# The Formal Typology of Morphological Polarity

**Abstract**

In this paper, I develop a set of formal categories to distinguish different types of morphological polarity. The goal is a taxonomy which allows to classify specific cases of polarity according to the degree of stringency they provide as evidence for polarity at a formal level. **Background Idea:** Suppose a learner of a language has to decide whether a given distribution of morphological marking is due to a polarity mechanism or some other device, which criteria would he use to choose the polarity analysis?

## 1. Morphological Polarity

## 2 Grammatical Status

**Syntactic Polarity:** In syntax, a syntactic constituent is associated to a morphosyntactic feature +F in the context +C, and to –F in the context of –C.

This type of phenomenon is rarely claimed to exist. An example is the inversion analysis of the Algonquian direct/inverse morphology by Rhodes (1976). Thus in a Menominee clause with a 2nd person subjuect and a third person object (2 → 3, (1a)), prefixal and suffixal number agreement is with the subject, and suffixal person agreement targets the object. In a 3 → 1 clause, the agreement targets are exchanged. Under a Rhodes-style analysis the agent argument is a subject in (1a) and an object in (1b), while the situation is reversed for the theme argument:

(1)     **Direct/Inverse Marking in Menominee** (Bloomfield, 1962)

     a.  **ke-na·n-a·-w-a·w**           'you (pl.) fetch him' (p. 153)
         2-fetch-D-[+3]-[-1+pl]
     b.  **ke-na·n-eko-w-a·w**       'he fetches you (pl.)' (p. 154)
         2-fetch-D-[+3]-[-1+pl]

**Morphosyntactic Polarity:** After syntax, but before morphological spellout, a syntactic constituent is associated to a morphosyntactic feature +F in the context +C, and to –F in the context of –C.

An example is Anderson (1992:172) who analyses Algonquian direct-inverse as the feature exchange of a nominative and an accusative head:

$$(2) \quad \left\{ \begin{bmatrix} +Nom \\ +Obv \end{bmatrix} \begin{bmatrix} +Acc \begin{matrix} +Obv \\ +Anim \end{matrix} \end{bmatrix} \\ \begin{bmatrix} +Nom \\ -1 \\ -2 \end{bmatrix} \begin{bmatrix} +Acc \left\{ \begin{matrix} +1 \\ +2 \end{matrix} \right\} \end{bmatrix} \right\}$$

$$[+\text{Nom 1}]\ [+\text{Acc 2}] \quad \rightarrow \quad [+\text{Nom 2}]\ [+\text{Acc 1}]$$
$$/\text{X}/ \quad\quad\quad\quad\quad \rightarrow \quad /\text{XukO}/$$

**Morphological Polarity:** A morphological marker M1 marks +F in the context +C, and –F in context –C, M2 marks –F in C1, and +F in C2.

(3)   **Partitive endings in Estonian**

|    | part sg | part pl |          |
|----|---------|---------|----------|
| a. | 'kool-i | 'kool-e | 'school' |
| b. | 'kukk-e | 'kukk-i | 'rooster' |

**Morphophonological Polarity:** A word form specified for the morphosyntactic feature +S has the phonological feature +F (–F), the corresponding word form specified for the morphosyntactic feature +S has the phonological feature –F (+F).

(4)   **Voicing Exchange in Luo [-voiced] → [+voiced]**

|    | sg    | pl     |               |                        |
|----|-------|--------|---------------|------------------------|
| a. | bat   | bed-e  | 'arm'         | (Okoth-Okombo, 1982:30) |
| b. | luθ   | luð-e  | 'walking stick' | (Okoth-Okombo, 1982:30) |
| c. | ari:p | ari:b-e | 'milky way'  | (p. 128)               |
| d. | guok  | guog-i | 'dog'         | (Okoth-Okombo, 1982:30) |

(5)   **Voicing Exchange in Luo [+voiced] → [-voiced]**

|    | sg     | pl      |           |                        |
|----|--------|---------|-----------|------------------------|
| a. | ki:dí  | kí:t-ê  | 'stone'   | (p. 128)               |
| b. | ɔkɛ̂:bɛ | okɛ́:p-ɛ̂ | 'tin can' | (p. 127)               |
| c. | cogo   | cok-e   | 'bone'    | (Okoth-Okombo, 1982:30) |

**Phonological Polarity:** An underlying phonological feature +F (–F) is changed to –F (+F) in a specific phonological context.

(6)   **Vowel Polarity in Zok Armenian** (Fitzpatrick et al., 2004)

| | **kov** | kovar | **tun** | tunar | sar | sarar | tandz | tandzar | ʒam | ʒamar |
|---|---|---|---|---|---|---|---|---|---|---|
| OA-PENULT | - | kavar | - | - | - | - | - | - | - | - |
| α | kuv | - | ton | - | - | - | - | - | - | - |
| AU- NASAL # | - | - | - | - | - | - | tundz | - | ʒum | - |
| low → round σ# | - | - | - | - | sor | - | - | - | - | - |
| UO-NASAL-PENULT | - | - | - | tonar | - | - | - | - | - | - |
| | **kuv** | kavar | **ton** | tonar | sor | sarar | tundz | tandzar | ʒum | ʒamar |

(7)   **The Taiwanese Tone Circle** (Moreton, 1996)

| | | |
|---|---|---|
| Environment 1 | [32] | [54] |
| Environment 2 | [54] | [32] |

**Ambiguous Cases**

- Algonquian Direct/Inverse is ambiguous between syntactic and morphosyntactic polarity (obvious from the different analyses by Rhodes (1976) and Anderson (1992)).

- Theme Vowel Polarity in Spanish is treated as morphological polarity in Fitzpatrick et al. (2004), but could be treated as morphophonological polarity.

(8)   **Theme Vowel Polarity in Spanish**

| | **hablar** 'talk' | | **temer** 'fear' | | **vivir** 'live' | |
|---|---|---|---|---|---|---|
| pres. ind. | hablo | hablamos | temo | tememos | vivo | vivimos |
| | hablas | habláis | temes | teméis | vives | viv[i]ís |
| | habla | hablan | teme | temen | vive | viven |
| pres. subj. | hable | hablemos | tema | temamos | viva | vivamos |
| | hables | habléis | temas | temáis | vivas | viváis |
| | hable | hablen | tema | teman | viva | vivan |

"One might treat this phonologically: a → e/[subjunctive], but we must ask under such an account: why i → a and not i → e? Why e → a and not e → i? etc..." (Fitzpatrick et al., 2004:4)

**Antifaithfulness Analysis for Spanish:**

(9)     **a → e**

| Base/Input: [a] | ¬IDENT [low] | IDENT [hi] | IDENT [rd] |
|---|---|---|---|
| ☞     a. [e] | | | |
| b. [o] | | | *! |
| b. [i] | | *! | |
| c. [a] | *! | | |

(10)     **e → a**

| Base/Input: [e] | ¬IDENT [low] | IDENT [hi] | IDENT [rd] |
|---|---|---|---|
| ☞     a. [a] | | | |
| b. [o] | *! | | * |
| b. [i] | *! | * | |
| c. [e] | *! | | |

(11)     **i → a**

| Base/Input: [e] | ¬IDENT [low] | IDENT [hi] | IDENT [rd] |
|---|---|---|---|
| ☞     a. [a] | | * | |
| b. [o] | *! | | * |
| b. [i] | *! | * | |
| c. [e] | *! | | |

## 3 Zeroicity

In a number of formal approaches to morphology, syncretism involving zero marking has a quite distinct status from other syncretism. For example in Distributed Morphology, zero marking can have at least the following three sources: (1) a morphological category is expressed by a zero VI (affix, hence -Ø or Ø-). (2) an impoverishment rule blocks insertion of an otherwise expected VI. (3) the lexicon of the language doesn't contain an appropriate VI for a specific head which therefore remains empty.[1]

Now consider polarity of gender marking in Hebrew: the suffix **-a** marks feminine gender in adjectives, but masculine gender in numbers. Zero marking appears with masculine gender in adjectives, but for feminine gender in numbers:

(12)    **Hebrew Gender Marking in Adjectives (Baerman, 2007:34)**

| **Masculine** | | **Feminine** | |
|---|---|---|---|
| davar-Ø | tov-Ø | tmun-a | tov-a |
| word(M)-sg | good-M | picture(F) | good-F |
| 'good word' | | 'good picture' | |

(13)    **Hebrew Gender Marking in Numerals (Baerman, 2007:34)**

| **Masculine** | | **Feminine** | |
|---|---|---|---|
| ʃloʃ-a | dvar-im | ʃaloʃ-Ø | tmun-ot |
| three-M | word(M)-pl | three-F | picture(F)-PL |
| 'three words' | | 'three pictures' | |

In the construct state the pattern is the same with the exception that **-a** is replaced by **-at/-et**:

(14)    **Hebrew Gender Marking in the Construct State (Baerman, 2007:34)**

| **Adjective** | | | **Numeral** | | |
|---|---|---|---|---|---|
| medina | aʃir-at | neft | ʃloʃ-et | ha | jelad-im |
| country(F) | rich-F:CNST | oil | three-M:CONST | the | boy(M)-PL |
| 'a country rich in oil' | | | 'the three boys' | | |

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[1]It is not entirely clear from the DM literature whether the last option is assumed to be possible or not. Alternatively one might assume that languages contain zero VIs for all cases where no other VI can be inserted.

(15) sketches a possible DM analysis ("CS" stands for whatever functional category licenses the construct state).

(15)   **Impoverishment Rule:** $[+\text{fem}]_{\text{Agr}} \rightarrow \emptyset$ /[  $]_{\text{Num}}$——

(16)   **Vocabulary Items:**

  a. $[-\text{fem}]_{\text{Agr}}$   $\leftrightarrow$   -Ø   /[  $]_{\text{Adj}}$——
  b. [  $]_{\text{Agr}}$        $\leftrightarrow$   -At   /CS——
  c. [  $]_{\text{Agr}}$        $\leftrightarrow$   -a

In this analysis, there is nothing special which couldn't be found in DM analyses of non-polarity phenomena. That there is no polarity here at the formal level follows from the underspecification of **-a/-At** which enforces these markers to appear whenever no other VI can be inserted, and the fact that Ø is introduced at two different occasions through impoverishment an d through a specific VI. Since there is no requirement in DM that Ø should only be introduced at one place in the morphological component of a language, the possibility of the analysis in (16) strfaightforwardly derives from the formal possibilities inherent in DM. Actually (16a) could also be reformulated as the impoverishment rule in (17), which would be equally possible since there is also no theory-internal ban in DM against a language with more than one impoverishment rule:

(17)   **Impoverishment Rule:** $[-\text{fem}]_{\text{Agr}} \rightarrow \emptyset$ /[  $]_{\text{Adj}}$——


Now imagine a language Hebrew' which uses the affix **-da** in every context where numerals and adjectives in Hebrew have a zero marker. In Hebrew'' cannot be inserted by impoverishment since impoverishment rules cannot introduce phonological material by definition. We could stipulate a list of VIs as in (18):

(18)   **Vocabulary Items:**

  a. $[-\text{fem}]_{\text{Agr}}$   $\leftrightarrow$   -da   /[  $]_{\text{Adj}}$——
  b. $[+\text{fem}]_{\text{Agr}}$   $\leftrightarrow$   -da   /[  $]_{\text{Num}}$——
  c. [  $]_{\text{Agr}}$        $\leftrightarrow$   -At   /CS——
  d. [  $]_{\text{Agr}}$        $\leftrightarrow$   -a

However, (18) contains two homophonous VIs for **-da**, an option which many DM-morphologists consider to be marked.

## 4   Categoricity

Many morphological analyses implicitly embrace the assumption that the inflection of different syntactic categories (parts of speech) form different morphological subsystems. For example

there is usually no attempt to unify partial syncretism (i.e., phonologically identical affixes) between nouns and verbs.[2] Under the premise that syncretism across parts of speech is not theoretically significant, polarity across categories is not true polarity. A simple example is the English suffix /-z/ (contrasting to Ø) which expresses plural in nouns but, singular in verbs:

(19) **Number Polarity in English**

|  | sg | pl |
|---|---|---|
| **Nouns** | -Ø | /-z/ |
| **Verbs (3rd person)** | /-z/ | -Ø |

A second case is Hebrew gender marking discussed above, where **-a** marks feminine in adjectives, but masculine in numerals. Of course the theorist might take the position that specific parts of speech form macro-systems which require a unified analysis while other ones do not. Thus Müller (2002) provides a unified analysis of the inflectional markers in German adjectives and determiners (hence the suffix **-n** in determiners is formally the same element as the homophonous suffix in determiners), but refrains from extending this to the verbal domain (which also uses **-n** in different contexts). Similarly one could argue that noun-modifying categories such as numerals and adjectives form amorphological domain, while nouns and verbs do not.

## 5 Range

English number polarity has another suspicious property: It applies only to a single pair of markers (/z/ ↔ Ø). In contrast, number polarity in Nehan comprises three different pairs of markers (a ↔ o, me ↔ mo, tar ↔ toro):

(20) **Articles in Nehan**

|  |  | sg | pl |
|---|---|---|---|
| **indefinite** | **Class A** | me | mo |
|  | **Class O** | mo | me |
| **topic/subject definite** | **Class A** | a | o |
|  | **Class O** | o | a |
| **non-topic/subject definite (default)** | **Class A** | tar | toro |
|  | **Class O** | toro | tar |

More generally, if a morphological polarity pattern is abstractly represented as a set of marker pairs, we might call the cardinality of this set the *range* of the polarity pattern. The larger the

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[2]Cf. e.g. Carstairs-McCarthy (1998) who discusses verb agreement in Hungarian without even mentioning that person and number is largely expressed by the same markers in nominal possessor forms with important differences in the details of distribution (see Trommer, 2003) for a critique and a unified analysis. In the phonological literatur there is more explicit discussion of the idea that nouns and verbs might form (partially) distinct grammatical subsystems. Cf. e.g. Smith (2001).

range of a pattern, the more reliable is it as true polarity. The English pattern has range of cardinality 1, Nehan a range of cardinality 3, and the Spanish indicative-subjunctive pattern also a range of cardinality 3 (e ↔ a, i ↔ a, a ↔ e). Abstracting away from syncretism and allomorphy, Amadiya has a range of cardinality 9.

Of course, the range of a polarity relation depends on the exact morphophonological analysis. Thus one might provide a relatively abstract (sub-)analysis for Nehan along the following lines, assuming that radically underspecified vowels, inherit the quality of an affixal **o** either by merging or by harmony, and are realized by **a** in the default case, while [–cons –high –low] is merged with **o** if present, and otherwise realized as **e**:

(21)    **Abstract Analysis for Nehan**

| | | |
|---|---|---|
| Number | ↔ | -Ø/-o |
| Indefinite | ↔ | m[–cons –high –low] |
| non-topic/subject definite (default) | ↔ | t[-cons]r |
| topic/subject definite | ↔ | [-cons] |

Under this analysis, polarity is only between **-Ø** and **-o**, and Nehan has a range of cardinality 1.

A straightforward consequence from a low range value of a polarity phenomenon is that a non-polarity analysis is possible which requires only a minimal amount of accidental homophony. Consider the following stem vowel alternation in Tiberian Hebrew:

(22)    **Stem Vowel Polarity in Tiberian Hebrew** (Chomsky and Halle, 1968:356)

| | Alternation | Perfect | Imperfect | |
|---|---|---|---|---|
| a. | a → o | lam**a**d | jilm**o**d | 'learn' |
| b. | o → a | qat**o**n | jiqt**a**n | 'be small' |
| c. | e → a | zaq**e**n | jizq**a**n | 'age' |

Assuming that these vowels are class markers, a non-polarity analysis could be given as follows:

(23)    **Analysis of Tiberian Hebrew Stem-Vowel Allomorphy**

| | | |
|---|---|---|
| Class1 | ↔ | o /__Imperfect |
| Class2 | ↔ | o /__Perfect |
| Class3 | ↔ | e /__Imperfect |
| Class | ↔ | a |

If you are not a radical advocate of the *Syncretism Principle* (Müller, 2005) this minimal amount of homophony might be a perfectly tolerable price to pay for avoiding a polarity analysis.

## 6  Predictability

If a speaker (or learner) of Nehan knows the appropriate article for a class-A noun with a given number he can predict to a high degree what the article for an O-class noun with the same number specification is. Knowing that the singular/plural contrast for indefinite A-class nouns is expressed by the contrast me-mo, the speaker can infer that this contrast for an O-class noun is encoded by mo-me. The higher the percentage of pairs is where the distribution of A-class articles predicts correctly the prediction of the O-class article the liklier is it that the speaker learner interprets polarity as aplausible rule. Consider now the full set of A-class/O-class contrasts:

(24)  **Articles in Nehan**

|  |  | **sg** | **pl** |
|---|---|---|---|
| **indefinite** | **Class A** | me | mo |
| | **Class O** | mo | me |
| **topic/subject definite** | **Class A** | a | o |
| | **Class O** | o | a |
| **non-topic/subject definite (default)** | **Class A** | tar | toro |
| | **Class O** | toro | tar |
| **non-topic/subject definite (human)** | **Class A** | tar | toso |
| | **Class O** | toro/tang | tasir |
| **non-topic/subject definite (body parts)** | **Class A** | tar | tar |
| | **Class O** | toro | tar |
| **non-topic/subject definite (animate)** | **Class A** | tar | tasir |
| | **Class O** | toro/tang | tasir |

There are 6 different cases which would allow to infer O-class from A-class behaviour, but in only three of them the distribution of the A-class allows to infer the distribution of the O-class. Hence we might say that the predictive value of a polarity strategy is 3/6 (50%).

Something similar holds for Estonian, where the singular allows only in on e half of the data in (25) to predict the plural:

(25)  **Partitive Endings in Estonian**

|  | **part sg** | **part pl** |  |
|---|---|---|---|
| a. | 'kool-i | 'kool-e | 'school' |
| b. | 'kukk-e | 'kukk-i | 'rooster' |
| c. | lukk-u | lukk-e | 'lock' |
| d. | mokk-a | mokk-i | 'lip' |

## 7 Productivity

A learner might plausibly refuse to acquire rules which apply only to a restricted and finite set of lexemes. Thus polarity in Tübatulabal aspect is restricted to a closed set of 30 verbs. Put another way lexeme identity might not be considered an appropriate context for polarity.

## 8 Types of Morphophonological Polarity

### 8.1 Length Polarity:

**Dinka Antipassive:** "This prediction is borne out by data from the Antipassive in Dinka (Andersen 1995). In the 'CVVC/H' class, the antipassive morpheme adds a floating mora to roots with a monomoraic vowel, but shortens roots with bimoraic vowels to being monomoraic, even though Dinka does have trimoraic vowels." (Wolf, 2005:56)

**Comment:** It is very hard to identify the alleged length polarity in the data and the description of (Andersen, 1995:43). 'CVVC/H' is the class of underlying H-tone roots with a long vowel, and according to Andersen, Dinka has no verbs with underlying H-tone and short vowels.

**Plural in Dinka, Nuer, and other Nilotic Languages:**

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