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Ways of morphologizing phonological rules

0 The borderlines of the extensive field of historical morphology are quite naturally marked by the phenomenon of formation of morphological regularities on the one hand and the phenomenon of decay of morphological regularities on the other. Both by the development of new morphological rules and by the elimination of existing morphological rules morphological systems are changed. Last but not least the historical transitions between various morphological-syntactic language types such as the isolative, agglutinative and inflective language type are induced by the formation or decay of certain types of morphological regularities. This is why problems of the formation or decay of morphological regularities and their consequences for the morphological system concerned are in the centre of a theory of morphological change, although such processes develop on the fringe of the morphological component of the language system exactly in the sense that here morphological facts and principles interact either with phonological or with syntactic facts and principles. From the latter it follows that such problems are relevant not only for a theory of morphological change. They hold for a field of facts which show especially clearly how the individual components of the language system with their different and partly contradictory principles not only interact but also counteract, which among other things makes up the specifics of natural language as against all formal constructed language and semiotic systems. The question of how the formation and decay of morphological rules proceeds within the field of tension among various components is thus at the same time aimed at essential characteristics of structure and function of the entire language system.

Below an important partial aspect of this question shall be discussed, namely the development of phonological rules to morphological rules within the history of language — in other words: the morphologization of phonological rules.

1 A question decisive for classifying and assessing the phenomenon of morphologization, which again and again crops up in the discussion of
these problems either explicitly or implicitly, is that of its cause: For which reasons are phonological rules morphologized at all, what is the 'driving force' in processes of morphologizing?

The answers to these questions are highly different. With all their difference, however, it is largely common to them that either largely phonological or largely morphological causes are quite one-sidedly advanced for morphologization and that the alternative aspect is underrated in its relevance. Cp. a recent controversy: Mayerthaler (1977, esp. p. 116ff.) takes the view that, due to intraphonological developments — the telescoping of rules is treated in great detail — phonological rules lose phonological naturalness, degenerate as it were and for this reason can then be morphologized. This view is discussed by Dressier (1977a:27ff.), who in his turn assumes that, in case of morphologizing, always morphology is the 'driving force'.

Both views represent only half the truth, for even a superficial consideration shows that evidently all processes of morphologization are more or less complex interactions of both phonological and morphological principles and developments. In addition the share of both aspects can apparently be quite different from case to case. For these reasons it is recommendable to be careful about statements on "the" cause of morphologizing and, instead, to analyze and assess cases of morphologizing as different as possible in their specific parameters.

In this sense three cases of morphologizing phonological rules shall be studied in greater detail below and the role of phonological and morphological factors in them.

2 Before studying individual cases, the morphologization of a phonological rule shall be outlined: morphologizing, as we understand it, holds whenever a rule, which so far has held for an operation of permutation, insertion or deletion in a phonological context P, changes in a way that it holds for the same operation (not necessarily only this one) or its inversion¹ in a context of grammatical categories C. A rule, whose original (more or less preserved) function it was to adapt a set of phonetic sequences to human speech organs, takes over the basically new function of formally marking grammatical categories in words.² Thus the complete or partial phonetic motivation of the rule is substituted by a semiotic motivation.³

In this connection also the question arises of the relationship between morphologization and morphonologization as well as of the delimitation of morphological (MR) and morphonological rules (MPR). In general morphologizations begin as morphonologizations. The introduction of grammatical categorial features into the context of a phonological rule as
well as the introduction of other non-phonetic characteristics (features of lexical rules, features of syntactic word classes, morphemic boundaries, etc.) implies a restriction of the phonetic motivation of the rule, a reduction of its phonological naturalness. It is evident that morphonologizing may lead to morphologizing only under certain preconditions. The transition from an MPR with partially grammatical context to an MR can be roughly located where the last remainder of the sequential phonological environment is deleted from the context of the rule. In this way the rule becomes free for categorial marking independently of phonological context conditions.4

3.1 Case 1: Morphologization of the “ir-rule” in Old High German

In a language state (A), which corresponds to reconstructed Proto-Germanic, the so-called s-stems — neuters of the *lambiz ‘lamb’ type — are roughly inflected as follows:

(A) N. Sg. lamb + iz  
G. lamb + iz + aza  
D. lamb + iz + ai  
A. lamb + iz  

(The instrumental, which does not play any role below, is neglected.) The morpheme /iz/ occurs in all forms of the paradigm. Thus it can be identified as a fully intact element of stem formation and is part of the lexical representation of the words concerned which, at this stage of development, has the form ///lamb//Rir/St/N. The occurrence of the morpheme /iz/ is lexically determined.5

In the transition to a language state (B), which can be most adequately called Pre-Old High German, the final element /iz/ is decomposed in two steps. To be more exact: There are two phonological changes based on the phonological process of reduction of phonological substance in unstressed syllables. They induce certain resegmentations in lexical units of other inflectional classes and in inflectional rules which are not of interest here. It is decisive that the phonological changes are reflected in the following natural phonological rules (NPR):

(a) z → Ø / VCV ___ #.  
(b) i → Ø / Σ ___ #.

At first a [z] is deleted at the end of all bi- and polysyllabic words, then final [i] as well, if preceded by a long syllable. In addition phonological substance is decomposed also in the case-number inflectional
morphemes of the *s*-stems and the voiced spirant [z] turns to the sonorant [r].

Due to these developments the discussed paradigm in Pre-Old High German runs as follows:

(B)  

<table>
<thead>
<tr>
<th></th>
<th>N. Sg.</th>
<th>Pl.</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.</td>
<td>lamb + ir + as</td>
<td>lamb + ir + o</td>
</tr>
<tr>
<td>D.</td>
<td>lamb + ir + a</td>
<td>lamb + ir + um</td>
</tr>
<tr>
<td>A.</td>
<td>lamb</td>
<td>lamb + ir + u</td>
</tr>
</tbody>
</table>

The lexical representations in terms of ///lamb/\_ir/\_N are preserved after the developments described; however, the occurrence or non-occurrence of the morpheme /ir/ at phonetic level now depends on conditions of phonological context.

The rule (b) does not for long remain an NPR. Due to the shortening of final [i], new instances of [i] develop in final position, cp. e.g. *gasti ‘guests (N. Pl.)’ or nāmi ‘I/he would take’ from *gastiī and *nāmī. The development of such counterinstances, however, does not lead to the decay of rule (b), for the corresponding paradigms show that the [i] is phonetically but not phonologically lost. A corresponding shortening rule is introduced into the language system, which follows deletion rule (b). Thus the latter becomes an opaque (non-transparent) rule, i.e. an MPR.

Rule (b) has lost in phonological naturalness.

Next the short-syllable words of the *ir*-set such as *blati ‘leaf’ which had originally preserved their final [i] join the “surface inflection” of the lamb type with N./A. Sg. without ending. They, too, now occur in terms of blat etc. As in other inflection classes where forms with [i] and without [i] co-occur, namely in masculine and feminine *i*-stems, there is also a levelling out in favour of the long-syllable [i]-less variant (cp. gast/*bi3i ‘bite’ > gast/bi3, anst ‘favour’/*5iaf/ ‘place’ > anst/stat), rule (b) is extended in its context? (b')  

\[ i \rightarrow \emptyset / VC \rightarrow \#. \]

The cause of this context extension is of morphological nature; there is a levelling out of two subclasses within one class of inflection. The development of the rule from (b) to (b'), however, proceeds according to purely phonological parameters, no morphological conditions being introduced into the rule. The reason for further development of the rule towards morphologizing is therefore not the influence of morphological factors but the repeated decay of phonetic motivation and this is a phonological factor.
Along with further phonological changes and the analogous influence of other inflectional classes the context extension of $i$-elimination finally causes the $i$-stems to be relexicalised according to the principle $/\text{gast} /_{R_t}/s_i/N > /\text{gast} /_{R_t}/s_i/N$ and thus leave the application range of rule (b').

Thus the two phonological rules (a) and (b') hold for the same set of cases and are always applied in common: If the [r] is deleted the [i] is also deleted. They can no longer be identified by the speakers as two separate operations, i.e. individual rules, and telescope to form a uniform MPR (simultaneously realizing the change from [z] to [r]):

$$(a/b') \quad \text{ir} \rightarrow \emptyset / \text{VC} \#.$$  

By telescoping, the phonological naturalness which is weakened anyway in (b') is further restricted, for the elimination of two segments at the same time is certainly less natural than that of one segment. On the other hand it should be noted that in contrast to (b'), MPR (a/b') is no longer opaque, it covers all surface instances of [ir], apart from few exceptions such as $\text{ahir}$ 'ear (of corn)' and $\text{trestir}$ 'drift'.

The phonological process of reducing unstressed syllables continues. Final [u] from Proto-Germanic [ô] is deleted. This is the transition to a language state (C), which we want to call Early Old High German. The mentioned change which decomposes the case marker of N./A. Pl. in this and other inflectional classes, along with further reductions of other case markers, leads to the paradigm:

<table>
<thead>
<tr>
<th></th>
<th>N. Sg.</th>
<th>P.</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.</td>
<td>lamb</td>
<td>lamb + ir + o</td>
</tr>
<tr>
<td>D.</td>
<td>lamb + ir + e</td>
<td>lamb + ir + um</td>
</tr>
<tr>
<td>A.</td>
<td>lamb</td>
<td>lamb + ir</td>
</tr>
</tbody>
</table>

At this stage of development a decisive change occurs: with the total loss of final [u] the phonological conditions are lost, based on which the alteration of [ir] $\sim \emptyset$ has functioned so far. In other words: The instances of [ir] in the paradigm can no longer be determined on the basis of phonological parameters. The generation of speakers having to learn the paradigm (C) without the inflectional morpheme /u/ of the N./A. Pl. cannot but acquire the distribution of [ir] in the inflected forms on the basis of given morphological parameters. They learn that the morpheme /ir/ occurs within the paradigm in the G./D. Sg. and the entire Pl. but not else. This means that they interpret the morpheme as an inflectional suffix introduced by an inflection rule. In this way there is a simultaneous relexicalisation of words eliminating [ir] from the lexical representation,
//lamb//ir//St//N becomes //lamb//ir//St//N. As thus the formal marker of the class has been deleted, the speakers have now to learn in detail for which neutral nouns the rule applies. They are characterised in the lexicon by a special morphological feature [+ ir-Inflection]. The inflection rule which, due to the specific conditions of the change discussed here, represents an inversion of the rule (a/b'), has the form:

\[(a/b'') \emptyset \rightarrow \begin{cases} 
[+ \text{Plural}] \\
[+] \text{Gen} \\
[+] \text{Dat}
\end{cases} \rightarrow [\text{ir-Inflect}] \quad /\text{St}\rightarrow /\text{N}.
\]

This rule is no longer an MPR. It represents the transition to an MR.

It is easy to see that the inflective paradigm (C) is rather unsystematic from a morphological point of view: The new inflectional morpheme /ir/ occurs not only in the category of Pl., where it takes the function of the only morphological categorial marker in the N./A. It redundantly occurs also in the G./D. Sg. which disturbs the formal uniformity of the Sg. Due to a corresponding morphological change the paradigm is systematised. The transition to language state (D), the Old High German, has been completed:

\[(D) \quad \begin{cases} 
\text{N. Sg.} & \text{lamb} \\
\text{G.} & \text{lamb} + es \\
\text{D} & \text{lamb} + e \\
\text{A.} & \text{lamb}
\end{cases} \rightarrow \begin{cases} 
\text{Pl.} & \text{lamb} + ir \\
\text{lamb} + ir + o \\
\text{lamb} + ir + um \\
\text{lamb} + ir
\end{cases}
\]

The morpheme /ir/ becomes the uniform plural marker for all cases. Thus it is the first plural marker in the German inflection system which has become independent of case marking. This is clearly expressed by the systematised rule of inflection

\[(a/b'') \emptyset \rightarrow \begin{cases} 
[+ \text{Plural}] \\
[+ \text{ir-Inflect}]
\end{cases} \quad /\text{St}\rightarrow /\text{N}.
\]

In the following centuries and particularly in Early New High German, this morphological rule is extended to many other nouns.

3.2 Case 2: Morphologization of the Old High German umlaut rule in two masculine classes of inflection

In Early Old High German, which represents language state (A) in this
connection, the distribution of umlauted and non-umlauted forms in the masculines of the \(i\)- and \(n\)-inflection is as follows:

<table>
<thead>
<tr>
<th></th>
<th>N. Sg.</th>
<th>G.</th>
<th>D.</th>
<th>A.</th>
<th>I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>gast</td>
<td>gastes</td>
<td>gaste</td>
<td>gast</td>
<td>gestiu</td>
</tr>
<tr>
<td></td>
<td>PI. gesti</td>
<td>gestio</td>
<td>gestim</td>
<td>gesti</td>
<td>—</td>
</tr>
<tr>
<td>(2)</td>
<td>hano</td>
<td>henin</td>
<td>henin</td>
<td>hanun</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Pl. hanun</td>
<td>hanöno</td>
<td>hanön</td>
<td>hanun</td>
<td>—</td>
</tr>
</tbody>
</table>

Quite "lautgesetzlich", there is umlaut in the \(i\)-stems of the type *gast* 'guest' in the I. Sg. and in the entire Pl., in the \(n\)-stems of the type *hano* 'cock' in the G./D. Sg. The umlaut rule, at this time still an NPR, accordingly functions purely phonologically. Neglecting details (such as umlaut preventing consonant groups), it can be outlined as:

\[
(c) \quad V \mapsto \breve{V} / \quad \begin{bmatrix}
- \text{consonant} \\
- \text{back} \\
+ \text{high}
\end{bmatrix}
\]

A (back) vowel changes to the corresponding front one if, separated by one or several consonants, it is followed by an [\(i\)] or [\(j\)]; cp. the paradigms.

The further development leading to Later Old High German, the language state (B), is characterised by the fact that, by morphological levelling, the umlauted forms disturbing the paradigm — the I. Sg. of masculine \(i\)-stems and the G./D. Sg. of masculine \(n\)-stems — are decomposed and substituted by non-umlauted forms. Thus the paradigms *gast* and *hano* change as follows:

<table>
<thead>
<tr>
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<th>G.</th>
<th>D.</th>
<th>A.</th>
<th>I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(B)</td>
<td>gast</td>
<td>gastes</td>
<td>gaste</td>
<td>gast</td>
<td>gestiu</td>
</tr>
<tr>
<td></td>
<td>PI. gesti</td>
<td>gestio</td>
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<td>gesti</td>
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<td>hano</td>
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<td>—</td>
</tr>
<tr>
<td></td>
<td>Pl. hanun</td>
<td>hanöno</td>
<td>hanön</td>
<td>hanun</td>
<td>—</td>
</tr>
</tbody>
</table>

After the morphological change, a non-umlauted Sg. faces a umlauted Pl. in the paradigm of the type (1), in the type-(2) paradigm umlaut has been entirely lost. This means that the umlaut rule has been restricted by non-phonological features. The mentioned cases are explicitly excluded from umlaut:
This rule is no longer an NPR but an MPR with non-phonological features, which guarantee the non-application of the rule under certain morphological conditions. Therefore these conditions are negative in their nature ("if not ...") even if, from the formal aspect, they can be formulated in positive terms. After this morphological levelling back vowels ([a] in our examples) may come to stand before [i] or [j] in certain contexts. The phonological naturalness of the rule is restricted but it further has a phonetic motivation: Back vowels, even if no longer all of them, become their front counterparts before [i]/[j].

For the further development of the rule (c') it is decisive that within a phonological change based — as the phonological changes in the discussed Case 1 — on the phonological process of reducing unstressed syllables all short unstressed vowels become [ə]. This also holds for umlaut-effecting [i]. Consequently, in language state (C), Middle High German, gast and hane are inflected:

<table>
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<tr>
<th></th>
<th>(C)</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(1) N. Sg. gast</td>
<td>Pl. geste</td>
<td>(2) N. Sg. hane</td>
</tr>
<tr>
<td>G.</td>
<td>gastes</td>
<td>geste</td>
<td>G.</td>
</tr>
<tr>
<td>D.</td>
<td>gaste</td>
<td>gesten</td>
<td>D.</td>
</tr>
<tr>
<td>A.</td>
<td>gast</td>
<td>geste</td>
<td>A.</td>
</tr>
</tbody>
</table>

The Instrumental no longer exists as a grammatical category. With unstressed short vowels coinciding in [ə], the phonological environment of the rule (c') is lost and thus its phonetic motivation — the rule has become an MR. It now contains the positive specification of the categories for whose forms it holds, among others, for those of the Plural of masculine i-stems. The n-stems, however, which no longer alternate between umlauted and non-umlauted forms after levelling, no longer occur in the rule:

(c'') \[ V \rightarrow \tilde{V} \mid \{ + \text{Masculine} \} \]

The non-phonological features no longer prevent the application of the
rule but effect its application. Instead of the condition “not in the Singular” there is now the positive condition “in the Plural”. As (c) was a phonological modificatory rule, the rule (c") is a modificatory MR. It has an exclusively semiotic motivation. It is extended to many cases which it did not cover as phonological rule, even today it is still extending its domain within certain morphological classes.

The original phonological umlaut rule (c) caused alternations not only in the two mentioned inflectional classes but also in a number of others. At the loss of conditioning segments it is therefore subject to a number of other morphologizations of our Case 1 type. They will not be studied in detail here. It is essential, however, that the uniform umlaut rule is thus split up into various MRs, which is, as it were, a counterpart of rule telescoping.

3.3 Case 3: Morphologization of the Old Icelandic i-umlaut rule in the present indicative singular of strong verbs

After the occurrence of the i-umlaut in Proto-Norse the long-syllable strong verbs with umlautable root vowel such as *blóta (n) (Old Icelandic blóta) sacrifice are conjugated as follows in the Present Indicative:

\[
\begin{align*}
\text{(A)} & \quad 1. \text{Ps. Sg.} & \text{blótu} & \quad \text{Pl.} & \text{blótaum} \\
2. \text{Ps.} & & \text{blótiiR} & & \text{blótii} \\
3. \text{Ps.} & & \text{blótiiR} & & \text{blóta(n)}
\end{align*}
\]

For the language state (A) the distribution of the forms with umlauted and non-umlauted vowels within the paradigm — as i-umlaut in general — is determined by a respective phonological rule which at this time most probably still represents an NPR:

\[
\begin{align*}
(d) & \quad V \rightarrow \check{V} / \left[ \begin{array}{c}
+ \text{long} \\
C_1 \\
\text{consonant}
\end{array} \right] \left[ \begin{array}{c}
- \text{back} \\
\text{C}_2 \\
+ \text{high}
\end{array} \right]
\end{align*}
\]

Before [i] or [j] of the following syllable, vowels in long syllables are umlauted to the respective front ones.

Probably very early — and therefore when the vowels of final syllables [i] and [u] were still preserved — there is a morphological adjustment of the root vowel of the 1st Pers. Sing. to the forms of the two other Persons of the Singular. The umlaut is extended within the paradigm according to morphological criteria. Thus the transition to language state (B) has been completed. The paradigm now runs as follows:
Due to this morphological change the umlaut rule (d) becomes an MPR, which functions partially on the basis of positive morphological conditions:

\[(d') \ V \rightarrow \ \hat{V} / \left\{ \begin{array}{l}
+ \text{present} \\
- \text{plural} \\
- \text{subjunctive} \\
+ \text{strong} \\
- \text{consonant} \\
- \text{back} \\
+ \text{high}
\end{array} \right\} X / V\]

This MPR (which is a little difficult to formulate) means that a back vowel is umlauted in a long syllable if it occurs in the Pres. Indic. Sing. of a strong verb or if it is followed by a [i]/[j].

In the next step, the so far umlaut-effecting [i] is eliminated as well as the final [u] of the 1st Pers Sing. Besides, runic [R] changes to [r] and [Ö] to [£]. In this language state, Old Icelandic, the verb \textit{blóta} is conjugated in the Present Indicative as follows:

\[(C) \ 1. \ Sg.\ \textit{blót} \quad \text{Pl.} \ \textit{blótum} \\
2. \ \textit{blótr} \quad \textit{blótep} \\
3. \ \textit{blótr} \quad \textit{blóta}.
\]

With the decay of phonological conditions for umlaut in these cases, the umlaut is morphologized; the MPR (d') is changed to an MR, the non-phonological context conditions of the MPR being taken over into the MR unchanged. As also short-syllable verbs such as \textit{taka} take' which properly should not have any umlaut, join this type of inflection (\textit{tek, tekr} instead of *\textit{tak, *takr}), the phonological specification in terms of long syllable is lost from the rule as well:

\[(d'') \ V \rightarrow \ \hat{V} / \left\{ \begin{array}{l}
+ \text{present} \\
- \text{subjunctive} \\
- \text{plural} \\
+ \text{strong}
\end{array} \right\} X / V\]
Here the umlaut has become a true categorial marker which, in the Pres. Indic. of strong verbs with umlautable vowel, formally distinguishes the Singular from the Plural, similarly as in the Preterite of most strong verbs by means of various ablaut vowels.

The i-umlaut rule (d) as well is subject not only to the described morphologization but also to further morphologizations in other inflectional classes and categories. Again, several MRs correspond to one NPR.

4 For the purpose of confrontation, let us again briefly summarize the essential characteristics of the three described cases of morphologizing phonological rules.

In Case 1 the two NPRs (a) and (b), which decompose the stemforming element \(/iiz/\) under certain phonologic conditions, are the starting-point of the development which finally leads to the formation of a new MR. The process starts with the development of counterinstances to rule (b) and thus with its morphologization in a phonological way. Due to further factors — the extension of the context of rule (b) (which is morphologically conditioned but has only phonological consequences for the rule) and the telescoping of (a) and (b') into MPR (a/b'), still more phonological naturalness is lost. The new rule (a/b') however further operates (apart from a few exceptions) in a purely phonologically determinable environment, namely in the context VC — #. This phonological environment appears quite accidental in the forms of certain grammatical categories in an inflectional class. In this way the absence or presence of \([ir]\) becomes the factual corepresentative of grammatical categories in addition to the categorial markers paroper. We want to call the element \([ir]\) a quasi-marker, that is a linguistic unit which, on the one hand, still has a phonologically determined distribution, but on the other, is already bound to grammatical categories and thus helps to identify them. The final step to morphologizing the ir-rule then is a further phonological change, namely the deletion of final short [u]. In this way an essential part of the phonological context is lost, which causes the alternation of \([ir] \sim 0\) in the paradigm. This alternation can no longer be determined with phonological means, and the rule (a/b') loses the rest of its phonetic motivation. As the alternation has so far been implicitly bound to grammatical categories, now the lost phonological conditions can be compensated by explicit reference to the respective categorial features, the element [ir] being willy-nilly interpreted as an inflectional morpheme, i.e. as a true categorial marker. With this re-interpretation the speakers of a new generation adopt an inflectional rule which introduces the inflectional morpheme /ir/ into certain grammatical categories — just as the other inflectional morphemes have been introduced by the other inflec-
tional rules. Thus the new MR \((a/b'')\) is an inversion of \((a/b')\). As it is no deletion rule but an insertion rule, it has to contain an additional morphological class feature delineating its domain. Due to its way of development, the MR is morphologically un-systematic and is therefore systematized by morphological change in a final step. The result of the entire process is a reasonable, morphologically natural rule of inflection, a rule with purely semiotic motivation. Schematically, this morphologization can be represented as follows:

\[\text{NPRs (a) and (b)} \quad \text{(A)}\]

- Decay of phonological naturalness due to various changes

\[\text{MPR (a/b')} \quad \text{(B)}\]

- with purely phonological context

\[\text{Phonological change} \quad \text{(C)}\]

\[\text{MR (a/b'')} \quad \text{(D)}\]

- with unsystematic domain

\[\text{Morphological change} \quad \text{(E)}\]

- with systematic domain

In Case 2 as well an NPR, rule (c), is the historical starting-point for morphologization. The process of the gradual change of the rule to an MR begins with a partial morphological levelling, that is a morphological change: The domain of the umlaut rule is restricted on the basis of
Ways of morphologizing phonological rules

non-phonological features; in this process phonological naturalness is lost. The preliminary result is the rule (c'), an MPR, referring explicitly to morphological features. This rule as well, this time in an indirect way, produces a quasi-marker which, in spite of its large phonological conditioning, accompanies grammatical categories. In masculine i-stems there is now no umlaut in the Singular but always in the Plural. Due to a phonological change neutralising the conditioning phonological environment the rule becomes an MR for a new generation of speakers, the so far negative (restrictive) morphological specification now appearing in positive form, cp. MR (c''). A systematisation of the rule in the sense of morphological naturalness is no longer necessary in this case, since already by the morphological change at the beginning of the entire process of morphologization the umlaut alternation in the paradigm had been revised according to morphological parameters: no umlaut in the Singular ~ umlaut in the Plural. For Case 2 thus the following overall picture results:

\[\text{NPR (c)} \quad (A)\]

\[\text{Morphological change} \quad (B)\]

\[\text{MPR (c')} \quad \text{with partially non-phonological context}\]

\[\text{phonological change} \quad (C)\]

\[\text{MR (c'')} \quad \text{with positive context and systematic domain}\]

Ad Case 3: Here the starting-point for later morphologization is the rule (d) which has apparently the character of an NPR. As in the preceding case, the process of morphologization is triggered by morphological levelling: The effect of the rule is extended beyond its original, phonologically defined range of application. This is done by introducing additional, non-phonological features into the rule. Thus its phonological natural-
ness is reduced. At this stage the result is the MPR (d') whose context conditions are partly phonological, partly morphological. The i-umlaut now covering the entire present indicative of strong verbs becomes a quasi-marker. It is at least partly phonologically determined in its occurrence but virtually accompanies a constellation of grammatical categories. Due to phonological changes, the segment [i] still co-conditioning, the alternation between non-umlauted and umlauted vowel is lost. In this way the rule then operates exclusively in its previous morphological environment which is preserved in the same form as at the preceding stage. The transition from the MPR (d') to MR (d'') has been completed. The resulting MR is already systematic in morphological terms, since — as we have seen — the entire process of morphologization has started with a morphologically motivated redistribution of the two alternants in the paradigm. Case 3 can be outlined as follows:

\[
\begin{align*}
\text{NPR (possibly MPR) (d)} & \quad \text{(A)} \\
\text{Morphological change} & \\
\text{MPR (d')} & \quad \text{(B)} \\
\text{with partially non-phonological context} & \\
\text{Phonological change} & \\
\text{MR (d'')} & \quad \text{(C)} \\
\text{with positive context and systematic domain} &
\end{align*}
\]

Now what can we state summing up the causes for morphologization in the three cases analysed?

In all three cases the entire process of morphologization consists of (at least) two partial processes, namely the morphonologization of the respective rule (A > B) and its morphologization in the stricter sense (B > C). As has been shown, the reasons for these two developments in the course of morphologization may be of quite different character. Consequently, they have to be distinguished.

In Case 1 there is morphonologization for phonological reasons;
phonological naturalness decays in a phonological way. In the other two cases, however, it is morphological changes that cause morphonologization. In Case 2 the phonologically conditioned non-uniformity of forms in the paradigm (n-stems) or in a category (i-stems) is eliminated, in Case 3 the phonologically conditioned non-uniformity of forms is directly used in terms of morphology. In both cases morphologization is here realised by introducing morphological context conditions into the rule.

The second step, morphologization proper, is due to phonological change in all three cases, the decay of phonological conditions based on which the alternation had functioned so far. In Case 1 there is also a third partial process, namely the morphological systematisation of the rule.

In all three morphologizations, phonological and morphological factors co-operate. But which of the two aspects has the dominating share, represents the “driving force”? In Cases 2 and 3 this is clearly morphology. Phonological alternations are morphologically regulated, changed with morphological motivation. The morphologically motivated regulation can take place — according to the concrete constellation — in various ways. In Case 2 it consists in the elimination of phonological differentiations obscuring the paradigmatic or categorial connection, in Case 3, however, in the direct utilisation of a phonological differentiation for categorial marking. Roughly summarised: On the one hand, it causes that “the same content” is formally marked in the same way, on the other, that “a different content” is formally marked in a different way. It is evident that these levelling tendencies are based on the principle of analogy. The phonological rule is restricted (Case 2) or extended (Case 3) accordingly. The consequences are different as well which result from the loss of phonological conditions in the so far MPR. The resulting MR in Case 3 is the direct result of morphological regulation. It serves exactly the morphological purpose which caused its development, namely categorial marking. The resulting MR in Case 2, however, is only an indirect result of morphological regulation. Here the regulation served the production of greater formal uniformity in the paradigm. Where this standardization of forms did not cover the entire paradigm, in masculine i-stems, instances of alternation were preserved in the paradigm. The MR holds for these cases and marks the respective non-adjusted category of “Plural”. The fully levelled paradigms, the n-stems, are eliminated from the rule. In Case 3 the morphologized rule thus covers the categories of the paradigm whose forms had been levelled by morphological regulation, in Case 2, however, its complementary class. We want to call the type of morphologization represented by Case 3 “direct morphologically-conditioned morphologization” and the type repre-
presented by Case 2 "indirect morphologically-conditioned morphologiza-

In contrast, morphological factors do not play any remarkable role up
to the change of the MPR to an MR in Case 1. The way of both NPRs to a
uniform MR (a/b") is characterised by the gradual reduction of phonolog-
ical naturalness in a phonological way up to the final decay of phonologi-
conditions of alternation. As the alternation is implicitly bound to
certain grammatical categories, these can replace the lost phonological
context. Thus the handed-down alternation remains to be practicable. It
is only at this late point of time that morphology comes into play. The
accidentally morphologized — from the aspect of morphology — and
therefore rather unsystematic rule is systematised in a way that the
marker introduced by it clearly marks a grammatical category within the
paradigm. This case is without doubt a phonologically-conditioned mor-
phologization.

Thus the decisive question for the classification undertaken for mor-
phologizations is: Is the explicit connection of an alternation with gram-
matical categories only the result of the decay of their phonological
conditions or has it existed (in positive or negative form) already before?

In this way we have, without aiming at a near-comprehensive analysis
of the extensive problems as a whole, delimited three main types of
morphologizations. In conclusion, we want to raise the somewhat
speculative question of which characteristics are common to all possible
morphologizations of phonological rules and try to briefly answer it on
the basis of the insight gained.

At any rate in every (completed) morphologization the sequential
phonological context conditions have to be fully decayed and replaced by
morphological-grammatical ones. The final point of morphologization is
trivially always a morphological rule. But what is its starting-point? In our
three cases it was (most probably) always NPRs. It also stands to reason
that purely phonologically-conditioned processes of morphologization
have to proceed from an NPR; their first step always consists in the
reduction of the phonological naturalness of such a rule. Morphologically
conditioned morphologizations, however, can proceed also from MPRs,
i.e. from rules which no longer function in a purely phonetic way. They
then again reduce their anyway restricted phonological naturalness, mor-
phologizing the respective MPR to a still greater extent.

Thus in such cases the division of the entire process into (at least) a
stage of morphonologization (A > B) and a stage of morphologization
(B > C) would hold. Nevertheless cases are imaginable where an NPR
becomes an MR in one step without preceding morphonologization by
phonological change (A > C). The conditions for such a process are easy
to realize. Similarly for the third stage, systematization, in case of phonological-conditioned morphologizations: It can be missing as well if the distribution of alternants on the categories is morphologically systematic by accident. It becomes clear, however, that a morphologization process contains in all no more than three essential steps (morphonologization, morphologization and systematization).

Last but not least we have seen that two NPRs can coincide in one MR in the course of the morphologizing process and that even the splitting up of a uniform NPR into several MRs with different functions is possible. Here again, no stricter conditions can be formulated.

What is left of common qualities is not too much: morphologizations of phonological rules are developments in the history of language in which the phonological conditions of alternations are replaced by morphological-grammatical conditions and the rules thus changed to MRs; they

— are (directly or indirectly) morphologically or phonologically conditioned,
— have NPRs or MPRs as their starting-points,
— proceed in one, two or three steps,
— lead from one or several phonological rule(s) to one or several MR(s) and
— proceed without or with rule inversion.

Consequently, morphologizations differ with respect to:

(1) their conditioning (motivation; C),
(2) the type of their input rule (IR),
(3) the number of steps in the entire process (S),
(4) the quantitative relations between input and output rules (QR) and
(5) the occurrence of rule inversion (RI).

Based on these criteria, a quite plausible typology of morphologizations of phonological rules covering the essence of such developmental processes becomes possible: In all five points there is — as we could see — only a limited number of possibilities which can be represented in terms of the theory of sets as follows:

\[
\begin{align*}
(1') & \quad C = \{M_{\text{dir}}, M_{\text{ind}}, P\} \\
(2') & \quad IR = \{\text{NPR, MPR}\} \\
(3') & \quad S = \{1, 2, 3\} \\
(4') & \quad QR = \{1R > 1R, 1R > sR, sR > 1R\} \\
(5') & \quad RI = \{\sim I, I\}.
\end{align*}
\]
Then a morphologization (M_j) can always be characterized as a quintuple consisting of an element of each of these five sets. For the three cases discussed, thus the following quintuples result:

(Case 1) \( M_1 = (P; \text{NPR}; 3; sR > 1R; I) \)
(Case 2) \( M_2 = (M_{\text{ind}}; \text{NPR}; 2; 1R > sR; \sim I) \)
(Case 3) \( M_3 = (M_{\text{dir}}; \text{NPR}; 2; 1R > sR; \sim I) \)

According to this classification, there would be a total of 108 different types of morphologizations of phonological rules from purely theoretical aspects. Yet the discussion of our few examples already showed that the various characteristics of morphologizations are not always independent of each other: morphologically-conditioned morphologizations always proceed in two steps, phonologically-conditioned morphologizations always start with NPRs and phonologically-conditioned morphologizations proceed mostly (not necessarily) in three steps etc. The detailed research of such connections will in future certainly lead to new interesting insights.

Notes

1. There is an inversion of a rule e.g. in Case 1 discussed below, cp. there.
2. There is not principally much difference if the categorial marker due to morphologization marks the respective category alone or along with other markers, cp. on the one hand, e.g. German umlaut in Nagel — Nägel and, on the other, in Stock — Stöcke.
3. Here such purely conventional morphonological rules are neglected which, although operating on the basis of a phonological context, have no longer any causal relation between phonological context and structural change. Rules of this type have of course no phonetic motivation.

   The change in motivation distinguishes the morphologization of phonological rules from that of syntactic rules which as such have already a semiotic motivation. Morphologization represents here merely a change in the type of means fulfilling the semiotic function.

4. Of course there may be a number of problems in the detailed delimitation between MPRs and MRs, cp. Dressler (1977a, 1977b) and Wurzel (1977).
5. For arguments in favour of the morphological form of complex lexical representations of this type cp. Wurzel (in preparation). The indexes of slants stand for “Root”, “Stem” and “Noun” (= word).
6. Thus for instance the phonological representation /näm + i/ with /ii/ is justified by the fact that the subjunctive marker appears also phonetically as [i] in all persons except the 1st/3rd pers. sing., cp. Old High German nāmis you would take, nämim we would take, etc. The conditions are somewhat more complicated in the case of *gasti: The lexical representation of the word is /*gasti/*gasti/*gasti/, the n.pl. being formed with /i/ so that the form/gast + i + i/ results which, by a type of monophthongization rule, becomes/gast + i/.
Forms of the type /nām + i/ and /gast + i/ then lost their vowel length due to the mentioned shortening rule.

It is not without interest that, due to the shortening rule, also the preconditions for restoring the lost categorial marker in the 2nd pers. pret. ind. of long-syllable strong verbs are given: Having the form /i/, it had been lost by the deletion of final i so that here “lautgesetzlich” zugi ‘you pulled’ (short syllable) was confronted by *nām ‘you took’ (long syllable). By restoring inflectional forms such as nāmi the personal marker /i/ is reinterpreted as /i/. Due to the shortening rule, it appears phonetically always as [i]. Consequently there is a morphological change by way of resegmenting an inflectional rule.

7. Thus individual non-levelled cases with short root syllable such as wini ‘friend’ and turi ‘door’ or few non-alternating forms such as furi ‘for’, which are actually regular forms from the aspect of language history, take the character of exceptions.

8. Here short-syllable and long-syllable words are concerned. For the development of these exceptions partly phonological (“after effect of Verner’s law”), partly morphological reasons (levelling within the paradigm) are advanced, cp. Braune (1955: 202) and Paul (1917:24).

9. We do not want to comment on umlaut here which is irrelevant in this connection.

10. Cp. e.g. feminine -stems which became quite “unexpectedly” subject to the loss of umlauting [i]. Here, the root vowel was umlauted “lautgesetzlich” in the G./D.Sg. and in the entire Plural: anst, enste, enste, anst; enste, enste, ensten, enste. The disturbing umlaut forms are done away with in a long process virtually covering the entire Middle High German period so that finally also here non-umlauted Singular is confronted by umlauted Plural.

11. Later still other umlaut regularities are added which, along with i-elimination and many relatively early levellings, represent a very complicated picture of umlaut conditions in the individual Nordic languages.

12. It is probable that this morphological change has actually occurred in preserved vowels of final syllables but cannot be proved, since runic inscriptions do not contain any forms of the *blōtu type.

13. The reason for the inversion of the rule in its morphologizing results from qualities of the morphological structure of Old High German: The form of the N.Sg. throughout represents the lexical representation of nouns and is, in most inflectional classes, at the same time identical with the input of inflectional rules (cp. Wurzel (in preparation)). These inflection rules are all of the additive type, i.e. they mark grammatical categories by introducing inflectional suffixes. There are no subtractive rules (as a morphological ir-deletion rule would be) in the Old High German system of declination.

14. It seems inadequate to us to consider the umlaut in the 2nd/3rd Pers.Sing. as a quasi-marker, that of the 1st Pers. Sing., however, as a true categorial marker.

15. The decay of phonological conditions of an alternation can occur in two ways: (a) In the forms covered by the rule so far, the phonological qualities on which it operates are eliminated; the application of the rule is no longer phonologically determined. (b) In forms not covered by the rule so far, phonological qualities develop on which it operates; the non-application of the rule is no longer phonologically determined. The former holds for Cases 2 and 3, the latter for Case 1.

16. What is understood by “same” and “different” mainly depends on the categorial system and its formal distinctions in the individual language.

17. In case essential determinations of morphologizations should be neglected in the present analysis, the n-tuple can of course be expanded easily.
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