisierungen:
Fi braucht keine lexikalische Spezifikation (kein Flexionsklassenmerkmal).

Fa braucht /ar/ für Nom./Akk.Pl. als lexikalische Spezifikation.

Fc1 braucht /ar/ für Nom./Akk.Pl. als lexikalische Spezifikation.

Fc2 braucht /ur/ für Gen.Sg. als lexikalische Spezifikation (d.h., die Genitiv-Singularform ist die Kennform der Flexionsklasse).

(379) **Paradigmenstrukturbedingungen**

a. (i) [+subst] → [um/Dat.Pl.]
   (ii) [+subst,-K-V] → [a/Gen.Pl.]
   (iii) [+subst,+fem,#σ#] → [Ø/Dat./Akk.Sg.]

Bemerkung: [-K] = auf Konsonant endend; [-V] = auf schweren Vokal endend; #σ# = Einsilbigkeit

**Probleme**

(380) **Alle Flexionsklassen**

<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>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Ø</td>
<td>ur</td>
<td>Ø</td>
<td>ur</td>
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<td>i</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>acc sg</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
<td>Ø</td>
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<td>Ø</td>
<td>a</td>
<td>a</td>
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<td></td>
<td></td>
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<td>Ø</td>
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<td>i</td>
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<td>a</td>
<td>a</td>
<td>n</td>
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</tr>
<tr>
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<td>ar</td>
<td>ar</td>
<td>ar</td>
<td>ur</td>
<td>a</td>
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<td>u</td>
<td></td>
</tr>
<tr>
<td>nom pl</td>
<td>ar</td>
<td>Ø</td>
<td>ar</td>
<td>it</td>
<td>it</td>
<td>it</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
<td>ar</td>
<td>ur</td>
</tr>
<tr>
<td>acc pl</td>
<td>a</td>
<td>Ø</td>
<td>ar</td>
<td>i</td>
<td>i</td>
<td>i</td>
<td>ur</td>
<td>ur</td>
<td>ur</td>
<td>a</td>
<td>ur</td>
</tr>
<tr>
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<td>um</td>
<td>um</td>
<td>um</td>
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</tr>
<tr>
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<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>

Gibt es hier zuverlässige Kennformen?

**Problem:**

More generally, the assumption seems to be untenable that one will always find morphological exponents that are inflection-class specific. (This also argues against the constraints on paradigm economy suggested by Carstairs-McCarthy (1994) (No Blur Principle) and Noyer (2005) (Interclass Syntresism Constraint).)

**Question:**

Where do the Kennformen come from? How can the learner identify them?

55. **McCarthy on Optimal Paradigms**

**Ref.:** McCarthy (2005)
“Epenthesis metastasizes throughout the paradigm, even in forms where it is not required for markedness reasons.”

(388) **Moroccan Arabic verbs: Majority rules:**

<table>
<thead>
<tr>
<th>Stem</th>
<th>NomSg</th>
<th>GenSg</th>
<th>NomPl</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>hab-</td>
<td>lū</td>
<td>nū</td>
<td>u, wə</td>
<td>lū</td>
</tr>
</tbody>
</table>

For stems by nū: 20 = 5x2x2, 24 = 4x3x2:

All stems are equally important for this constraint, i.e., OP-MAX-V is violated for ar stems by rə stems, and for rə stems by or stems).

56. **Albright on Leading Forms**


**Case study** (Albright (2008)): Nominal paradigms in Yiddish.

(389) a. Middle High German (MHG):

/bund/, /bund-o/ → /bunt/, /bun-da|

b. Yiddish (NEY):

/bund/, /bun-da/ → /bunt/, /bun-da|

**Problem for Optimal Paradigms model**

The Yiddish change is unexpected since the model relies on overapplication only (of devoicing, in the case at hand).

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**Problem for Optimal Paradigms model**

The Yiddish change is unexpected since the model relies on overapplication only (of devoicing, in the case at hand).
(395) **Constraints:**

a. Faithfulness constraints:
   (i) IDENT(voi):
       Preserve underlying voicing value.
   (ii) IDENTpl(voi):
       Preserve voicing in onset position.
   (iii) IDENTLexCat(voi):
       Preserve voicing within roots of lexical categories.

b. Markedness constraints:
   (i) FINDEVOIO:
       No faithfully voiced obstruents in coda position.
   (ii) FINDEVOIN:
       No derived (new) voiced obstruents in coda position.
   (iii) *DD#:
       No word-final sequences of voiced obstruents.
   (iv) AGREE:
       Consecutive obstruents may not have conflicting [voice] specifications.
   (v) AGREE/#:
       Consecutive obstruents may not have conflicting [voice] specifications at the ends of words.

(396) **Ranking (in stochastic OT):**

\[
\text{AGREE} \succ \text{IDENTpl(voi)}, \ 
* \text{DD#} \succ \text{FINDEVOIN}, \ 
\text{AGREE}, \ 
\text{IDENTLexCat(voi)} \succ \text{FINDEVOIO} \succ \text{IDENT(voi)}
\]

**Note:**

In (396), “\(\succ\)” stands for no (or hardly any) overlapping domains of constraints, “\(\succ\)” stands for overlapping domains, with the relative (non-categorical) ranking corresponding to the order presentation.

(397) **Crucial partial ranking for MHG and NEY:**

a. MHG:
   \[
   \text{FINDEVOIO} \succ \text{IDENTLexCat(voi)}, \ \text{IDENT(voi)}
   \]

b. NEY:
   \[
   \text{IDENTLexCat}(voi) \succ \text{FINDEVOIO} \succ \text{IDENT(voi)}
   \]

(398) **Absence of final devoicing in Yiddish: Conspiracy of regular constraints**

<table>
<thead>
<tr>
<th>[bund] / /bund-a/</th>
<th>IDENTLexCat(voi)</th>
<th>FINDEVOIO</th>
<th>IDENT(voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1: [bunt], [bunda]</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: [bunt], [bunta]</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O3: [bund], [bunda]</td>
<td>*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

This simple analysis seems to work well for Yiddish; by taking into account all the other constraints, all other data where one can or must have devoicing after all can be accommodated.

(399) **Blocking of final voiced+voiced sequences in Yiddish:**

<table>
<thead>
<tr>
<th>/lib-t/</th>
<th>*DD#</th>
<th>AGREE</th>
<th>IDENTLexCat(voi)</th>
<th>FINDEVOIO</th>
<th>IDENT(voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1: [lib]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: [libd]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| O3: [lipt] | | | | | *

**Another case: (Variation in) regressive devoicing.**

(400) a. Regressive devoicing in /abta/:

<table>
<thead>
<tr>
<th>abta</th>
<th>IDENTpl</th>
<th>FINDEVOIN</th>
<th>AGREE</th>
<th>IDENTLexCat (voi)</th>
<th>FINDEVOIO</th>
<th>IDENT (voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1: [abta]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: [abda]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| O3: [aptal] | | | | | | *

b. No regressive voicing in /apta/:

<table>
<thead>
<tr>
<th>apta</th>
<th>IDENTpl</th>
<th>FINDEVOIN</th>
<th>AGREE</th>
<th>IDENTLexCat (voi)</th>
<th>FINDEVOIO</th>
<th>IDENT (voi)</th>
</tr>
</thead>
</table>
| O1: [apta] | | | | | | *
| O2: [apda] | | | | | | *
| O3: [apta] | | | | | | *

**Situation so far:**

The analysis works technically. However: At no point does the concept of a *leading form* (a “base”, in Albright’s terminology) play a role in the analysis. This changes in the last five pages of the paper, where an alternative (?) analysis is presented that is based on the model developed in Albright (2002). The new approach replaces IDENTLexCat (voi) with BASEIDENTpl which requires faithfulness to a *preselected plural base form*.

(401) **Absence of final devoicing in Yiddish: Paradigmatic leveling**

a. Plural form without devoicing:

<table>
<thead>
<tr>
<th>bund-a</th>
<th>BASEIDENTpl</th>
<th>FINDEVOIO</th>
<th>IDENT (voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1: [bunda]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: [bunta]</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

b. Singular form without devoicing (so as to match the plural form):

<table>
<thead>
<tr>
<th>bund</th>
<th>BASEIDENTpl</th>
<th>FINDEVOIO</th>
<th>IDENT (voi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1: [bund]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: [bunt]</td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

**Question:**

How is the plural form selected as the base form (leading form)?

**Answer:**

The plural form is the most informative part of the paradigm. It is “the form that most clearly exhibits lexical contrasts and extending the plural variant does the least violence to recoverability” (p. 300). “See Albright (2002) for details and algorithmic implementation.” (Crucial concepts: reliability score of rules (hits divided by scope), adjustment by confidence scores, etc.)

**Hunch:**

It might in principle be possible (though perhaps less plausible) to carry out leading form determination in inflectional morphology in OT *within* OT (rather than by invoking some
algorithm like the Minimal Generalization Learner of Albright (2002)). As a matter of fact, there is already such a proposal: Sympathy theory (McCarthy (1999)).

57. McCarthy on Sympathy Theory

Ref.: McCarthy (1999)

Problem:
Instances of opaque rule application in derivational phonology (counter-bleeding, counter-feeding) cannot straightforwardly be accounted for in representational optimality-theoretic phonology (“harmonic parallelism”).

(402) Counter-bleeding in Tiberian Hebrew:
a. Epenthesis into final clusters:
/melk/ → melekx “king”
b. ?-Deletion outside onsets:
/qaraʔ/ → qara̰ “he called”
c. Interaction – Epenthesis → ?-Deletion:
/dešʔ/ → dešeʔ → deše “tender grass”

Note:
Standard (parallel) optimality theoretic can only produce the result of transparent rule application: *deš.

McCarthy’s (1999) idea:
The intermediate stage of the derivation in (402-c), viz., dešeʔ, corresponds to a candidate that competes with (and loses against) the optimal form deše, but that is more faithful to the input /dešʔ/: in one respect – it maintains the ?-deše blocks deš because it is more faithful to the candidate that corresponds to the intermediate step in a derivational approach. This latter instance of faithfulness is called sympathy.

(403) Basic tenets of sympathy theory:
a. Certain (input/output faithfulness) constraints F_i divide the candidate set C into two non-overlapping subsets: C_{+F_i} is the class of candidates that respect F_i, and C_{−F_i} is the class of candidates that violate F_i. F_i is called a “selector”.
b. The optimal member of C_{+F_i} is called •F_i. This is the •-candidate selected by F_i. •F_i does not have to be optimal in C.
c. There are •-faithfulness constraints that demand faithfulness (sympathy) to •F_i candidates, rather than to the input itself. If high-ranked, these •-faithfulness constraints can render non-transparent candidates optimal and thereby account for opacity effects like counter-bleeding.

Note:
Sympathy theory identifies leading forms and ensures that properties of these leading forms (• candidates) can be transported to other forms in the same candidate set. Normally the selector is a faithfulness constraint, but perhaps this does not have to be the case (see, e.g., Müller (2002a) on sympathy in syntax). In principle, it might be possible to extend this to paradigmatic leveling; the only technical issue would be that if paradigms (rather than word forms) are subject to optimization, it looks as though the • optimization would have to take place within the paradigm first (cyclically, or in a separate stratum).

Yet another alternative?
Harmonic serialism: Leading forms as outputs of prior optimizations can somehow be the inputs for subsequent optimization, so that regular faithfulness constraints derive analogical leveling. (In the case of Yiddish, singular forms must be derived from plural forms.)
XI. Optimality Theory 4: Syncretism without Underspecification

58. Basic Assumptions and Data
The Approach to Syncretism in Müller (2011)

1. There is no underspecification of exponents.

2. Not all members of a paradigm (exponents) are present in the input; only leading forms are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Allbrit (2008), and Baerman (2009) on somewhat related concepts).

3. A mismatch of paradigm cells and leading forms gives rise to syncretism: Initial gaps are filled by using “wrong”, i.e., unfaithful exponents (Weisser (2007)).

4. Mismatches between the exponent’s specification and the target specification are minimized; this is not accomplished by a single Minimality condition (cf. the Nearest Neighbour Principle in Weisser (2007, 26), or the Minimality principle in Lahue (2007a, 11)), but by a set of ranked faithfulness constraints for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004), etc.; however, these authors all crucially rely on underspecification - cf. handout Morphology I).

5. Feature decomposition yielding natural classes is needed exactly as before.

6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a rule of referral (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

(404) Determiner inflection in German

<table>
<thead>
<tr>
<th>dies</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOMINATIVE</td>
<td>r</td>
<td>s</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>ACCUSATIVE</td>
<td>m</td>
<td>m</td>
<td>r</td>
<td>n</td>
</tr>
<tr>
<td>DATIVE</td>
<td>s</td>
<td>s</td>
<td>r</td>
<td>r</td>
</tr>
</tbody>
</table>

59. Analysis

(405) Nine leading forms:

<table>
<thead>
<tr>
<th></th>
<th>/r/1</th>
<th>/n/2</th>
<th>/m/3</th>
<th>/s/4</th>
<th>/s/5</th>
<th>/e/6</th>
<th>/n/7</th>
<th>/r/8</th>
<th>/r/9</th>
</tr>
</thead>
<tbody>
<tr>
<td>dies</td>
<td>[+masc, +fem, -gov, -obl]</td>
<td>[+masc, +fem, +gov, -obl]</td>
<td>[+masc, +fem, +obl]</td>
<td>[+masc, -fem, +gov, +obl]</td>
<td>[+masc, -fem, +obl]</td>
<td>[+masc, -fem, -obl]</td>
<td>[+masc, +fem, +obl]</td>
<td>[+masc, -fem, +obl]</td>
<td>[+masc, -fem, -obl]</td>
</tr>
</tbody>
</table>

Optimality-Theoretic Constraints

(406) MATCH (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(407) Faithfulness constraints for features on exponents

a. IDENTMASC: ±masc of the input must not be changed in the output on an exponent.

b. IDENTOBL: ±obl of the input must not be changed in the output on an exponent.

c. IDENTFEM: ±fem of the input must not be changed in the output on an exponent.

d. IDENTGOV: ±gov of the input must not be changed in the output on an exponent.

(408) Ranking:
IDENTMASC ≫ IDENTOBL ≫ IDENTFEM ≫ IDENTGOV

Incomplete Paradigms

(409) Incomplete paradigm with leading forms only

<table>
<thead>
<tr>
<th>dies</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>/r/1</td>
<td>/n/2</td>
<td>/m/3</td>
<td>/s/4</td>
<td>/s/5</td>
</tr>
<tr>
<td>dies</td>
<td>[+giv, -obl]</td>
<td>[+giv, -obl]</td>
<td>[+giv, -obl]</td>
<td>[+giv, -obl]</td>
</tr>
</tbody>
</table>

Note: In what follows, EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1994)).
null
This kind of approach does not easily accommodate elsewhere distributions.

Tableau T22: A wrong prediction for Dat.Fem.Sg. contexts under reranking

<table>
<thead>
<tr>
<th>Input: dies ↔ [masc., fem., +gov., +obl]</th>
<th>MATCH</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Or: dies-nf ↔ [masc., -fem., -gov., +obl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: dies-t8 ↔ [masc., -fem., +gov., +obl]</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau T23: Correct prediction for Gen.Pl. contexts without /r/; contextual faithfulness

<table>
<thead>
<tr>
<th>Input: dies ↔ [masc., fem., +gov., +obl]</th>
<th>MATCH</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Or: dies-nf ↔ [masc., -fem., +gov., +obl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O2: dies-t8 ↔ [masc., -fem., +gov., +obl]</td>
<td></td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tableau T24: OT tableau for pros-im 'beg-1SG'

<table>
<thead>
<tr>
<th>I: pros ↔ [+1 -2 -pl]</th>
<th>MATCH</th>
<th>ID1</th>
<th>ID2</th>
<th>IDPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. proc-im ↔ [+1 -2 -pl]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. proc-ime ↔ [+1 -2 -pl]</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. proc-ís ↔ [+1 -2 -pl]</td>
<td></td>
<td>*(!)</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. proc-ite ↔ [+1 -2 -pl]</td>
<td></td>
<td>*(!)</td>
<td>*(!)</td>
<td>*</td>
</tr>
<tr>
<td>e. proc-i ↔ [+1 -2 -pl]</td>
<td></td>
<td>*(!)</td>
<td>*(!)</td>
<td>*</td>
</tr>
<tr>
<td>f. proc-i ↔ [+1 -2 -pl]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Tableau T25: OT tableau for pros-i 'beg-3PL'

<table>
<thead>
<tr>
<th>I: pros ↔ [–1 +2 +pl]</th>
<th>MATCH</th>
<th>ID1</th>
<th>ID2</th>
<th>IDPL</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. proc-im ↔ [–1 +2 +pl]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. proc-ime ↔ [–1 +2 +pl]</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. proc-ís ↔ [–1 +2 +pl]</td>
<td></td>
<td>*(!)</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d. proc-ite ↔ [–1 +2 +pl]</td>
<td></td>
<td>*(!)</td>
<td>*(!)</td>
<td>*</td>
</tr>
<tr>
<td>e. proc-i ↔ [–1 +2 +pl]</td>
<td></td>
<td>*(!)</td>
<td>*(!)</td>
<td>*</td>
</tr>
<tr>
<td>f. proc-i ↔ [–1 +2 +pl]</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

(413) An Obvious Challenge: Verb Inflection in English

<table>
<thead>
<tr>
<th>Singular</th>
<th>Plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 am</td>
<td>are</td>
</tr>
<tr>
<td>2 are</td>
<td></td>
</tr>
<tr>
<td>3 is</td>
<td>are</td>
</tr>
</tbody>
</table>

(414) Underspecification approach (Subset Principle; standard):

a. /am/ ↔ [–2, +pl]
b. /is/ ↔ [–1, +2, +pl]
c. /are/ ↔ [ ]

(415) Overspecification approach (Superset Principle; Starke (2006), Caha (2007; 2008)):

a. /am/ ↔ [pres,part]
b. /is/ ↔ [pres]
c. /are/ ↔ [pres,part,addr,group]

Even more interesting: /is/ vs. Ø with regular verbs.

Solution for “to be” via contextual faithfulness:

Add a constraint IDENTPERS([-pl]); /are/ ↔ [–1, +2, +pl].

61. Czech Verb Inflection by Leading Forms, without Underspecification

Ref.: Englisch (2015)

(416) Present tense of the Czech verb prosit 'ask/beg'

<table>
<thead>
<tr>
<th>SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pros-im</td>
<td>pros-ime</td>
</tr>
<tr>
<td>2 pros-ís</td>
<td>pros-ite</td>
</tr>
<tr>
<td>3 pros-i</td>
<td>pros-i</td>
</tr>
</tbody>
</table>

Note:

A learning algorithm for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the “No-Homonymy Learner” and the “Elsewhere Learner”).
XI. Optimality Theory 5: Deponency

62. Introduction

62.1. Deponency

(422) A Definition (Baerman (2007)):
Deponency is a mismatch between form and function (1). Given that there is a formal morphological opposition (2) between active and passive (3) that is the normal realization of the corresponding functional opposition (4), deponents are a lexically-specified set (5) of verbs whose passive forms function as actives. The normal function is no longer available (6).

Note:
Baerman suggests to treat (1) as the central, defining characteristic of deponency; all the other properties are subject to parametrization. Thus, an extended concept of deponency emerges that is not confined to deponent verbs in Latin (Greek, Sanskrit).

62.2. Deponent Verbs in Latin

(423) Regular and deponent verbs

<table>
<thead>
<tr>
<th>ACT</th>
<th>PASS</th>
<th>ACT</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>regere ('rule')</td>
<td>hortari ('urge')</td>
<td></td>
<td></td>
</tr>
<tr>
<td>regit</td>
<td>regitur</td>
<td>hortatur</td>
<td></td>
</tr>
<tr>
<td>regere</td>
<td>regi</td>
<td>hortari</td>
<td></td>
</tr>
<tr>
<td>rexit</td>
<td>rectus est</td>
<td>hortatus est</td>
<td></td>
</tr>
<tr>
<td>rectus</td>
<td>hortatus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hortum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>regens</td>
<td>hortans</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• Even with deponent verbs, some forms are taken from the active marker set (and have an active interpretation): In addition to the supine and the present participle, this holds for the future participle (hortaturus) and the gerund (hortandi).

• In contrast, the gerundive has maintained its passive meaning: hortandus ‘someone who must be urged’.

62.3. Preterite Present Verbs in German

Generalization:
Preterite present verbs in German are mainly modal verbs, but also, e.g., wissen (‘know’). They give rise to heteroelision: Two inflectional patterns are mixed in one paradigm.

<table>
<thead>
<tr>
<th>PRES</th>
<th>PASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>sollen ('shall')</td>
<td>wollen ('choose')</td>
</tr>
<tr>
<td>1.sg. soll-Ø</td>
<td>1.sg. *wähl-Ø</td>
</tr>
<tr>
<td>2.sg. soll-st</td>
<td>2.sg. wählt-st</td>
</tr>
<tr>
<td>3.sg. soll-Ø</td>
<td>3.sg. *wähl-Ø</td>
</tr>
<tr>
<td>1.pl. soll-en</td>
<td>1.pl. wählen</td>
</tr>
<tr>
<td>2.pl. soll-t</td>
<td>2.pl. wählt</td>
</tr>
<tr>
<td>3.pl. soll-en</td>
<td>3.pl. wählen</td>
</tr>
</tbody>
</table>

Note:
Preterite present verbs take their present tense exponents from the past tense marker inventory of strong verbs. There is no defectiveity. “The present tense forms of modal verbs arose via reinterpretation [...] A past tense form was reinterpreted as a present tense form. Given this reinterpretation, the past paradigm was vacant and had to be newly generated. This generation took place ‘regularly’, i.e., with weak forms” (Eisenberg (2000, 185)).

62.4. Infinitivus pro Participio (Ersatz infinitive) in German

(426) Infinitivus pro participio (IPP):

a. *dass das Lied singen gewollt hat 
that she the song sing-INF want-PART has 

b. dass sie das Lied hat singen wollen 
that she the song has sing-INF want-INF

(427) Absence of IPP:

a. dass sie das gewollt hat 
that she that want-PART has 

b. *dass sie das hat wollen 
that she that has want-INF

Generalization:
If a modal verb like wollen (‘want’) is embedded by a perfect auxiliary and embeds an infinitive itself, it shows up as an infinitive, not as a past participle (which one would normally expect). In addition, the VP headed by the modal verb is extraposed. In contrast to other cases of deponency, the IPP effect is syntactically conditioned.

63. Deponency: Some Theories

63.1. A Taxonomy of Analyses

(428) a. Form deponency

(i) There is a featural mismatch between a morphological exponent and morpho-syntactic property set (= paradigm cell, syntactic context, ...) that it realizes.

(ii) Refs.: Stump (2006), Weisser (2014)

b. Property deponency

(i) There is no mismatch between the morphological exponent and the morpho-syntactic property set; but there is a mismatch between the morpho-
Two general properties of the analysis can be noted. First, there is a true mismatch, except that [active] is replaced with [passive].

(i) There is no mismatch. The morphological exponent faithfully realizes the morpho-syntactic property set, but the features involved are more abstract than one might initially have thought.


(i) There is no mismatch. The morphological exponent faithfully realizes a purely morphological (‘morphomic’, Aronoff (1994)) property set; there is a relation between syntactic features and morphomic features, but it is indirect.


(i) There is no mismatch. The morphological exponent faithfully realizes a certain abstract semantic property; i.e., deponent verbs in Indo-European languages can form a semantically defined natural class with other, more obvious instances of non-active morphology after all.


63.2. Form Dependency
63.2.1. Stump (2006) on Paradigm Linkage

Form deponency would a priori seem to be the most straightforward approach, but there seem to be very few analyses of this type: Stump (2006) is one. Stump (2006, 286-289)) introduces rules of paradigm linkage which can be viewed as generalizations of rules of referral. Stump (2006) shows that the inflectional properties of deponent verbs can be accounted for by means of a generalization of rules of referral, which were originally introduced in order to account for syncretism (Zwicky (1985), Corbett & Fraser (1993), Stump (2001)). Such rules state that the exponent for a given morpho-syntactic context (or paradigm cell) must be identical to the exponent independently chosen for some other morpho-syntactic context. The otherwise expected morphological rule of exponence underapplies in this context.

Against this background, Stump (2006) introduces rules of paradigm linkage which can be viewed as generalizations of rules of referral, such that the referral does not merely affect individual paradigm cells, but entire paradigmatic areas (i.e., what Corbett (2007) calls ‘slabs’), as required for deponency. Normally, the form chosen for a given morpho-syntactic context $\sigma$ is the most specific form where the morphological exponent realizes a subset of $\sigma$’s features; this is guaranteed by a universal default rule of paradigm linkage. However, with deponent verbs, a more specific Latin rule of paradigm linkage ensures that the form chosen for a morpho-syntactic context $\sigma$ that contains the specification [+active] is the one chosen for a context that is just like $\sigma$, except that [+active] is replaced with [passive].

Two general properties of the analysis can be noted. First, there is a true mismatch between exponent and syntactic context with deponent verbs; the morpho-syntactic features associated with the morphological exponent (e.g., [passive]) and the features of the morpho-syntactic context (e.g., [active]) are of the same type.

With deponent verbs, the otherwise expected morphological rule of exponence underapplies in this context. Against this background, Stump (2006) introduces rules of paradigm linkage which can be viewed as generalizations of rules of referral, such that the referral does not merely affect individual paradigm cells, but entire paradigmatic areas (i.e., what Corbett (2007) calls ‘slabs’), as required for deponency. Normally, the form chosen for a given morpho-syntactic context $\sigma$ is the most specific form where the morphological exponent realizes a subset of $\sigma$’s features; this is guaranteed by a universal default rule of paradigm linkage. However, with deponent verbs, a more specific Latin rule of paradigm linkage ensures that the form chosen for a morpho-syntactic context $\sigma$ that contains the specification [+active] is the one chosen for a context that is just like $\sigma$, except that [+active] is replaced with [passive].


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(i) There is no mismatch. The morphological exponent faithfully realizes a certain abstract semantic property; i.e., deponent verbs in Indo-European languages can form a semantically defined natural class with other, more obvious instances of non-active morphology after all.


63.2.2. Weisser (2014) on Mismatch Verbs

Another form deponency approach is developed in Weisser (2014), based on minimalist syntax and Distributed Morphology. Here the main claim is that deponent verbs and unaccusative verbs emerge as two sides of the same coin, with reversed values for the feature [+active].

(i) There is no mismatch. The morphological exponent faithfully realizes a certain abstract semantic property; i.e., deponent verbs in Indo-European languages can form a semantically defined natural class with other, more obvious instances of non-active morphology after all.


(i) There is no mismatch. The morphological exponent faithfully realizes the morpho-syntactic property set, but the features involved are more abstract than one might initially have thought. However, with deponent verbs, the otherwise expected morphological rule of exponence underapplies in this context.


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(i) There is no mismatch. The morphological exponent faithfully realizes a purely morphological (‘morphomic’, Aronoff (1994)) property set; there is a relation between syntactic features and morphomic features, but it is indirect.
63.3. Property Deponency

63.3.1. Stump (2007) on Sanskrit Middles

Ātmanepadīn verbs (A-verbs) may take on middle forms in the presence of active (non-middle) interpretation. The middle interpretation – with an affected subject – is also possible with these forms, i.e., the deponency does not lead to defectivity, and there is no loss of the original function.

Two arguments for property deponency:

1. Even in cases of active interpretation, the information “middle” must be syntactically (and not just morphologically) available because it participates in agreement rules: An auxiliary verb that co-occurs with the A-verb in the periphrastic perfect also must have formal middle marking.

2. There is a system-wide syncretism pattern according to which the passive forms of a verb have to be syncretic with the middle forms in a number of contexts, and the deponent A-verbs are no exception; thus, the information “middle” must be accessible at the point where this generalization is expressed, which can not be the individual morphological exponent.

Proposal:

A-verbs are morphologically and syntactically marked [middle], but can, by stipulation, escape a standard [middle] interpretation (viz., an interpretation of the object as affected).

63.3.2. Embick (2000) on Latin Deponents

Background:

Distributed Morphology (Halle & Marantz (1993)): Inflectional items are post-syntactic realizations of functional heads.

Two approaches, each with two possible sources of [pass]:

1. [pass] may be present in syntax, triggering passive morphology and interpretation, or may be inserted after syntax, where it still triggers passive morphology (by late insertion of morphological exponents) but comes too late to trigger passive syntax (or interpretation → counter-feeding). (Problem: deponency realization feeds head movement, but there is no post-syntactic movement. Solution:)

2. [pass] may show up in two different positions: With regular passivization, it is part of a functional head (triggering passive syntax and interpretation). With deponents, it shows up on a root, where subcategorization information and interpretation are not affected. Morphological realization of [pass] proceeds uniformly.

Note:

In both cases, [pass] of the morpho-syntactic property set is matched with [pass] of a morphological exponent, and standard [pass] interpretation is not possible with deponents. However, in contrast to Stump (2007), agreement for [pass] may also be unexpected (in the first proposal, and unless agreement is post-syntactic).

63.4. Spurious Morpho-Syntactic Deponency

63.4.1. Bobaljik (2007) on Chukchi Antipassive

(433) Antipassive in Chukchi:

a. ?ańček-a kimit?-an ne-ųńetet-on youth-ERG load-ABS 3.SUBJ(TRANS)-carry-3.SG.OBJ

‘(The) young men carried away the load.’


‘(The) young men carried away the load.’

(434) Spurious Antipassive in Chukchi:

s-ăn yım Ø-ine-ńų-ýt he-ERG I(ABS) 3.SG.SUBJ(INTR)-AP-see-3.SG.SUBJ(INTR)

‘He saw me.’

Observation:

In certain marked combinations of external and internal argument (3.sg>1.sg, 2>1.sg, 2>1.pl), antipassive morphology is required even though the clause stays transitive (and the external argument bears ergative case).

Bobaljik’s (2007) Analysis:

• Distributed Morphology

• Object movement in transitive clauses, blocked in marked contexts.

• Regular antipassive: object also stays in situ.

• The two relevant contexts (spurious antipassive, antipassive) – share a property that sets them apart from standard transitive contexts.

• Morphological realization of v proceeds differently depending on whether object movement has applied or not: A marker like ine is inserted in v/Ø_OBJ contexts, whereas a zero marker Ø is inserted in bare v contexts after object movement.

• Thus, ine is not an antipassive marker; it realizes v v as it shows up in antipassive contexts as well as in certain well-defined transitive contexts; and the only thing that the two contexts have in common is that there is no object movement.

• There is no “spurious antipassive” because the morphological exponent does not mark antipassive in the first place; it marks v/Ø_OBJ.

63.4.2. Keine (2010) on IPP in German

(435) Infinitīvus pro participio (IPP):

a. *dass sie das Lied singen gewollt hat

that she the song sing-INF want-PART has

b. dass sie das Lied hat singen wollen

that she the song has sing-INF want-INF
165

166

(436) Absence of IPP:
   a. dass sie das gewollt hat
      that she that want-PART has
   b. *dass sie das hat wollen
      that she that has want-INF

Note:
The analysis also relies on post-syntactic insertion of exponents into functional heads:
   • The infinitive marker is the default exponent.
   • The past participle exponent is used if a verb is c-commanded by a perfect auxiliary ($v_{\text{perf}}$).
   • If verb movement has applied to a position outside of the c-command domain of $v_{\text{perf}}$, the context for participle morphology is not present anymore, and the default infinitive exponent is inserted.
   • The movement of the embedded verb is normally blocked; however, it is forced by a special filter with certain kinds of embedding verbs.

63.4.3. Grestenberger (2014) on Deponent Verbs in Hittite, Vedic Sanskrit, Latin, and Ancient Greek

Claim:
Deponent verbs in the older Indo-European languages are agentive transitive predicates. However, passive morphology is not per se incompatible with such a specification. Passive (or middle) morphology shows up whenever $v$ does not introduce an agent DP.

(437) Post-syntactic rules of morphological exponence:
   a. $v$ triggers non-active morphology if it does not have an agentive DP as its specifier.
   b. $v$ triggers active morphology if it has an agentive DP as its specifier.

Crucial assumption:
Deponent verbs, as a lexical property, project their agentive DP within VP already. Hence, there is an agent, the clause is transitive, but the context for morphological realization of active exponence is not present.

Conclusion:
Grestenberger’s approach belongs to the class of spurious morpho-syntactic deponency analyses because non-active morphological realization is tied to the abstract morpho-syntactic property of $v$ without DP specifier. (And it is this abstract property that characterizes regular passive/middle verbs and deponent active verbs as a natural class.)

63.5. Spurious Morphomic Deponency

Assumption:
“Active” inflection, “passive” inflection, etc. in Latin are pure form classes, without any syntactic interpretation as such; the relevant features governing morphological exponence are morphomic.

Other instances of morphomic analysis:
   • inflection class features (Aronoff (1994))
   • decomposed inflection class features (Alexiadou & Müller (2008), Trommer (2008), Müller (2007b))
   • decomposition of morpho-syntactic features for syncretism (Jakobson (1962b), Bierwisch (1967))
   • transcategorial decomposition of morphological features for syncretism (Wiese (1999), Trommer (2005b))
   • purely morphomic features for syncretism (Bonami & Boyé (2010))

A predecessor: Kiparsky (2005)
“These data [showing that verbs of any semantic type can be deponents in Latin, and showing that there are semi-deponents] suggest that passive inflection in Latin is a conjugational feature – we’ll call it $[\pm \text{Passive}]$ – which can be lexically specified, for verb stems as well as for inflectional endings, or left unspecified” (p. 121).

However: “[ $[\pm \text{Passive}]$ inflections] trigger one or more of the operations on the verb’s argument structure [...] forming passives, as well as possibly reflexives, reciprocals, and inchoatives, depending on further, partly idiosyncratic, properties of the verb” (p. 122).

An explicitly morphomic approach: Schulz (2010)

(438) Hippisley’s (2007) analysis of Latin deponent verbs:
   a. VERB
      (i) $<\text{syn}> == "<\text{mor}>"
      (ii) $<\text{mor active}> == \text{ACT-FORMS}::<>
      (iii) $<\text{mor passive}> == \text{PASS-FORMS}::<>
   b. DEPONENT
      (i) $<> == \text{VERB}$
      (ii) $<\text{mor active}> == \text{PASS-FORMS}::<>
      (iii) $<\text{mor active imperfective future infinitive}> == \text{VERB}$
      (iv) $<\text{mor passive}> == \text{undefined}$. (deponency)

ACT-FORMS, PASS-FORMS are morphmic; they define form classes and play no role in syntax. The system works in exactly the same way if one replaces ACT-FORMS, PASS-FORMS with FORM-CLASS 1, FORM-CLASS 2; or, indeed, with PASS-FORMS, ACT-FORMS, respectively.

63.6. Conclusion
1. There are some spurious morpho-syntactic deponency approaches. It is not clear whether a different syntactic context can plausibly be assumed in all attested cases of deponency.
2. There are surprisingly many spurious morphomic deponency approaches. These approaches work, but they complicate the syntax/morphology interface because the two
levels do not talk about the same kinds of features even though there is a tight interaction; this interaction must then be derived by stipulation in each case. Also, it is not quite clear where to stop (there must be features that are shared by morphology and syntax).

3. There are some property deponency approaches. In those cases where Stump argues that they are needed, they make radical assumptions necessary; e.g., a feature like [passive] cannot be mentioned by syntactic rules if passive deponency is derived in this way.

4. There are few form deponency approaches.

5. Deponency and syncretism are very similar. There is an optimality-theoretic approach to syncretism that relies on the use of “wrong” (i.e., unfaithful) morphological exponents. This approach can be generalized so as to cover deponency.

Strategy:
• Wrong forms are not a marginal phenomenon of grammar; they are everywhere.
• The ubiquity of grammatical wrong forms requires a model of grammar that envisages rule/constraint violability.
• Optimality Theory is such a model of grammar.

63.7. Deponency and Syncretism

Typology of morphological mismatches (Spencer (2007)):

- Syncretism (canonical):
  - Domain: within, Paradigm coverage: cell, Generality: class, Defectivity: no
- Deponency (canonical):
  - Domain: within, Paradigm coverage: slab, Generality: exception/subclass, Defectivity: yes

However:
“No logical possibility [with respect to the combination of variables] can be ruled out.”

A mixed pattern (Corbett (2007)):
The noun xexbi ("child(ren)") in Tsez is deponent because it has plural inflection in the singular, but it shares properties with both (canonical) syncretism and (canonical) deponency:

- no defectivity of the paradigm (syncretism)
- no loss of the original function (syncretism)
- slabs as relevant domains (deponency)
- generalizes across cells, not lexemes (deponency)

Coding of xexbi in Spencer (2007):

- Domain: within, Paradigm coverage: slab, Generality: exception, Defectivity: no

64. An Optimality-Theoretic Approach to Syncretism

64.1. Determiner Inflection in German

<table>
<thead>
<tr>
<th>dies</th>
<th>NOMINATIVE</th>
<th>ACCUSATIVE</th>
<th>DATIV</th>
<th>GENITIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘this’</td>
<td>er</td>
<td>en</td>
<td>cm</td>
<td>es</td>
</tr>
</tbody>
</table>

Standard analysis:
Syncretism is derived via (a) feature decomposition yielding natural classes of instantiations of grammatical categories; and (b) underspecification of morphological exponents with respect to these features. Among the (underspecified) exponents that realize a subset of the fully specified features characterizing the paradigm cell, the most specific one is chosen.


64.2. A Standard Underspecification-Based Approach

Feature Decomposition (Bierwisch (1967), Wiese (1999)):

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MASC: [+masc,+,fem]</td>
<td>FEM: [+masc,+,fem]</td>
<td>NEUT: [+masc,+,fem]</td>
<td>PL: [+masc,+,fem]</td>
</tr>
</tbody>
</table>

(443) Feature hierarchy for specificity:

- [+masc] > [+obl] > [+fem] > [+gov].

64.3. The Approach to Syncretism in Müller (2011)

1. There is no underspecification of exponents.

2. Not all members of a paradigm (exponents) are present in the input; only leadings forms are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Albright (2008), and Baerman (2009) on somewhat related concepts).
3. A mismatch of paradigm cells and leading forms gives rise to syncretism: Initial gaps are filled by using "wrong", i.e., unfaithful exponents (Weisser (2007)).

4. Mismatches between the exponent's specification and the target specification are minimized; this is not accomplished by a single Minimality condition (cf. the Nearest Neighbour Principle in Weisser (2007, 26), or the Minimality principle in Lahne (2007a, 11)), but by a set of ranked faithfulness constraints for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004); however, these authors all crucially rely on underspecification).

5. Feature decomposition yielding natural classes is needed exactly as before.

6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a rule of referral (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

64.4. Leading Forms

(445) **Determiner inflection in German**

<table>
<thead>
<tr>
<th>dies 'this'</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOMINATIVE</td>
<td>r</td>
<td>s</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>ACCUSATIVE</td>
<td>n</td>
<td>s</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>DATIVE</td>
<td>m</td>
<td>m</td>
<td>r</td>
<td>n</td>
</tr>
<tr>
<td>GENITIVE</td>
<td>s</td>
<td>s</td>
<td>r</td>
<td>r</td>
</tr>
</tbody>
</table>

(446) **Nine leading forms:**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>/r/1</td>
<td>+masc,+fem,+gov,+obl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/n/2</td>
<td>+masc,+fem,+gov,+obl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/m/4</td>
<td>+masc,+fem,+gov,+obl</td>
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<td></td>
</tr>
<tr>
<td>/s/5</td>
<td>+masc,+fem,+gov,+obl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>/o/6</td>
<td>+masc,+fem,+gov,+obl</td>
<td></td>
<td></td>
</tr>
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<td>+masc,+fem,+gov,+obl</td>
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<td>/r/8</td>
<td>+masc,+fem,+gov,+obl</td>
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<tr>
<td>/r/9</td>
<td>+masc,+fem,+gov,+obl</td>
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</tbody>
</table>

64.5. Optimality-Theoretic Constraints

(447) **MATCH** (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(448) **Faithfulness constraints for features on exponents**

a. **IDENTMASC:**

   [±masc] of the input must not be changed in the output on an exponent.

b. **IDENTOBL:**

   [±obl] of the input must not be changed in the output on an exponent.

c. **IDENTFEM:**

   [±fem] of the input must not be changed in the output on an exponent.

d. **IDENTGOV:**

   [±gov] of the input must not be changed in the output on an exponent.

64.6. **Incomplete Paradigms**

(450) **Incomplete paradigm with leading forms only**

<table>
<thead>
<tr>
<th>dies 'this'</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
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<td>/r/1</td>
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<td>/s/4</td>
<td>/s/4</td>
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</table>

64.7. Sample Paradigms

Tableau T

<table>
<thead>
<tr>
<th>dies 'this'</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
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<tr>
<td>/masc,+fem,+gov,+obl</td>
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</tbody>
</table>

Note:

EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1991)).

64.8. Spreading

(451) **Complete paradigm with spreading of leading forms**

<table>
<thead>
<tr>
<th>dies 'this'</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>/gov,+obl</td>
<td>/m/3</td>
<td>/m/3</td>
<td>/m/3</td>
<td></td>
</tr>
<tr>
<td>/gov,+obl</td>
<td>/s/4</td>
<td>/s/4</td>
<td>/s/4</td>
<td></td>
</tr>
</tbody>
</table>

Note:

EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1991)).
64.9. Restrictiveness of the Approach

As it stands, the approach does not derive elsewhere distributions.

(452) a. Leading forms

\[
\begin{array}{c|c|c}
\text{Exp} & \text{Masc} & \text{Fem} \\
\hline
\text{O_1: dies} & + & + \\
\text{O_2: dies} & + & + \\
\text{O_3: dies} & + & + \\
\text{O_4: dies} & + & + \\
\text{O_5: dies} & + & + \\
\text{O_6: dies} & + & + \\
\text{O_7: dies} & + & + \\
\text{O_8: dies} & + & + \\
\text{O_9: dies} & + & + \\
\text{O_{10}: dies} & + & +
\end{array}
\]

b. Intended spreading

\[
\begin{array}{c|c|c}
\text{Exp} & \text{Masc} & \text{Fem} \\
\hline
\text{O_1: dies} & + & + \\
\text{O_2: dies} & + & + \\
\text{O_3: dies} & + & + \\
\text{O_4: dies} & + & + \\
\text{O_5: dies} & + & + \\
\text{O_6: dies} & + & + \\
\text{O_7: dies} & + & + \\
\text{O_8: dies} & + & + \\
\text{O_9: dies} & + & + \\
\text{O_{10}: dies} & + & +
\end{array}
\]

Multidirectional spreading.

It seems that in order to derive something like (452-b), contextual faithfulness is needed in the absence of radically underspecified elsewhere markers.

Note:

A learning algorithm for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the “No-Homonymy Learner” and the “Elsewhere Learner”).

65. An Optimality-Theoretic Approach to Deponency

65.1. General Features of the OT Approach to Deponency

1. As with the optimality-theoretic approach to syncretism sketched above, an unfaithful (leading) exponent emerges as optimal.

2. However, the trigger is not an initial paradigmatic gap (absence of a leading form) but a lexical specification on the stem (a feature co-occurrence restriction (FCR), see Gazdar et al. (1985)) that expresses an incompatibility with the regular exponent’s morphosyntactic features.

3. The fewer features the FCR excludes, the more cells will be affected by the deponency.

4. The more stems the FCR applies to, the more general the deponency pattern will be.

5. As with many other approaches to deponency (e.g., Embick (2000), Kiparsky (2005), Bobaljik (2007), Hippisley (2007), Schulz (2010)), defectivity does not automatically follow as a general property of deponency. It is logically independent and where it holds, it must be derived by some additional means.

6. The analysis predicts that unfaithful exponents chosen in cases of deponency are not arbitrary (as is the case, e.g., with the Network Morphology analyses developed in Hippisley (2007) for Latin deponent verbs and Archi deponent nouns, and in Brown (2006) for spurious antipassive in Chukchi, verbal case on nouns in Kayardild, and polarity effects with telic and atelic verb stems in Tullalabalab; or with the Paradigm Function Morphology analyses in Sadler & Spencer (2001), Stump (2006)). Rather, the unfaithful exponents must differ minimally from the regularly expected exponent.

65.2. Deponent Nouns in Archi

Partial paradigm of some regular nouns in Archi

<table>
<thead>
<tr>
<th></th>
<th>ašlāš ('apple')</th>
<th>qlin ('bridge')</th>
<th>ašyum ('sickle')</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>ašlāš-Ø</td>
<td>qlin-Ø</td>
<td>ašyum-Ø</td>
</tr>
<tr>
<td>PL</td>
<td>ašlāš-um</td>
<td>qlin-qom-ør</td>
<td>ašyum-Ø</td>
</tr>
<tr>
<td>ABS</td>
<td></td>
<td>qom-qom-ør-čaj</td>
<td>ašyum-li</td>
</tr>
<tr>
<td>ERG</td>
<td>ašlāš-li</td>
<td>ašlāš-um-čaj</td>
<td>ašyum-mul-čaj</td>
</tr>
<tr>
<td>GEN</td>
<td>ašlāš-li-n</td>
<td>ašlāš-um-čej-n</td>
<td>ašyum-li-n</td>
</tr>
<tr>
<td>DAT</td>
<td>ašlāš-li-s</td>
<td>ašlāš-um-čes-s</td>
<td>ašyum-li-s</td>
</tr>
<tr>
<td>COMIT</td>
<td>ašlāš-li-tu</td>
<td>ašlāš-um-če-tu</td>
<td>ašyum-li-tu</td>
</tr>
</tbody>
</table>

Note:
The system involves (i) parasitic (Priscianic) formation, where oblique case forms are derived from the ERG form; and (ii) extended exponent: /li/ is an ergative singular exponent; /čaj/ is an ergative plural exponent; and /um/ /or/ /mul/ are plural exponents sensitive to noun class.

Partial paradigm of deponent nouns with plural markers in singular contexts

<table>
<thead>
<tr>
<th></th>
<th>haYtora (‘river’)</th>
<th>čaj (‘female goat’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td>haYtora-Ø</td>
<td>čaj-Ø</td>
</tr>
<tr>
<td>PL</td>
<td>haYtora-mul</td>
<td>čaj-čohor-Ø</td>
</tr>
<tr>
<td>ABS</td>
<td>haYtora-Ø</td>
<td>čaj-čaj</td>
</tr>
<tr>
<td>ERG</td>
<td>haYtora-čaj</td>
<td>čaj-čaj</td>
</tr>
</tbody>
</table>

Note:
Choice of čaj vs. čaj is determined by consonant-final vs. vowel-final roots.

Partial paradigm of the deponent (and suppletive) noun ‘xTon’ with singular markers in plural contexts

<table>
<thead>
<tr>
<th></th>
<th>xTon (‘cow’)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG</td>
<td></td>
</tr>
<tr>
<td>PL</td>
<td>xTon-Ø</td>
</tr>
<tr>
<td>ABS</td>
<td>xTon-Ø</td>
</tr>
<tr>
<td>ERG</td>
<td>xTon-i-</td>
</tr>
</tbody>
</table>

65.2.1. Optimality-Theoretic Analysis of Deponent Nouns in Archi

a. Case numbers features:

<table>
<thead>
<tr>
<th></th>
<th>[+obl]</th>
<th>[-pl]</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERG</td>
<td>[+obl]</td>
<td></td>
</tr>
<tr>
<td>DAT</td>
<td>[+obl, +gov]</td>
<td></td>
</tr>
</tbody>
</table>

MATCH (undominated, possibly part of GEN):

The morpho-syntactic features of stem and exponent are identical in the output.

LEX (undominated, possibly part of GEN):

A stem with FCR *[α] cannot be combined with an exponent bearing *[α] in the input (where α is a – possibly singleton – set of morpho-syntactic features).

Reference to inputs:
LEX refers to the input properties of an exponent, not to its output properties (which may have been changed, triggered by MATCH). See Trommer (2006a), Stoppel (2010) for this kind of reference to inputs in optimality-theoretic constraints. One way to implement this would be to assume that LEX applies to structure-building directly (in which case candidates violating it would not be part of the competition).

Faithfulness constraints for features on exponents

<table>
<thead>
<tr>
<th></th>
<th>LEX</th>
<th>MATCH</th>
<th>IDENT OBL</th>
<th>IDENT NUM</th>
</tr>
</thead>
</table>

65.2.2. Sample Optimizations

Tableau T29: Erg.Pl., faithful winner

<table>
<thead>
<tr>
<th>Input: haYtara-mul ↔ [+obl +pl], Exp</th>
<th>LEX</th>
<th>MATCH</th>
<th>IDENT OBL</th>
<th>IDENT NUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁: haYtara-mul-li ↔ I: [+obl, +pl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₂: haYtara-mul-Ø ↔ I: [+obl, +pl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₃: haYtara-mul-čaj ↔ I: [+obl, +pl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
Strictly speaking, there are two EXP morphemes associated with the stem in the plural; but class-dependent optimization of the first EXP (yielding plural marker mul) is orthogonal to the deponency issue, and hence omitted here. (Similarly for further oblique case markers.)

Tableau T30: Erg.Sg., unfaithful winner

<table>
<thead>
<tr>
<th>Input: haYtara ↔ [+obl +pl], Exp</th>
<th>LEX</th>
<th>MATCH</th>
<th>IDENT OBL</th>
<th>IDENT NUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₁: haYtara-li ↔ I: [+obl, +pl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₂: haYtara-Ø ↔ I: [+obl, +pl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₃: haYtara-čaj ↔ I: [+obl, +pl]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
No attempt is made here to account for stem selection/suppletion. As with multiple EXP optimization, this issue is orthogonal to the deponency issue.
Tableau T₃₁: Erg.Sg., faithful winner

| Input: x'on- ↔ [+obl.,pl], Exp  
<p>|</p>
<table>
<thead>
<tr>
<th><strong>LEX</strong></th>
<th><strong>MATCH</strong></th>
<th><strong>IDENT</strong></th>
<th><strong>IDENT</strong></th>
</tr>
</thead>
</table>
| O₁: x'On-i ↔ I: [obl., pl]  
| O₂: x'On-O ↔ I: [obl., pl]  
| O₃: x'On-čaj ↔ I: [obl., pl]  
| ☞ ☞ ☞ |

Tableau T₃₂: Erg.Pl., unfaithful winner

| Input: buc:′ ↔ [+obl.,pl], Exp  
<p>|</p>
<table>
<thead>
<tr>
<th><strong>LEX</strong></th>
<th><strong>MATCH</strong></th>
<th><strong>IDENT</strong></th>
<th><strong>IDENT</strong></th>
</tr>
</thead>
</table>
| O₁: buc:′ i-li ↔ I: [obl, –pl]  
| O₂: buc:′ i-Ø ↔ I: [–obl, –pl]  
| O₃: buc:′ i-čaj ↔ I: [obl, pl]  
| ☞ ☞ ☞ |

Note:
The genitive 1 marker /-s/ would strictly speaking have to enter the optimal output form by (trivial) optimization; as before, the issue is irrelevant for questions of deponency.

65.3. Deponent Nouns in Tsez

Refs.: Corbett (2007), Spencer (2007)

(460) Partial paradigm of regular noun besuro (‘fish’)

<table>
<thead>
<tr>
<th>SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>besuro-Ø besuro-bi</td>
</tr>
<tr>
<td>GEN 1</td>
<td>besuro-Ø-s besuro-za-s</td>
</tr>
<tr>
<td>INES/HERG</td>
<td>besur-Ø-¯a besur-z-¯a</td>
</tr>
</tbody>
</table>

(461) Partial paradigm of deponent noun xexbi (‘child(ren)’)

<table>
<thead>
<tr>
<th>SG</th>
<th>PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>xex-bi xex-bi</td>
</tr>
<tr>
<td>GEN 1</td>
<td>xex-za-s xex-za-s</td>
</tr>
<tr>
<td>INES/HERG</td>
<td>xex-z-¯a xex-z-¯a</td>
</tr>
</tbody>
</table>

Assumption:
/bi/ is a plural exponent, /Ø/ is a singular exponent, /za/ is an oblique plural exponent, /s/ and /¯a/ are pure oblique case exponents.

An interesting consequence:
Even in simple absolutive singular noun forms like besuro-Ø, (‘fish’), there must be a number position (Exp) that needs to be filled by some marker (which then must regularly be Ø) under present assumptions. Otherwise, there would be no motivation for the system to provide an unfaithful plural marker in singular contexts.

Tableau T₃₃: Abs.Sg., unfaithful winner

| Input: xex- ↔ [+obl.,pl], Exp  
<p>|</p>
<table>
<thead>
<tr>
<th><strong>LEX</strong></th>
<th><strong>MATCH</strong></th>
<th><strong>IDENT</strong></th>
<th><strong>IDENT</strong></th>
</tr>
</thead>
</table>
| O₁: xex-Ø ↔ I: [obl., pl]  
| O₂: xex-bi ↔ I: [obl., pl]  
| ☞ ☞ ☞ |

Tableau T₃₄: Gen1.Sg., unfaithful winner

| Input: xex- ↔ [+obl.,pl], Exp  
<p>|</p>
<table>
<thead>
<tr>
<th><strong>LEX</strong></th>
<th><strong>MATCH</strong></th>
<th><strong>IDENT</strong></th>
<th><strong>IDENT</strong></th>
</tr>
</thead>
</table>
| O₁: xex-Ø-s ↔ I: [obl., pl]  
| O₂: xex-za-s ↔ I: [obl., pl]  
| ☞ ☞ ☞ |

65.4. Deponent Stems in Tübatulabal

Refs.: Baerman (2007), Brown (2006), and references cited there.

Observation:
Tübatulabal (Uto-Aztecan) exhibits a polarity effect in deponency. There is stem alternation via reduplication with telic vs. atelic verbs. Normally, the telic stem is generated by reduplication on the basis of the atelic stem; however, there are some thirty verbs where the telic stem is in fact the basis, and the atelic stem is formed by reduplication.

(462) Regular verbs:  (463) Polar verbs:

<table>
<thead>
<tr>
<th>atelic</th>
<th>telic</th>
</tr>
</thead>
<tbody>
<tr>
<td>ela-</td>
<td>e'ela-</td>
</tr>
<tr>
<td>tik-</td>
<td>itik</td>
</tr>
<tr>
<td>tana-</td>
<td>andana-</td>
</tr>
</tbody>
</table>

Assumption:
There are two exponents; /Ø/ ↔ [–telic]; /RED/ ↔ [+telic].

Problem:
telic

on deponent V will produce a reduplicated stem for atelic contexts, but not yet a simple stem for telic contexts; similarly, *[+telic] on deponent V will produce a simple stem for telic contexts, but not yet a reduplicated stem for atelic contexts.

Assumption:
There are variables over feature values (α notation, Chomsky & Halle (1968)): A [+telic] stem cannot combine with an exponent that is [–telic] in the input; a [–telic] stem cannot combine with an exponent that is [+telic].
Lexical entries for regular and deponent verbs:

a. ela- ↔ [telic]
b. naq- ↔ [telic]
[*telic]

Note:
α is realized as + or – as soon as the verb is taken out of the lexicon and enters grammar.

Tableau T35: deponent verb, atelic; unfaithful winner

<table>
<thead>
<tr>
<th>Input: EXP, naq- ↔ [-telic]</th>
<th>LEX MATCH IDENT Tel</th>
</tr>
</thead>
<tbody>
<tr>
<td>*[-telic]</td>
<td></td>
</tr>
<tr>
<td>Oₙ: Ø-naq- ↔ I: [-telic]</td>
<td>*!</td>
</tr>
<tr>
<td>O: [-telic]</td>
<td></td>
</tr>
</tbody>
</table>

Tableau T36: deponent verb, telic; unfaithful winner

<table>
<thead>
<tr>
<th>Input: EXP, naq- ↔ [+telic]</th>
<th>LEX MATCH IDENT Tel</th>
</tr>
</thead>
<tbody>
<tr>
<td>* [+telic]</td>
<td></td>
</tr>
<tr>
<td>Oₙ: Ø-naq- ↔ I: [-telic]</td>
<td>*</td>
</tr>
<tr>
<td>O: [-telic]</td>
<td></td>
</tr>
<tr>
<td>O₂: RED-naq- ↔ I: [+telic]</td>
<td>*!</td>
</tr>
<tr>
<td>O: [+telic]</td>
<td></td>
</tr>
</tbody>
</table>

Tableau T37: regular verb, telic; faithful winner

<table>
<thead>
<tr>
<th>Input: EXP, ela- ↔ [+telic]</th>
<th>LEX MATCH IDENT Tel</th>
</tr>
</thead>
<tbody>
<tr>
<td>* [+telic]</td>
<td></td>
</tr>
<tr>
<td>Oₙ: Ø-naq- ↔ I: [-telic]</td>
<td>*!</td>
</tr>
<tr>
<td>O: [-telic]</td>
<td></td>
</tr>
<tr>
<td>O₂: RED-naq- ↔ I: [+telic]</td>
<td></td>
</tr>
<tr>
<td>O: [+telic]</td>
<td></td>
</tr>
</tbody>
</table>

In the same way, the Ø-prefixed stem wins in atelic contexts with regular verbs.

65.5. Spurious Antipassive in Chukchi

(465) **Spurious Antipassive in Chukchi:**

ο-ναν γιάν Ο-ινε-μ�υ-γι
he-ERG I(ABS) 3.SG.SUBJ(INTR)-AP-see-3.SG.SUBJ(INTR)

‘He saw me.’

Observation:
In certain marked combinations of external and internal argument (3.sg>1.sg, 2>1.sg, 2>1.pl),
antipassive morphology is required even though the the clause stays transitive (and the ex-
ternal argument bears ergative case).

(466) Sketch of an analysis:

a. /Ø/ ↔ [-apass]
b. /ine/ ↔ [+apass]
c. /α/ [+V]:

[3.sg.>1.sg.>apass]
[2>1.sg.-apass]
[2>1.pl.-apass]

Violated faithfulness constraint in optimal deponent outputs: IDENTAPASS

65.6. Deponent Verbs in Latin

Deponent Verbs in Latin

(467) Deponent verbs:
/α/ [+V,+dep]:
[–pass]

(468) Semi-deponent verbs:
/α/ [+V,+dep]:
[–pass,+perf]

Violated faithfulness constraint in optimal deponent outputs: IDENTPASS.

Note:
This does not yet derive defectivity. This can be handled by output/output constraints.
XIII. Optimality Theory 6: Harmonic Serialism & Extended Exponence

66. Background

- **Harmonic serialism in phonology:**
  McCarthy (2008; 2010), McCarthy et al. (2012), Kimper (2012), Pater (2012), ...
  (also see Prince & Smolensky (1993; 2004) for the general option, and McCarthy (2000)
  for an early negative assessment)

- **Harmonic serialism in syntax:**

- **Harmonic serialism in morphology:**

  □

*Claim:*
Extended exponence provides an empirical domain in which an approach in terms of harmonic
serialism suggests itself.

67. Extended Exponence

*Origin* (Matthews (1972b, 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).

**Empirical domain:**
Interaction of argument encoding and number/person marking in:

- German  
  (case-marking on nouns, number marking)
- Archi  
  (case-marking on nouns, number marking)
- Timucua  
  (agreement morphology on verbs, person marking)
- Sierra Popoluca  
  (agreement morphology on verbs, person marking)
- Swahili  
  (negation and verb inflection)

67.1. German

*Observation:*
Plural can be marked twice on nouns in dative (DAT) contexts in German (Eisenberg (2000),
Wiese (2000)). Note: n must be a DAT plural marker rather than a simple DAT marker because
it does not show up in the singular.

(469) **Extended exponence in German nouns:**

a. Kind-er-n  
  child-PL-DAT.PL
b. *Kind-n  
  child.SG-DAT.PL

67.2. Archi

*Observation:*
The same phenomenon exists in the Daghastanian language Archi (Kibrik (1991; 2003),
Melčuk (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 *um* and the ERG plural marker *čaj* (in that order); for a stem like *qIinn* (‘bridge’), the
ERG plural is derived by adding the plural marker *or* and, again, the ERG plural marker *čaj*;
see (470-ac). As before, it is clear that *čaj* must be a marker of both case (ERG) and number
(plural): This marker cannot be used in the singular, where the case markers *i, i* are used for
marking ERG instead.

(470) **Extended exponence in Archi nouns:**

a. gel-um-čaj  
  cup-PL-ERG.PL
b. gel-li  
  cup.SG-ERG

c. qIinn-or-čaj  
  bridge-PL-ERG.PL
d. *qIinn-i  
  bridge.SG-ERG

67.3. Timucua

*Observation:*
A similar phenomenon can be found in the domain of verb inflection in Timucua, an extinct
language isolate from Florida (Mithun (1999, 520); 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 (NOM-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., Bobaljik & Wurmband (2003)).)

(471) **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.
   c. A NOM prefix precedes a 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, 86))
      (ii) a 2.NOM marker ci-
      (iii) a zero 3.NOM marker Ø-.

(472) **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
Extended exponence in Timucua verbs:

a. bo-ini-ta-la
   1.NOM-be-ASP-LOC
   ‘I am.’

b. ni-huba-so-si-ho-te-la
   1.NOM-love-TR-REC-1/2.NOM.PL-ASP-LOC
   ‘We love each other.’

c. ci-hubu-so-te-le
   2.NOM-love-TR-ASP-LOC
   ‘You love (someone).’

d. ci-huba-so-te-le
   2.NOM-love-TR-1/2.NOM.PL-ASP-LOC
   ‘You love (someone).’

e. ano Ø-hewa-na-no
   man 3.NOM-speak-ASP-LOC
   ‘The man is speaking.’

f. Ø-ini-ma-bi-la
   man 3.NOM-speak-ASP-LOC
   ‘They are just now.’

Note:

- (473-ace) involve singular subjects (1., 2., 3. person), with a prefix encoding person and case.
- (473-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/ta, le/la are variants.)

67.4. Sierra Popoluca

Observation:

Sierra Popoluca (Mixe-Zoque, Mexico) employs a head-marking system of argument 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.

Extended exponence in Sierra Popoluca verbs, intransitive contexts:

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

b. A-pišši
   1.ABS-man
   ‘I am a man.’

c. Ta-hozy-pa
   1.INCL.ABS-take.a.walk-INC
   ‘You and I take a walk.’

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 (477), via subanalysis based on a decomposition of person features as in (478). 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] (Müller (2006b)). If so, there is extended exponence of [+1] in Sierra Popoluca.

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.

67.5. Swahili

Observation (Stump (2001, 162-163)):

Noyer’s concept of secondary exponence [see below] 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.
Extended exponence exists in the argument encoding systems of German, Archi, Timucua, and Sierra Popoluca, and with negative verb inflection in Swahili.

Note:
That said, there are several cases where extended exponence has been argued to show up that may not be fully convincing upon closer inspection. For instance, Matthews (1974) argues for extended exponence 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. *Buch-er* (‘books’). However, this evidence for extended exponence loses its force if we assume that Umlaut is encoded on plural markers as an abstract (‘floating’) feature; cf., e.g., Wiese (1996). Similar conclusions may be drawn in the case of deverbal noun formation in Kujamaat Jóola discussed in Aronoff & Fudeman (2005, 154), where a class marker change is accompanied by vowel tensing.

Question:
How do current theories of morphology deal with extended exponence?

State of the art:

1. **Lexical-incremental approaches** (e.g., Wunderlich (1996)):
   - Extended exponence is prima facie unexpected.
   - Possible solution (Stiebels (2015)): A second exponent of a given feature must primarily contribute another feature; in addition, reference to secondary contextual features is needed.

2. **Inferential-realizational approaches** (e.g., Matthews (1972b), Anderson (1992), Aronoff (1994), Stump (2001)):
   - Extended exponence is expected.

3. **Lexical-realizational approaches** (e.g., Halle & Marantz (1993), Noyer (1992), but also most of the morphematic optimality-theoretic approaches discussed in handout 8 on morphematic optimality-theoretic approaches: Grimshaw (2001), Don & Blom (2006), Trommer (2001; 2003; 2006a)): 
   - An exponent realizes one syntactic position (standard assumption, disjunctive ordering).
   - Extended exponence is prima facie unexpected. → Reference to secondary contextual features is needed.
   - An exponent discharges a feature that it realizes (Noyer (1992), Trommer (1999b)): 
     - Extended exponence is prima facie unexpected → References to secondary discharged features is needed.
   - Müller (2007a): Reference to secondary (contextual, discharged) features can be dispensed with if post-syntactic enrichment rules are postulated that copy features before realization, and that act as the counterpart of impoverishment rules.

**Observation:**
The enrichment approach in Müller (2007a) is compatible with the existence of multiple exponents with an identical feature specification. Abstracting away from cases of form replication (i.e., multiple occurrence of the same exponents), this does not seem to occur. Caballero & Harris (2012) give a single example from Nahua that is supposed to exhibit “fully superfluous multiple exponence” but this may well be misanalyzed. (It is claimed that there can be two causative suffixes in some cases, *l* and *tia*, that correspond to only one instance of causativization; however, there no evidence for the independent availability of *l* as a causative marker, and synchronically the *l*-version might simply be an optional part of the causative exponent *tia*.)

**Generalization:**
Extended exponence is possible only when the morpho-syntactic features of two exponents are not identical (Stiebels (2015)); they can then (a) be in a subset relation (“partially superfluous multiple exponence”, in the terminology of Caballero & Harris (2012), as in all the examples discussed here), or (b) not be in a subset relation (“overlapping multiple exponence”, Caballero & Harris (2012)).

**Problem:**
It is not a priori clear how can this generalization be derived in a (morphematic) optimality-theoretic approach (of the type discussed in lecture 8 (Optimality Theory I. Morphematic Approaches)), given that an exponent whose morpho-syntactic features are a subset of the morpho-syntactic features of another exponent should be blocked as redundant. (In contrast, overlapping exponence is unproblematic from an OT perspective.)

**Claim:**
This only holds for classical, parallel optimality theory, not for serial optimality theory.
69. Extended Exponent in Harmonic Serialism

69.1 Assumptions

(485) Harmonic serialism (McCarthy (2010), Heck & Müller (2007)):

a. Given some input I, the candidate set CS_i = \{O_{i1}, O_{i2}, ..., O_{im}\} is generated by applying at most one operation to I_i.

b. The output O_{ij} with the best constraint profile is selected as optimal.

c. O_{ij} forms the input I_{i+1} for the next generation step producing a new candidate set CS_{i+1} = \{O_{i1}, O_{i2}, ..., O_{ijn}\}.

d. The output O_{ijn} with the best constraint profile is selected as optimal.

e. Candidate set generation stops (i.e., the derivation converges) when the output of an optimization procedure is identical to the input (i.e., when the constraint profile cannot be improved anymore).

(486) Assumptions about morphology (simplified):

a. The initial input is a stem plus a fully specified set of morpho-syntactic features that are realized by exponents which themselves can be underspecified.

b. The optimal exponent for some feature(s) is determined by a ranked set of faithfulness constraints (deriving compatibility and specificity requirements) and other (e.g., markedness) constraints (Grimshaw (2001), Don & Blom (2006), Trommer (2001; 2003; 2006a), Wunderlich (2004), Stiebels (2006)).

c. An exponent realizing the morpho-syntactic feature of a stem by attaching to it discharges the corresponding feature of the stem (Noyer (1992), Trommer (1999b)); a discharged feature remains visible and can be realized again, but cannot be discharged again: [F] \rightarrow [\overline{F}].

69.2 Case study: Archi

(487) Extended exponence in Archi nouns:

a. gel-un-čaj

b. gel-li

(Archi)

c. qIinn-or-čaj

d. qIinn-i

bridge-PL-ERG.PL

cup-ERG

cup-ERG

bridge-ERG

Note:

Oblique case forms are generated on the basis of the ergative form: parasitic (Priscianian) formations (Matthews (1972b); Mel’čuk (1999, 8)). These forms are unproblematic if case features are also decomposed (see Bierwisch (1967), Franks (1995), Wiese (1999); and Kibrik (2003, 60-61) for an approach along these lines).

(488) Exponents:

a. /-um/ \leftrightarrow [+pl, I]

b. /-or/ \leftrightarrow [+pl, II]

c. /-čaj/ \leftrightarrow [+pl, +erg]

d. /i/ \leftrightarrow [+pl, +erg]

Note:

I, II are inflection class features; these features are morphomic (Aronoff (1994)) rather than morpho-syntactic; they play no role whatsoever in syntax. Consequently, the cases of extended exponence in (487) involve subset relations (i.e., “partially superfluous” exponence).

(489) Faithfulness constraints:

a. IDENT_NOM:

A number feature [F] on a stem is realized by an exponent with an identical feature.

b. IDENT_CASE:

A case feature [F] on a stem is realized by an exponent with an identical feature.

(490) Other constraints:

a. MIN_DIS (‘Minimize Discharge’):

An operation does not discharge more than one feature.

b. UNIQUE_REAL (‘Uniqueness of Realization’):

A morpho-syntactic feature associated with a stem cannot be realized by more than one exponent.

c. ~CON (‘No Contradiction’):

Stem and exponent must not bear contradictory features.

Remarks:

(i) (490-a) basically demands agglutination and blocks portmanteau morphemes. (Also cf. Don & Blom (2006) on *COMPLEX, discussed in lecture 8.)

(ii) (490-b) prohibits extended exponence.

(iii) (490-c) primarily ensures that stem and exponent do not bear contradictory inflection class features. This should not be formulated as an IDENT constraint because it would otherwise be violated in all those cases where inflection class does not play any role (e.g., in the singular in Archi) – morphomic inflection class features inherent to a stem are never

<table>
<thead>
<tr>
<th>sg</th>
<th>pl</th>
</tr>
</thead>
<tbody>
<tr>
<td>absolutive</td>
<td>gel</td>
</tr>
<tr>
<td>genitive</td>
<td>gel-li</td>
</tr>
<tr>
<td>dative</td>
<td>gel-li</td>
</tr>
<tr>
<td>comparative</td>
<td>gel-li-Xur</td>
</tr>
<tr>
<td>permutative</td>
<td>gel-li-L'ana</td>
</tr>
<tr>
<td>qIinn (Brücke)</td>
<td>qIinn-Ø</td>
</tr>
</tbody>
</table>

...
discharged. In addition, \( -\text{Con} \) ensures that O\(_{115} \) in T\(_2 \) below does not accidentally block O\(_{115} \) (Fabian Heck (p.c.)). \( -\text{Con} \) is similar to MATCH as discussed in lectures 11 & 12, but MATCH requires identity of all the features of stem and exponent, whereas \( -\text{Con} \) only requires compatibility.

69.3. A Harmonic Serialism Analysis

(491) Ranking in Archi:
\[ -\text{Con} \gg \text{IDENTNum} \gg \text{MinDis} \gg \text{IDENTCase} \gg \text{UniqReal} \]

T\(_{38} \): Deriving gel-um-čaj, Step 1: Plural marking

<table>
<thead>
<tr>
<th></th>
<th>I(_{11} ) / gel_[-pl,+erg]/</th>
<th>-Con</th>
<th>IdentNum</th>
<th>MinDis</th>
<th>IdentCase</th>
<th>UniqReal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_{11} )</td>
<td>gel_[-pl,+erg]_um_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{12} )</td>
<td>gel_[-pl,+erg]_or_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{13} )</td>
<td>gel_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{14} )</td>
<td>gel_[-pl,+erg]_i_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{15} )</td>
<td>gel_[-pl,+erg]_čaj_[-pl,+erg]/</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T\(_{39} \): Deriving gel-um-čaj, Step 2: Extended exponence

<table>
<thead>
<tr>
<th></th>
<th>I(_{11} ) / gel_[-pl,+erg]/_um_[-pl,l]</th>
<th>-Con</th>
<th>IdentNum</th>
<th>MinDis</th>
<th>IdentCase</th>
<th>UniqReal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_{11} )</td>
<td>gel_[-pl,+erg]_um_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{12} )</td>
<td>gel_[-pl,+erg]_or_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{13} )</td>
<td>gel_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{14} )</td>
<td>gel_[-pl,+erg]_i_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{15} )</td>
<td>gel_[-pl,+erg]_čaj_[-pl,+erg]/</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T\(_{40} \): Deriving gel-um-čaj, Step 3: Convergence

<table>
<thead>
<tr>
<th></th>
<th>I(_{11} ) / gel_ [-pl,+erg]/_um_[-pl,l] _čaj_[-pl,+erg]/</th>
<th>-Con</th>
<th>IdentNum</th>
<th>MinDis</th>
<th>IdentCase</th>
<th>UniqReal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_{11} )</td>
<td>gel_ [-pl,+erg]/_um_[-pl,l] _čaj_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{12} )</td>
<td>gel_ [-pl,+erg]/_or_[-pl,l] _čaj_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{13} )</td>
<td>gel_ [-pl,+erg]/          _čaj_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{14} )</td>
<td>gel_ [-pl,+erg]_i_[-pl,+erg]/ _čaj_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{15} )</td>
<td>gel_ [-pl,+erg]/_čaj_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Note:

- T\(_3 \) illustrates how extended exponence can become optimal. The second realization of \([-pl] \) by /čaj/ does not violate \text{MinDis} because \([+pl] \) already has been discharged in the prior optimization step.
- The way in which the competition is resolved in T\(_3 \) accounts for the absence of fully superfluous multiple exponence in the world’s languages.
- Outputs with exponents bearing the wrong inflection class information are harmonically bounded.

(492) Further rankings:

a. \( -\text{Con} \gg \text{IDENTNum} \gg \text{IDENTCase} \gg \text{MinDis} \gg \text{UniqReal} \):

\( \Rightarrow \text{gel-čaj} \rightarrow \) no extended exponence

b. \( -\text{Con} \gg \text{IDENTNum} \gg \text{MinDis} \gg \text{UniqReal} \gg \text{IDENTCase} \):

\( \Rightarrow \text{gel-um} \rightarrow \) no extended exponence

69.4. Global Optimization

Note:

Ceteris paribus, global, parallel optimization as it is standardly assumed will always be incompatible with extended exponence, under any ranking. (In \text{MinDis}, “operation” stands for “input-output mapping”.)

T\(_{44} \): Global optimization: wrong winner

<table>
<thead>
<tr>
<th></th>
<th>I(_{11} ) / gel_ [-pl,+erg]/</th>
<th>-Con</th>
<th>IdentNum</th>
<th>MinDis</th>
<th>IdentCase</th>
<th>UniqReal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_{11} )</td>
<td>gel_ [-pl,+erg]/_um_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{12} )</td>
<td>gel_ [-pl,+erg]/_or_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{13} )</td>
<td>gel_ [-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{14} )</td>
<td>gel_ [-pl,+erg]_i_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{15} )</td>
<td>gel_ [-pl,+erg]/_čaj_[-pl,+erg]/</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:

The problem is a high-ranked \text{MinDis}. However, alternative rankings like the ones in (492) will not produce extended exponence either under global optimization.

T\(_{45} \): Global optimization, second attempt: wrong winner

<table>
<thead>
<tr>
<th></th>
<th>I(_{11} ) / gel_ [-pl,+erg]/</th>
<th>-Con</th>
<th>IdentNum</th>
<th>MinDis</th>
<th>IdentCase</th>
<th>UniqReal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O(_{11} )</td>
<td>gel_ [-pl,+erg]/_um_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{12} )</td>
<td>gel_ [-pl,+erg]/_or_[-pl,l]</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{13} )</td>
<td>gel_ [-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{14} )</td>
<td>gel_ [-pl,+erg]_i_[-pl,+erg]/</td>
<td>*</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>O(_{15} )</td>
<td>gel_ [-pl,+erg]/_čaj_[-pl,+erg]/</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:

The problem is a high-ranked \text{MinDis}. However, alternative rankings like the ones in (492) will not produce extended exponence either under global optimization.

Conclusion:

More generally, under global optimization, the candidate that has extended exponence will always be harmonically bounded by a candidate that leaves out one of the two markers. If \text{MinDis} is simply abandoned, the optimal candidate will always be one where the exponent realizing a subset of the other exponent’s features is blocked.
Qualification:
This only holds for scenarios with a subset relation (“partially superfluous multiple exponence”), not for those where there is no subset relation (“overlapping multiple exponence”): In these latter cases, extended exponence can be brought about both in a harmonic serialism approach and in a harmonic parallelism approach (by a high ranking of two faithfulness constraints demanding realization of [F₁] and [F₂], which are present on two exponents α and β, respectively, that also share some feature [F₃]).

Observation:
Extended exponence in the other languages discussed above works in exactly the same way.

Predecessor:
Caballero & Inkelas (2013) introduce a stratal OT approach that can also cover extended exponence, and has the same fatal consequence for standard parallel optimization. Crucially, in the case of Archi, it is assumed that there are two strata (root to stem and stem to word), and um, by stipulation, belongs to the first stratum, and čaj to the second.

Differences between the stratal and the harmonic serialism approaches:
- What needs to be stipulated in the stratal approach (viz., why um comes first) is derived in the harmonic serialism approach (via MINDis).
- Depending on a number of further assumptions, the stratal approach could be compatible with fully superfluous extended exponence; deriving this is impossible under the harmonic serialism analysis.
- Whereas the case may or be not be dubious in Archi, for some of the above cases (e.g., dative plurals in German and agreement marking in Sierra Popoluca) it seems unlikely that the two markers participating in extended exponence can be argued to belong to two different strata.
- The order of the two exponents in negative marking in Swahili poses a potential problem for both approaches; both approaches must assume that the general negation marker becomes optimal before the negation/past marker is introduced in cases like (479-b) (ha-tu-ku-taka). However, it is hard to see how a stratal analysis that defines strata on the basis of roots can accomplish that.
- More generally, if “root → stem” defines the first stratum in Caballero & Inkelas (2013), then a partially superfluous exponent can never be non-adjacent to the root. This is certainly not the case for absolute markers on verbs in Sierra Popoluca.

XIV. Optimality Theory 7: Harmonic Grammar

70. Background: Syncretism by Leading Forms, without Underspecification

70.1. Basic Assumptions and Data

The Approach to Syncretism in Müller (2011)

1. There is no underspecification of exponents.
2. Not all members of a paradigm (exponents) are present in the input; only leadings forms are are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Albright (2008), and Baerman (2009) on somewhat related concepts).
3. A mismatch of paradigm cells and leadings forms gives rise to syncretism: Initial gaps are filled by using “wrong”, i.e., unfaithful exponents (Weisser (2007)).
4. Mismatches between the exponent’s specification and the target specification are minimized: this is not accomplished by a single Minimality condition (cf. the Nearest Neighbour Principle in Weisser (2007, 26), or the Minimality principle in Lahne (2007a, 11)), but by a set of ranked faithfulness constraints for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004), etc.; however, these authors all crucially rely on underspecification – cf. handout Morphology I).
5. Feature decomposition yielding natural classes is needed exactly as before.
6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a rule of referral (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

(493) Determiner inflection in German

<table>
<thead>
<tr>
<th>dies</th>
<th>NOMINATIVE</th>
<th>ACCUSATIVE</th>
<th>DATIVE</th>
<th>GENITIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘this’</td>
<td>r</td>
<td>s</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>‘this’</td>
<td>n</td>
<td>s</td>
<td>e</td>
<td>e</td>
</tr>
<tr>
<td>‘this’</td>
<td>m</td>
<td>m</td>
<td>r</td>
<td>n</td>
</tr>
<tr>
<td>‘this’</td>
<td>s</td>
<td>s</td>
<td>r</td>
<td>r</td>
</tr>
</tbody>
</table>
70.2. Analysis

(494) Nine leading forms:

\[
\begin{align*}
\gamma_1 & \leftrightarrow [+\text{masc}, -\text{fem}, -\text{gov}, -\text{obl}] \\
\gamma_2 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_3 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_4 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_5 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_6 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_7 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_8 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\gamma_9 & \leftrightarrow [+\text{masc}, +\text{fem}, +\text{gov}, +\text{obl}] \\
\end{align*}
\]

Optimality-Theoretic Constraints

(495) Match (undominated, possibly part of Gen):
The morpho-syntactic features of stem and exponent are identical in the output.

(496) Faithfulness constraints for features on exponents

a. IDENTMASC:  
[±masc] of the input must not be changed in the output on an exponent.

b. IDENTOBL:  
[±obl] of the input must not be changed in the output on an exponent.

c. IDENTFEM:  
[±fem] of the input must not be changed in the output on an exponent.

d. IDENTGOV:  
[±gov] of the input must not be changed in the output on an exponent.

(497) Ranking:
IDENTMASC \(\gg\) IDENTOBL \(\gg\) IDENTFEM \(\gg\) IDENTGOV

Incomplete Paradigms

(498) Incomplete paradigm with leading forms only

<table>
<thead>
<tr>
<th>dies ‘this’</th>
<th>MASC.SG</th>
<th>NEUTER.SG</th>
<th>FEMININE.SG</th>
<th>PLURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+gov, -obl]</td>
<td>/\gamma_1/</td>
<td>/\gamma_6/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+gov, +obl]</td>
<td>/\gamma_2/</td>
<td>/\gamma_3/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+gov, +obl]</td>
<td>/\gamma_4/</td>
<td>/\gamma_5/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+gov, +obl]</td>
<td>/\gamma_7/</td>
<td>/\gamma_8/</td>
<td></td>
<td>/\gamma_9/</td>
</tr>
</tbody>
</table>

Note:
In what follows, Exp is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1994)).
Tableau T46: A wrong prediction for Gen.Pl. contexts if /r/ is not present

<table>
<thead>
<tr>
<th>Input: dies ↔ [–masc,–fem,–gov,+obl],</th>
<th>MATCH</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₂: dies-n₁ ↔ [–masc,–fem,+gov,+obl]</td>
<td>☛</td>
<td>O 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₄: dies-r₈ ↔ [–masc,+fem,–gov,+obl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
To some extent, the decisions on which occurrence of an exponent’s distribution is to count as primary (i.e., qualify as the leading form), and which occurrences of the distribution are secondary (involving a violation of faithfulness) have been arbitrary from a purely synchronic, grammar-internal point of view.

However:
Evidence for occurrence asymmetries of inflectional exponents comes from other domains (i.e., outside grammatical theory) which can be addressed by research in areas like diachronic linguistics, corpus linguistics, and psycholinguistics.

70.3. Restrictiveness of the Approach: No Elsewhere
As it stands, the approach does not derive elsewhere distributions.

Tableau T47: A wrong prediction for Dat.Fem.Sg. contexts under reranking

<table>
<thead>
<tr>
<th>Input: dies ↔ [–masc,+fem,+gov,+obl],</th>
<th>MATCH</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₇: dies-n₇ ↔ [–masc,–fem,+gov,+obl]</td>
<td>☛</td>
<td>O 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₉: dies-r₉ ↔ [–masc,+fem,–gov,+obl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
A learning algorithm for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the “No-Homonymy Learner” and the “Elsewhere Learner”).

Tableau T48: Correct prediction for Gen.Pl. contexts without /r/; contextual faithfulness

<table>
<thead>
<tr>
<th>Input: dies ↔ [–masc,–fem,–gov,+obl],</th>
<th>MATCH</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
<th>IDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₅: dies-n₅ ↔ [–masc,–fem,+gov,+obl]</td>
<td>☛</td>
<td>O 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O₆: dies-r₆ ↔ [–masc,+fem,–gov,+obl]</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note:
A learning algorithm for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the “No-Homonymy Learner” and the “Elsewhere Learner”).
For each instance of the feature \( pl \):

\[
\begin{align*}
    a. \text{ am} & \leftrightarrow [+1 -2 -pl] & H & = +2 \\
    b. \text{ are} & \leftrightarrow [-1 +2 +pl] & \text{Ido} & = 2 \\
    c. \text{ is} & \leftrightarrow [-1 -2 -pl] & \text{Idy} & = 2
\end{align*}
\]

\( *[-pl] \) For each instance of the feature \([-pl]\) in the output, add \(-1\) to the satisfaction score.

### Table 49: OT tableau for \textit{pros-ím} 'beg-1SG'

<table>
<thead>
<tr>
<th>I: pros (\leftrightarrow [+1 -2 -pl] )</th>
<th>MATCH</th>
<th>Id1</th>
<th>Id2</th>
<th>IdPl</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \text{ pros-im} (\leftrightarrow [+1 -2 -pl] )</td>
<td>*(!) *(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. \text{ pros-ime} (\leftrightarrow [+1 -2 -pl] )</td>
<td>*(!) *(!)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. \text{ pros-ís} (\leftrightarrow [+1 -2 -pl] )</td>
<td>*(!) *(!)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. \text{ pros-ite} (\leftrightarrow [+1 -2 -pl] )</td>
<td>*(!) *(!)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. \text{ pros-i} (\leftrightarrow [+1 -2 -pl] )</td>
<td>*(!) *(!)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. \text{ pros-i} (\leftrightarrow [-1 -2 -pl] )</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 50: OT tableau for \textit{pros-i} 'beg-3PL'

<table>
<thead>
<tr>
<th>I: pros (\leftrightarrow [-1 -2 +pl] )</th>
<th>MATCH</th>
<th>Id1</th>
<th>Id2</th>
<th>IdPl</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \text{ pros-im} (\leftrightarrow [-1 -2 +pl] )</td>
<td>*(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. \text{ pros-ime} (\leftrightarrow [-1 -2 +pl] )</td>
<td>*(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. \text{ pros-ís} (\leftrightarrow [-1 -2 +pl] )</td>
<td>*(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. \text{ pros-ite} (\leftrightarrow [-1 -2 +pl] )</td>
<td>*(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. \text{ pros-i} (\leftrightarrow [-1 -2 +pl] )</td>
<td>*(!)</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. \text{ pros-i} (\leftrightarrow [-1 -2 -pl] )</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(506) First person: \([+1 -2]\) Singular: \([-pl]\) Past tense: \([+pst]\)
Second person: \([-1 +2]\) Plural: \([+pl]\) Non-past: \([-pst]\)
Third Person: \([-1 -2]\)

(507) a. \text{ -ím} \(\leftrightarrow [+1 -2 -pl] \)
    b. \text{ -ime} \(\leftrightarrow [+1 -2 +pl] \)
    c. \text{ -ís} \(\leftrightarrow [-1 +2 -pl] \)
    d. \text{ -ite} \(\leftrightarrow [-1 +2 +pl] \)
    e. \text{ -i} \(\leftrightarrow [-1 -2 -pl] \)

(508) \text{ MATCH}

The morpho-syntactic features of stem and exponent are identical in the output.

(509) \text{ Faithfulness constraints}

a. \text{ Id1}

\([\pm 1]\) of the input must not be changed in the output of an exponent.

b. \text{ Id2}

\([\pm 2]\) of the input must not be changed in the output of an exponent.

c. \text{ IdPl}

\([\pm pl]\) of the input must not be changed in the output of an exponent.

(510) \text{ MATCH} \\supset \{ \text{ Id1, Id2} \} \supset \text{ IdPl}

\text{ Problem (as before)}:

This kind of approach does not easily accommodate elsewhere distributions.

### 72. A Harmonic Grammar Approach to Syncratism


### Table 51: HG tableau for \textit{pros-ím} 'beg-1SG'

<table>
<thead>
<tr>
<th>I: ([+1 -2 -pl])</th>
<th>MATCH</th>
<th>Id1</th>
<th>Id2</th>
<th>IdPl</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \text{ -ím} (\leftrightarrow [+1 -2 -pl] )</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>b. \text{ -ime} (\leftrightarrow [+1 -2 +pl] )</td>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>c. \text{ -ís} (\leftrightarrow [+1 -2 -pl] )</td>
<td>-4</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>d. \text{ -ite} (\leftrightarrow [+1 -2 +pl] )</td>
<td>-5</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>e. \text{ -i} (\leftrightarrow [+1 -2 -pl] )</td>
<td>-2</td>
<td>0</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>f. \text{ -i} (\leftrightarrow [-1 -2 -pl] )</td>
<td>-6</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(511) \text{ Harmony}

\[
H = \sum_{k=1}^{K} s_k w_k
\]

\(s = \text{satisfaction score, } w = \text{weight}\)

(512) \text{ Illustration of the gap effect in Harmonic Grammar}

<table>
<thead>
<tr>
<th>I: ([\pm \alpha + \beta + \gamma])</th>
<th>MATCH</th>
<th>Id1</th>
<th>Id2</th>
<th>IdPl</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. \text{ -ím} (\leftrightarrow [+1 -2 -pl] )</td>
<td>-3</td>
<td>-1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>b. \text{ -ime} (\leftrightarrow [+1 -2 +pl] )</td>
<td>-4</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
</tr>
</tbody>
</table>

\text{Goal:}

Reanalysis of the approach to Czech verb inflection in Harmonic Grammar.

(513) \text{ MATCH}

For each feature in each marker, add \(-1\) to the satisfaction score iff. the feature value differs from the value of the feature in the corresponding feature structure in the input.

(514) \text{ Idx}

For each marker in the output, add \(-1\) to the satisfaction score iff. its value for the feature \([\pm \alpha]\) differs from the value of \([\pm \alpha]\) in the corresponding leading form.

(515) \text{ Constraints and their weights for Czech verbal inflection}

<table>
<thead>
<tr>
<th>constraint MATCH</th>
<th>Id1</th>
<th>Id2</th>
<th>IdPl</th>
</tr>
</thead>
<tbody>
<tr>
<td>weight</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

### 72.1. Reconstruction of the Analysis of Czech Verb Inflection

(Pater; 2009: 1006)

\[H = \sum_{k=1}^{K} s_k w_k\]

Table 52: HG tableau for pros-i ‘beg-3pl’

<table>
<thead>
<tr>
<th>I: [−1 −2 +pl]</th>
<th>H</th>
<th>MATCH</th>
<th>ID1</th>
<th>ID2</th>
<th>IDpl</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. -im ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>b. -ime ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>c. -is ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>d. -ite ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>e. -er ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>f. -e ↔ [−1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 53: Paradigm of the English verb be

| Constraint and their weights for English: |
|-----------------|--------------|
| weight | 19 | 19 | 3 | 2 | 2 | 2 |

Table 54: HG tableau for the 1pl form of the English copula be

<table>
<thead>
<tr>
<th>I: [+1 −2 +pl]</th>
<th>H</th>
<th>MATCH</th>
<th>IDpST</th>
<th>IDPl</th>
<th>ID1</th>
<th>ID2</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. am ↔ [+1 −2 −pl]</td>
<td>−5</td>
<td>0</td>
<td>0</td>
<td>−1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>b. are ↔ [+1 −2 +pl]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>c. is ↔ [+1 −2 −pl]</td>
<td>0</td>
<td>0</td>
<td>−1</td>
<td>−1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 55: HG tableau for the 2sg form of the English copula be

<table>
<thead>
<tr>
<th>I: [−1 +2 −pl]</th>
<th>H</th>
<th>MATCH</th>
<th>IDpST</th>
<th>IDPl</th>
<th>ID1</th>
<th>ID2</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. am ↔ [−1 +2 −pl]</td>
<td>−6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>−1</td>
</tr>
<tr>
<td>b. are ↔ [−1 +2 −pl]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>c. is ↔ [−1 +2 −pl]</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The resulting system does not derive a full elsewhere pattern. Suppose that /am/ were not present. In that case, /is/ rather than /are/ would be the optimal candidate for first person singular contexts. Englisch (2015) claims that this is a correct result since it exactly corresponds to the distribution of exponents in past tense contexts.

References

Amherst.


Deal, Amy Rose (2014): Person-Based Split Ergativity in Nez Perce is Syntactic. Ms., Uni-


Heck, Fabian & Gereon Müller (2000): Successive Cyclicity, Long-Distance Superiority, and


