On Deriving Polarity Effects

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December 7, 2007

In this paper, I argue for a new, theory-neutral approach to polarity effects resting upon the idea that the choice of marker for a given feature specification is determined by the choice of marker for a minimally different specification. In paradigms instantiating polarity effects, the matching of morpho-syntactic and phonological features proceeds by natural class based-rules, but is partly overriden by two principles, Discreteness of Environment and Minimality, the latter of which is an independently motivated assumption underlying syntactic derivations, and arguably a basic property of language in general.

1 Background

The concept of natural classes is one of the most basic concepts of linguistic description. However, there are data that seem to escape analyses making use of natural classes. The arguably most striking example are polarity effects in inflectional paradigms, that is, "complementary distributions of inflectional markers in such a way that syncretism constitutes itself in mirror-image identity of non-contiguous paradigmatic cells" (Baerman et al. 2005:104). These effects can be found in Old French masculine o-stems (Rheinfelder 1976), where the syncretism pattern that occurs is that of a chessboard: nominative singular syncretises with the accusative plural, and the nominative plural syncretises with the accusative singular (table 1). Likewise, in the Somali definite article (Saeed 1999:112), the masculine singular and the feminine plural are syncretic, and the masculine plural and the feminine singular are syncretic (table 2).

These "chessboard distributions" do not seem to be analysable by having recourse to natural classes (cf. Baerman et al. 2005), as the two morpho-syntactic feature specifications associated with one phonological form do not

*For comments and discussion, I would like to thank Gereon Müller, Andrew Nevins, Catherine Taylor, Jochen Trommer, and audiences at WOTM 3 (Leipzig, June 2007) and MMM 6 (Vathy/ Ithaka, September 2007). This research was supported by the *2007/08 Research Grant for the State of Saxony.*

Table 1

Old French
Masculine o-stems

	SG	PL
NOM	-s	-ø
OBJ	-ø	-s

Table 2

Somali
Definite article

	SG	PL
FEM	-ta	-ka
MASC	-ka	-ta

have a common value for any given feature (or do not have a common distinctive structure for any given dimension), no matter which particular feature representation is chosen, and therefore cannot be referred to by means of standard natural class-based rules.

2 On the Systematicity of Polarity Effects

Chess board distributions can be treated by morphological theories in two different ways:

(I) Natural classes are taken to be the sole underlying concept. Consequently, polarity effects come as a completely accidental pattern (i.e., they are ignored by the morphological theory).

(II) The systematicity of chess board distributions is integrated into the morphological theory. There are basically two ways of accomplishing this:

a. The theory defines new natural classes such that seemingly un-unifiable specifications come out as forming a class (e.g. exactly *because* of their property of being un-unifiable);

b. The matching of morpho-syntactic and phonological features is modeled in such a way that it proceeds according to natural class based-rules, but can be overriden by other morphological principles or processes.

Section 2.1 discusses theories of type (I). Two powerful techniques of type (IIa) are discussed in section 2.2. To my knowledge, there is no type (IIb) theory of polarity effects up to now (though Weißer (2007), an analysis of L-shaped syncretisms, can perhaps be extended to account for polarity effects). In this paper I would like to propose a new analysis of the data which makes use of strategy (IIb).

2.1 Polarity Effects as an Accidental Pattern

It seems at first sight that polarity effects are not a systematic, but an accidental pattern. The seeming syncretisms in the paradigms in tables 1 and 2 could therefore be seen as a case of marker homonymy, as shown in (1) for the Old French example.[1]

(1) Vocabulary items for Old French noun inflection:
/-s/ $\leftrightarrow$ [+obj +pl +m +x[2]]
/-s/ $\leftrightarrow$ [–obj –pl +m +x]
/-ø/ $\leftrightarrow$ [ ]

The alternative – if polarity effects are understood as an accidental pattern – is to assume that impoverishment rules, or rules of referral, respectively (Halle and Marantz 1993; Noyer 1997; Bobaljik 2002; Stump 1993, 2001) are at work in these data. The basic idea of this device is that a marker which is expected to appear in the context of a certain morphosyntactic feature specification is replaced by a different marker due to a feature modification operation which is prioritised in the sense that it applies before matching with phonological features takes place. As a result, when the phonological features are inserted, the set containing the modified feature(s) is matched with a previously unexpected, potentially underspecified marker. (2) shows the prioritised rule for the Somali definite article in two notational variants: (2a) is a possible impoverishment rule from the Distributed Morphology framework (multiple non-standard feature-changing impoverishment as proposed in Noyer 1998), and (2b) is a rule of referral from the framework of Word-and-Paradigm Morphology.

(2) a. Impoverishment rule for the Somali definite article:
[+f +pl] > [–f –pl] / [+art +def]

b. Rule of referral for the Somali definite article:[3]
$\mathrm{I}_{\{[+\mathrm{f}\ +\mathrm{pl}]\}} \rightarrow \mathrm{I}_{\{[-\mathrm{f}\ -\mathrm{pl}]\}}$ / [+art +def]__.

The effect of this prioritised rule is that whenever the system encounters the morphosyntactic context [+f +pl], this context is changed to [–f –pl]. The vocabulary items for the Somali definite article are given in (3).

(3) Vocabulary items for the Somali definite article:
/-ka/ $\leftrightarrow$ [–f –pl]
/-ta/ $\leftrightarrow$ [ ]

1. Throughout the paper, the association of markers and forms is given in the notation used in Distributed Morphology. The analysis is however theory-neutral; it can be implemented in any mophological theory.
2. x= class feature defining o-stems.
3. $\mathrm{I}_{\{+\mathrm{x}\}}$ represents the inflection marker for context {+x}, and $\rightarrow$ represents "is replaced by".

The *a priori* expected marker for the context [+f +pl] is /-ta/. However, as the features [+f +pl] of the head (or cell) have been overwritten by [–f –pl], the morphosyntactic context now matches the specification for /-ka/, thus /-ka/ is inserted in the context [+f +pl].
A difference between impoverishment rules and rules of referral is that impoverishment rules are conceived as being more restrictive inasfar as they are either deletions of features or changes of values from [+x]→[–x], or [±x]→[x] (i.e., a retreat to the general case causing the insertion of a less specific marker; Halle and Marantz 1993, 1994; Noyer 1998), whereas rules of referral by definition modify features without restrictions.

2.2 Polarity Effects as a Systematic Pattern

As has been shown by Baerman (2007), polarity effects are far from being a rare phenomenon in the world's languages; they occur e.g. in Hebrew gender marking, Old Church Slavonic neuter noun and adjective suffixes, voicing reversal in Luo, Estonian partitive endings, Nehan definite articles, Tübatulabal aspect marking, and tense marking in Trique. It therefore seems to be reasonable to model morphological theory in such a way that polarity effects follow as a systematic pattern. Two solutions have been previously suggested.
One possible way of capturing polarity effects as a systematic pattern is to establish natural classes by abstracting over feature values (α*-notation*, Chomsky and Halle 1968). (4) shows the vocabulary items for the Somali definite article using α-notation.

(4) Vocabulary items for Somali definite article:
/-ta/ ↔ [αf –αpl]
/-ka/ ↔ [ ]

This solution has been modelled as a powerful device of forming natural classes. However, as is shown in (5) for the Somali definite article, if the variable in the insertion rule is resolved, then α*-notation* turns out to be a mere notational variant for homonymous markers.

(5) /-ta/ ↔ {[+f –pl], [–f +pl]}

A second possible solution, proposed by Béjar and Hall (1999), is to assume a new form of underspecification by which seemingly un-unifiable specifications come out as forming a natural class. The basic idea of this geometry-based approach is that natural classes are defined by the degree of featural markedness (where markedness is defined in terms of presence or absence of structure in a feature-geometrical representation). Let me sketch this approach for the Old French data. The analysis is based on the following case and number decomposition:[4]

4. Abbreviations in this paper: ind=individuation; min=minimal; part=participant;

(6) Old French: feature geometry

Singular:	Plural:	Nominative:	Objective:
ind	ind	case	case
|	|	|	|
min	group	subj	obj

The combination of case and number features yields the featural representations of the four contexts:

(7) Old French: case-number combinations

NOM SG:	NOM PL:	OBJ SG:	OBJ PL:
ind case	ind case	ind case	ind case
	|	|	| |
	min	obl	min obl

The specifications that form a natural class in this approach are OBJ SG and NOM PL in that both are specified for the dimension node on one branch ([ind] in the case of OBJ SG, and [case] in NOM PL), and the dimension node plus a further node on the other branch ([case|obj] in OBJ SG, and [ind|group] in NOM PL). The vocabulary items for Old French are given in (8).

(8) Vocabulary items for Old French:

/-ø/ : DIM1 DIM2|X

/-s/ ↔ [ ]

In this case, the zero marker is the most specific vocabulary item. It is inserted in NOM PL and OBJ SG contexts. /-s/ is the elsewhere marker and thus matches all other contexts (NOM SG, OBJ PL). The zero marker cannot be inserted in the context NOM SG: though on one branch this context is specified for a dimension node only ([ind] or [case], respectively), it is not specified for a dimension node plus a further node on the other branch. Note that the system crucially relies on the assumption that underspecification is not at work in vocabulary insertion operating on degrees of structural markedness; thus, the zero marker cannot be inserted in OBJ PL contexts. This assumption is potentially incompatible with the need for full underspecification (i.e., the specification of /-s/ as the elsewhere marker). This dilemma can possibly be solved by assuming that the grammar allows for a mixed system of both feature-based and markedness-based insertion rules, where the former are subject to underspecification, and the latter must be fully specified for the context where they can be inserted.

spk=speaker; addr=addressee; subj=subject; obj=object; obl=oblique.

2.3 A Motivation for Polarity Effects

Up to now, a single argument has been given in favour of a systematic analysis of polarity effects: that it is not unknown among the world's 6000 languages. The desideratum however is to recover a deeper motivation for why this seemingly random pattern is actually systematic. The starting point for such a motivation is the empirical observation that the matching of phonological forms with morphological or syntactic specifications can be accomplished by embarking on one of three basic strategies:

(A) Targeting minimal ambiguity with maximal formal inventory (i.e., yielding no syncretisms at all);

(B) Making use of syncretisms in natural classes;

(C) Targeting minimal ambiguity with minimal formal inventory (i.e. yielding evenly distributed syncretisms).

Strategy (A) occurs e.g. in Greek aorist or Russian present indicative, while strategy (B) seems to be favoured in the world's languages. The typical chessboard distributions of morphological polarity are instantiations of strategy (C). The implication of this typology of matching strategies is that polar distribution of inflectional markers is in no way unexpected, but the most efficient way of referring to feature specifications minimally ambiguously with a minimal formal inventory (i.e., minimal formal inventory, but at the same time minimal ambiguity).

3 Claim

The goal of this paper is to propose a new analysis of polarity effects as a systematic pattern resting upon the idea that the choice of marker for a given feature specification is determined by the choice of marker for a minimally different specification. In the new approach, polarity effects are a result of the interaction of natural class-based rules and two economy principles, Discreteness of Environment and Minimality.

(9) **Discreteness of Environment (general version)**
Adjacent cells must be discretely marked.

(10) **Minimality**
If the association of a marker M_1 with a matching morpho-syntactic environment $[\alpha]$ violates a principle P, then insert a marker M_2 such that M_2 meets P and the features of M_2 are minimally distinct from the features of M_1.

The effect of (9) and (10) is that the choice of marker for a given feature specification is determined by the choice of marker for a minimally different specification: whenever a marker matches a feature specification but is prohibited by Discreteness, a marker with a minimally different specification is chosen to fill the given cell.

Minimality is one of the basic properties of language (alongside e.g. compositionality, double articulation, and cyclicity). Syntactic examples of minimality effects are manifold, e.g. wh-movement in English:

(11) a. (I wonder) who_1 t_1 invented $what_2$
b. * (I wonder) $what_2$ who_1 invented t_2
c. * $What_2$ did who_1 invent t_2?

Data like (11) show that in English multiple wh-questions, extraction of the lower wh-item is accepted by native speakers to a much lesser degree than extraction of the higher wh-item. The same principle is at work in extraction from complex NPs:

(12) a. They heard [$_{DP_1}$ a rumour that [$_{DP_2}$a linguist] dined and dashed at Café Kowalski]
b. [$_{DP_1}$What] did they hear t_1?
c. * [$_{DP_2}$Who] did they hear [$_{DP_1}$ a rumour that t_2 dined and dashed at Café Kowalski?]

A third example is object shift in Icelandic, where the higher, but not the lower object can be moved above the negation (Collins and Thráinsson 1996):

(13) a. Ég lána $Maríu_1$ ekki t_1 $bækurnar_2$
I lend Maria.DAT not books.ACC
b. * Ég lána $bækurnar_2$ ekki $Maríu_1$ t_2
I lend books.ACC not Maria.DAT
'I do not lend the books to Maria'

The underlying principle has been formulated first in Chomsky (1964) as *A-over-A Principle*, of which a generalised version (*F-over-F*) is given in (14a). It was reformulated as *Superiority Condition* (14b).[5]

(14) a. **F-over-F Principle**
In a structure $\alpha_{[*F*]}$ ... [$_{\beta_{[F]}}$... [$_{\gamma_F}$ ...] ...] ..., movement to [*F*] can only affect the category bearing the [F] feature that is closer to [*F*].
b. **Superiority Condition** (Chomsky 1973):
In a structure $\alpha_{[*F*]}$ ... [... $\beta_{[F]}$ ... [... γ_F ...] ...] ..., movement

5. The difference between (14a) and (14b) is that β dominates γ in the F-over-F Principle, whereas in the Superiority Condition, β c-commands γ.

to [*F*] can only affect the category bearing the [F] feature that is closer to [*F*].

The most recent formulation of the minimality principle is the combination of these two constraints, known as the *Minimal Link Condition*:

(15) **Minimal Link Condition** (Chomsky 2000, 2001):
If β and γ both match a probe α and β asymmetrically c-commands γ, a syntactic operation cannot involve α and γ.

Minimality is also an underlying principle in language processing (Late Closure, Minimal Chain Principle, Minimal Attachment; see e.g. Frazier and Fodor 1978; Bornkessel and Schlesewsky 2006) and phonology (e.g. association lines in autosegmental phonology; Goldsmith 1976). It therefore seems reasonable to assume that the minimality property of language is at work in morphology, too (Müller 2007).

4 Formal Implementation

The new analysis works independently of a particular feature representational system. Section 4.1 demonstrates the implementation in an approach resting upon feature geometry; in section 4.2 the analysis is implemented for a binary feature system.

4.1 Implementation for Feature Geometry Representations

The basic assumption of approaches working with feature geometries is that grammatical categories are represented as decomposed into geometrically organized privative features (Harley and Ritter 2002, among many others). The feature geometry for Old French masculine o-stems is the one given in (6). The basic idea of this analysis is that paradigms are generated in such a way that the system detects the most specific vocabulary item and the morphosyntactic specification associated with it, and then detects a contiguous specification and the marker associated with it. The system thus proceeds until all cells have been filled. The transition from cell to cell (or specification to specification) is accomplished by detecting that the featural specification of the "new" cell can be reached starting from the feature specification of the "old" cell by a transition from a node α in the feature geometry to an adjacent node β. In paradigms showing polar distributions, this transition from node to node is subject to the Discreteness Principle, which is given in (16) in its feature geometry version.

(16) **Discreteness of Environment (feature geometry version)**
Adjacent nodes in the geometry must be discretely marked.

This constraint has the effect that whenever a marker M_β is detected by a transition from a node α to a node β, then the marker associated with M_β has to be phonologically distinct from M_α. If M_α and M_β are associated with the same phonological features, then the choice of marker is determined by the Minimality Principle (10). The vocabulary items for Old French masculine o-stems are given in (17).

(17) Vocabulary items for Old French (masc. o-stems)
 /-s/ ↔ [case|obj ind|group]
 /-ø/ ↔ [ ]

The paradigm develops in such a way that at first the most specific vocabulary item (/-s/ ↔ [case|obj ind|group]) is inserted in the matching context (Specificity Principle).

(18)

MORPHOSYNTACTIC REPRESENTATION			PHON. REPRES.	
		ind|group case|obj		-s

Now the most proximate specification is detected (either [ind|group case|subj] or [ind|min cas|obj]; it is of no import which way the system takes in unfolding the paradigm). The transition to either of these specifications is achieved by a transition to an adjacent node in the geometry ([group→ind→min], or [obj→case→subj]). The matching marker for these nodes is /-ø/ (underspecification; cf. Identity Default Rule, Stump 2001). The insertion of the zero marker conforms to the Discreteness Principle: adjacent nodes in the geometry are marked differently.

(19)

MORPHOSYNTACTIC REPRESENTATION			PHON. REPRES.	
		ind|group case|**subj**		-ø
		↑		
ind|*min* case|obj	⟵	ind|*group* case| **obj**	-ø	-s

The system now detects the remaining specification [ind|min case|subj], which can only be matched with the zero marker. However, the insertion of this marker is prevented by the Discreteness Principle: [ind|min case|subj] and [ind|min case|obj] are adjacent, and [ind|min case|subj] and [ind|group case|subj] are adjacent, but in both cases the adjacent specifications are both associated with the zero marker, thus they are not discretely marked:

(20)

MORPHOSYNTACTIC REPRESENTATION			PHON. REPRES.	
ind|*min* case|**subj**	⟵	ind|*group* case|subj	*ø	-ø
↑				
ind|min case| **obj**		ind|group case|obj	-ø	-s

In this case the choice of marker is determined by a principle of vocabulary insertion, Minimality:

(21) (=10) **Minimality**
If the association of a marker M_1 with a matching morphological environment [α] violates a principle P, then insert a marker M_2 that

meets P iff. the feature specification of M_2 is minimally distinct from that of M_1.

The effect of this principle is that a marker with a minimally different specification is chosen to fill the given cell. The avaliable marker for [ind|min case|subj] with minimally different specification in Old French is the only alternative marker available in the Old French case system: /-s/. Thus, /-s/ is inserted in the context [ind|min case|subj].

(22)

MORPHOSYNTACTIC REPRESENTATION			PHON. REPRES.	
ind|*min* case|**subj**	⟵	ind|*group* case|subj	-s	-ø
↑				
ind|min case| **obj**		ind|group case|obj	-ø	-s

4.2 Implementation for Binary Feature Representations

In a system based upon a binary feature representation, the principles of Discreteness and Minimality can be formulated in the form of the following algorithm:[6]

(23) **Discreteness of Environment/ Minimality (binary feature version):**

a. Let x,y = associations of morpho-syntactic and phonological features ("cells").
Let F = morpho-syntactic feature $\in$ x,y.
Let P= set of phonological features $\in$ x,y.

b. f(sim(x,y)) = n =
{
n=0;
for all F
if $\text{val}(x)(F_i) = \text{val}(y)(F_i)$
then n=n+1:
}

c. {
if n=1, then $P_x \neq P_y$.
if n$\neq$1, then $P_x = P_y$
}

(23b) is a function over the morphosyntactic similarity of a "cell" (i.e., associations of morpho-syntactic and phonological features) x and a "cell" y. In 4-cell paradigms, two primitive features are minimally needed (and thus optimal) to uniquely characterise each of the cells. These features can be cross-classified, as shown in (24):

6. Andrew Nevins, p.c.

(24) Feature distribution in 4-cell paradigms:

	$-F_1$	$+F_1$
$-F_2$	$-F_1$ $-F_2$	$+F_1$ $-F_2$
$+F_2$	$-F_1$ $+F_2$	$+F_1$ $+F_2$

The function f(sim(x,y)) operates with all possible pairs of (x,y), that is, all possible pairs of "cells". In a 4-cell paradigm, there are 6 possible combinations:

(25) $\{-F_1\ -F_2,\ -F_1\ +F_2\}$;
$\{-F_1\ -F_2,\ +F_1\ -F_2\}$;
$\{-F_1\ -F_2,\ +F_1\ +F_2\}$;
$\{+F_1\ +F_2,\ -F_1\ +F_2\}$;
$\{+F_1\ +F_2,\ +F_1\ -F_2\}$;
$\{+F_1\ -F_2,\ -F_1\ +F_2\}$.

For any given pair (x,y), f compares the values of a given feature F_i. If the value F_i of x equals the value F_i of y, then the counter n is set to 1. If the value F_i of x is not equal to the value F_i of y, then n is not raised. Now (23c), the algorithm controlling the phonological realisation, comes into effect: if f returns a number unequalling 1 for a given pair of "cells", then the set of phonological features of x and y must be identical; if f returns 1 for a given pair of "cells", then the phonological features of x and y must not be identical.

Let me exemplify the analysis by means of the Old French masculine o-stem paradigm. The case and number features are decomposed as given in table 3.

Table 3

Old French Masculine o-stems

	SG	PL
NOM	–pl –obj /-s/	+pl –obj /-ø/
OBJ	–pl +obj /-ø/	+pl +obj /-s/

Let x equal [–pl –obl], and y=[+pl –obl]. F_1 is thus [pl], and F_2 = [obl]. The algorithm starts with n=0. The value of (x)([pl]) equals '–', and val(y)([pl])='+', thus val(x)(F_1) $\neq$ val(y)(F_1); n is not raised. Now x and y are compared with regard to F_2. The value of (x)([obl]) equals '–', and val(y)(obl])='–', thus val(x)(F_2) = val(y)(F_2). The equation f(sim([+pl –obl],[+pl –obl])) thus returns 0+1 = 1. As a result, (23c) requires P_x to unequal P_y.
If x=[–pl +obl] and y=[+pl –obl], then val(x)(pl) $\neq$ val(y)(pl), and val(x)(obl) $\neq$ val(y)(obl). In this case, f returns 1+1=2. (23c) thus requires P_x to equal P_y.

5 Partial Polarity Effects

Partial polarity effects are complementary distributions of markers embedded in larger paradigms (Baerman et al. 2005). Examples are Romanian i-stem verbs with -esc/eşt-infix (Popovici 2003) and Old Irish masculine o-stems (Lühr 2004):

Table 4

Romanian
I-stem verbs with
-esc/eşt-infix

	SING	PLURAL
1	**-esc**	-im
2	-eşti	-iţi
3	-eşte	**-esc**

Table 5

Old Irish
Masculine o-stems

	SING	PLURAL	DUAL
NOM	fer	fir	(dá) ḟer
ACC	fer	firu	(dá) ḟer
GEN	fir	fer	(dá) ḟer
DAT	fiur	feraib	(dib) feraib

The Romanian data can still be described in terms of an epiphenomenon by natural class-based rules alone. The marker /-esc/ then must be the elsewhere marker:

(26) Vocabulary items for Romanian i-stem verbs with -esc/eşt-infix:
/-eşte/ ↔ [–1 –2 –pl]
/-iţi/ ↔ [+2 +pl]
/-im/ ↔ [+1 +pl]
/-eşti/ ↔ [+2 –pl]
/-esc/ ↔ [ ]

However, such an analysis is impossible in the case of Old Irish unless a special device (prioritised operation, α-notation) or a homonymous form /fir/ (or /fer/) is assumed, as the morpho-syntactic environments associated with /fir/ (and, likewise, /fer/) do not have a common value for any given feature.

I would like to put forth a uniform solution for full and partial polarity. So far, however, the new analysis can only satisfactorily account for polarity effects that constitute themselves in strict chessboard distributions of inflectional markers. The solution is a refined notion of Discreteness: recall from section 4.1 that in the new theory, paradigms "unfold" by first inserting the most specific vocabulary item into its morphosyntactic context, and then moving on to a contiguous cell, inserting the matching marker there, and so on; the transition from cell to cell is accomplished by a transition from node to node in the feature geometry. These node transitions are subject to the

Discreteness Principle, which requires adjacent nodes in the geometry to be marked discretely. Partial polarity effects can be integrated into the theory by assuming that the Discreteness Principle can be active only on certain node transitions.

Let me illustrate this by means of the Romanian and Old Irish data. In Romanian verb inflection, there are two basic patterns: pattern A shows number syncretism in the 3rd person; pattern B is constituted by a syncretism of the 1st singular and 3rd plural forms.[7] This is illustrated in tables 6 and 7:

Table 6

Romanian C-final A-stems (PATTERN I)

	SING	PLURAL
1	-ø	-ăm
2	-i	-aţi
3	**-ă**	**-ă**

	SING	PLURAL
1	A	D
2	B	E
3	**C**	**C**

Table 7

Romanian infixal I-stems (PATTERN II)

	SING	PLURAL
1	**-esc**	-im
2	-eşti	-iţi
3	-eşte	**-esc**

	SING	PLURAL
1	**A**	D
2	B	E
3	C	**A**

The feature geometry relevant to these data is given in (27):

(27) Romanian: feature geometry

SING:	PLURAL:	1ST:	2ND:	3RD:
ind	ind	part	part	part
|	|	|	|	
min	group	spk	addr	

The new assumption made is that for verb classes following pattern II there is a Discreteness constraint D_r on the transition SG → PL (i.e., [min → ind → group]):

(28) **Discreteness constraint for Romanian (D_r):**
[min → ind → group] must be discretely marked /__+V +y[8]

The paradigm generation proceeds analogously to Old French (cf. section 4.1), using the vocabulary items given in (29).

7. Pattern A occurs in a-stems, V-final i-stems, î-stems without infix, and some "irregular" verbs in the present indicative; Pattern B occurs in ea-stems, e-stems, C-final i-stems, i-stems with -esc/eşt-infix, î-stems with ăsc/ăşt-infix, and some "irregular" verbs in the present indicative.

8. y=class feature(s) defining verbs following pattern 2.

(29) Vocabulary items for Romanian I-stems with -esc/eşt-infix:

/-esc/ $\leftrightarrow$ [ind|min part|spk]	*(1 sg)*
/-eşti/ $\leftrightarrow$ [ind|min part|addr]	*(2 sg)*
/-im/ $\leftrightarrow$ [ind|group part|spk]	*(1 pl)*
/-iţi/ $\leftrightarrow$ [ind|group part|addr]	*(2 pl)*
/-eşte/ $\leftrightarrow$ [ ]	*(3)*

According to the vocabulary specifications, the marker for 3 PL is the elsewhere marker /-eşte/. However, the insertion of /-eşte/ is prevented by D_r. Now the Minimality Principle comes into effect. The candidates for filling the cell in question and their feature specifications are shown in table 8 (/-eşte/, which is not a possible candidate, is marked grey).

Table 8

Romanian Candidates for minimal discreteness

	SG	PL
1	/-esc/: ind (min), part (spk)	/-im/: ind (group), part (spk)
2	/-eşti/: ind (min), part (addr)	/-iţi/: ind (group), part (addr)
3	/-eşte/: ind (min), part	?: ind (group), part

The detection of a minimally distinct marker is accomplished by comparing the two nodes A=3 SG and B=3 PL between which Discreteness is violated. The constraint by which the minimally distinct marker /-c/ is detected is given in (30):

(30) **Minimal Distinctness**
A marker /c/ associated with a node C in the feature geometry is minimally distinct from two nodes A and B in the geometry iff.
a. C is reached from A by a node transition in a single dimension.
b. C retains at least 1 feature of B.

In the case of Romanian verb inflection, C has to be identical with A=3 SG in one dimension (30a). There are two specifications meeting this constraint, 1SG and 2SG. (30b), on the other hand, has no effect here: with B=3PL being underspecified for [part], all nodes that have a [part] dimension meet (30b). (30) thus does not help to decide between the candidates 1SG and

2SG. However, [part|spk] (1SG) is preferred over [part|addr] (2SG) because 'speaker' is the default interpretation for the organising node 'participant' (Harley and Ritter 1999). Consequently, the marker associated with 1SG is inserted into the 3PL context.
A question that comes up at this point is, why is it the NOM PL marker that is adjusted, and not the NOM SG marker? The answer is that the Discreteness constraint is defined only for the transition from singular to plural ([min→ind→group]), not for [group→ind→min]. Thus, the transition from 3PL to 3SG does not lead to a violation of D_r. The constraint will however not fail to apply, as each single possible node transition is used in the paradigm generation.

The polarity effect in the Old Irish nominal inflection constitutes itself in the *i/e* umlaut.[9] The analysis is based on the following feature geometry:

(31) Old Irish: feature geometry

SINGULAR: ind | min

PLURAL: ind | group

DUAL: ind (group, min)

NOMINATIVE: case | subj

ACCUSATIVE: case | obj

DATIVE: case | obj | obl

GENITIVE: case (subj, obj | obl)

For Old Irish masculine o-stems, too, there is a Discreteness constraint on the transition SG → PL ([min → ind → group]). As shown in (33), /fir/ is the marker for genitive singular, and /fer/ is the elsewhere marker.

(32) **Discreteness constraint for Old Irish (D_i):**
[min → ind → group] must be discretely marked /__+N +z[10] +m

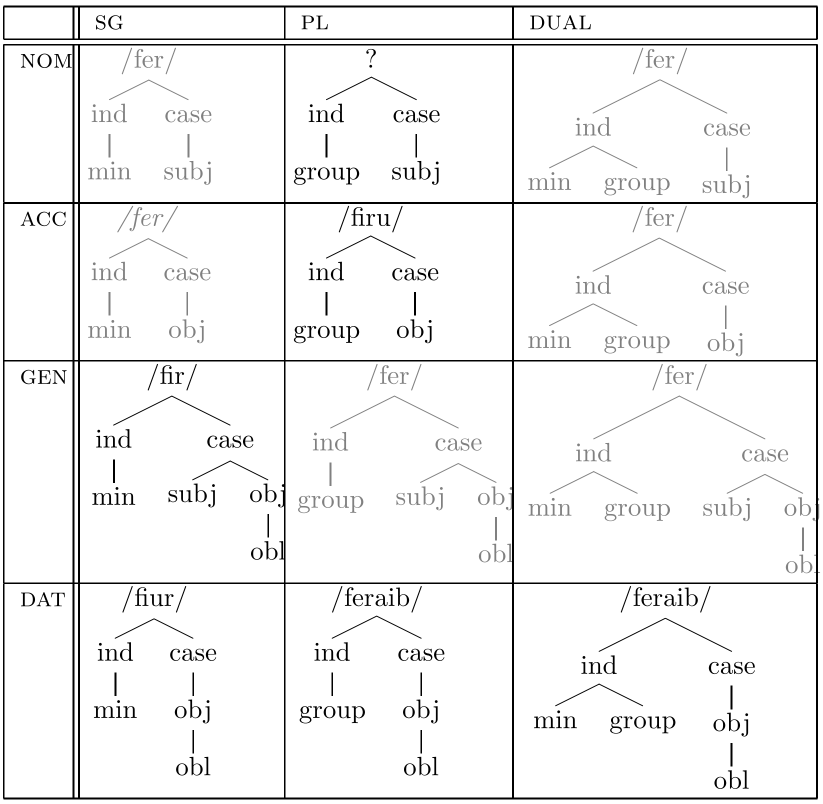
(33) Vocabulary items for Old Irish *fir* 'man':[11]

/fir/ ↔ [case|subj|obj|obl ind|min]	*(gen sg)*
/fiur/ ↔ [case|obj|obl ind|min]	*(dat sg)*
/feraib/ ↔ [case|obj|obl ind]	*(dat pl, dual)*
/firu/ ↔ [case|obj ind|group]	*(acc pl)*
/fer/ ↔ [case ind]	*(elsewhere)*

9. The umlaut is due to *i > *e /__ [ā̆/o in IE.
10. z= class feature(s) defining o-stems.
11. Though Old Irish masculine o-stems are arguably best analysed by means of subanalysis (/fir-/, /fer-/, /-aib/, /-u/), I will stick to the pattern instantiated by the whole word forms for the purpose of demonstration.

The only matching marker for both NOM SG and NOM PL is the elsewhere marker /fer/. The insertion of /fer/ in the context NOM PL however is banned by D_i, so that a different marker has to be chosen. As can be seen from table 9, the possible candidates are /firu/ (ACC PL), /fir/ (GEN SG), /fiur/ (DAT SG), and /feraib/ (DAT PL+DUAL). The other feature specifications fail to be legitimate candidates (and are thus marked grey), as they are associated with the marker /fer/, which is disallowed for insertion into the NOM PL context.

Table 9 *Old Irish*
Candidates for minimal discreteness



The marker for the NOM PL context is determined by the definition of Minimal Distinctness: The nodes that can be reached by A=NOM SG by node transitions in one dimension only are GEN SG and DAT SG (condition (30a); both are identical with A in their [ind|min] node, and there is no legitimate candidate which is identical with A in its [case|subj] node). Of those two, GEN SG wins, as it also has the features [case|subj] in common with NOM PL, whereas ACC SG has no feature in common with NOM PL (condition (30b)).

6 Consequences

The new analysis has a number of advantages. Firstly, only two insertion rules are needed to model full polarity effects, while the morphology is now making use of two principles, the latter of which is an independently well motivated assumption underlying syntactic derivations. Secondly, the choice of marker is predictable (in contrast to impoverishment rules or rules of referral, where the choice is to a high degree arbitrary). Thirdly, the analysis can be implemented in any morphological theory; it is fully compatible with lexical-incremental approaches (Lieber 1992; Wunderlich 1996), lexical-realisational approaches such as Distributed Morphology (Halle and Marantz 1993, 1994), and inferential-realisational approaches such as the Word-and-Paradigm model (Spencer 2001; Stump 2001). Fourthly, in this analysis, polar distributions of inflectional markers come for free as a systematic pattern.

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