On the Relevance of Underlying Forms

Or the genesis of schwa as an attributive adjective marker in the history of German

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1. Introduction

In the on-going discussions on the organisation of the grammar, a recurrent issue is that of the autonomy of the various components. As a result, there is a continuous debate on the interaction of the components, and on thèir interfaces. In this debate, phenomena in which the manifestations of the components seem intertwined, form a challenge for the view that the components are autonomous.

In the case of phonological processes that seem morphologically conditioned, the usual solution that is advanced to prevent direct reference to morphology in the formulation of these processes, and thus to preserve the autonomy of phonology, is to introduce lexical level ordering. Lexical level ordering entails that there are several morphological levels at which phonological processes apply. A given phonological process can be specified to apply at a given level, or at several specified levels. Also, if the same processes apply at different levels, the ordering of the processes can nevertheless be different per level. For present purposes, I call this strategy, which has found its full development in the theory of Lexical Phonology, the *Lexical Phonology Approach (LPA)*.

Another type of strategy is to look at the underlying forms, and to assume that the different patterns of phonological behaviour in different morphological categories result from differences in underlying form. I will call this strategy the *Underlying Form Approach (UFA)*. As I will discuss below, the contrast between LPA and UFA contains elements of, but is not identical to, the well-known contrast item-and-process vs. item-and-arrangement, notions which were introduced by Hockett (1954).

From a point of view in which grammar is mostly seen as a set of processes or rules (let us call this transformationalism), UFA may

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seem to contain a tautology, because it basically says "things behave differently because they are underlyingly different", whereas transformationalism, and with it the LPA, assumes that processes (whether specific, general, minimal), are responsible for the diversity we find in surface forms. Perhaps because of this apparent tautology, not enough attention is paid, to my mind, to the logical possibility in the organisation of the grammar that diversity can be encoded in the underlying form.

In this paper, I will show that a detailed case study of the schwa/zero alternations in German demonstrates that the seemingly complex morphological conditioning of the data cannot be well understood if it is assumed that they are the result of complex level ordering. Instead, it will become clear that the assumption of a differentiation of the underlying forms makes it possible to account for the alternation without referring directly to morphological categories, hence maintaining the autonomy of phonology.

This view will then be corroborated by a presentation of facts from historical phonological research, that have gone hitherto unnoticed by generative phonologists of German. These facts show unequivocally, and on independent grounds, that there has indeed been a differentiation of the underlying forms.

Towards the end of this paper I will address the implications for phonological theory.

2. Schwa/zero alternation in German: the data

Schwa-zero alternations are a major issue in the study of the phonology of German. As already mentioned, the alternations seem to be strongly morphologically conditioned, but they are nevertheless very regular. Examples are given in table 1, in which also counterparts of the forms are given in a West-Germanic language closely related to German, i.e. Dutch, which has no such alternations:

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Table 1. **Schwa-zero alternation in German forms and their Dutch cognates**

	Modern Standard German	Dutch	gloss
infinitives with liquid-final stem	zitt<u>e</u>rn	sidd<u>eren</u>	'to tremble'
infinitives with nasal-final stem	atm<u>en</u>	ad<u>emen</u>	'to breathe'
adjectives	(im) dunkl<u>en</u> (Zimmer)	(in de) donk<u>ere</u> (kamer)	'(in the) dark room'
nouns, nominalized adjectives	(im) Dunk<u>e</u>ln	(in het) donk<u>er</u>	'(in the) dark'

A comparison of corresponding forms in Dutch and Modern Standard German (MSG) reveals that in MSG, one of two successive schwas present in the corresponding Dutch form has disappeared. In verbs with liquid-final stems the schwa between the liquid and the infinitive marker -*n* has disappeared (*zittern*), while in verbs whose stem is nasal-final it is the schwa between the stem nasal and the preceding segment that is absent (*atmen*). Another observation is that in MSG adjectives it is the schwa preceding the liquid that disappears (*dunklen*), whereas in nouns and nominalized adjectives the schwa that disappears is the one following the liquid (*Dunkeln*). Hence there is a double contrast, which can be schematized as follows:

Table 2. **Scheme of schwa-zero alternation in MSG; the two ǝ's in /XǝS+ǝX/ become:**

S =	infinitives		nouns, nominalized adjectives		adjectives in attributive position	
liquid	ǝ	Ø	ǝ	Ø	Ø	ǝ
nasal	Ø	ǝ	Ø/ǝ	Ø	Ø/ǝ	Ø

The alternation is seemingly conditioned in two ways. It is conditioned (i) by the category of the final consonant of the stem (i.e. whether it is a liquid or not) and (ii) by the morphological word category in which it takes place (i.e. whether this category is adjective or {verb, noun}). I will come back to the Dutch forms later in §5, when I discuss the historical development of schwa in German.

It is understandable that, because of the apparent complexity of the data, complicated solutions were already proposed early on in the his-

tory of generative phonology. These proposals involve direct reference to morphological information, i.e. direct reference is made to morphological information in the formulation of the processes (rules or otherwise).

By way of illustration I give here two rules proposed by Kloeke (1982). These rules, a deletion rule and an epenthesis rule, are very complex, work into each other's opposite directions and refer directly to morphological word categories:

(1)   *Kloeke's (1982: 200) e-epenthesis in the inflected stem*

$$\emptyset \rightarrow e \bigg/ \left\{ \begin{matrix} [\text{son}] \\ [\text{-cont}] \end{matrix} \right\} \quad - \quad \left[\begin{matrix} +\text{cons} \\ +\text{son} \\ <\text{-nas}> \end{matrix} \right]_{N, <V>}$$

(2)   *Kloeke's (ibid.) Elimination of the flectional e*

$$e \rightarrow \emptyset \bigg/ \left[\ldots [\ldots \left\{ \begin{matrix} [\text{-stress}] \\ [+E] \end{matrix} \right\} \quad R]_{N,V} \quad [\overline{\phantom{\text{Mod}}}_{\text{-Mod}}] \quad {}^{(e)} \right]$$

The *e* is later turned into ə in Kloeke's analysis. The analysis adequately describes the facts and can be considered as an example of sound work done within the SPE-framework. Other analyses in the SPE-framework (notably Wurzel (1970) and Strauss (1982)) show a similar degree of complexity.
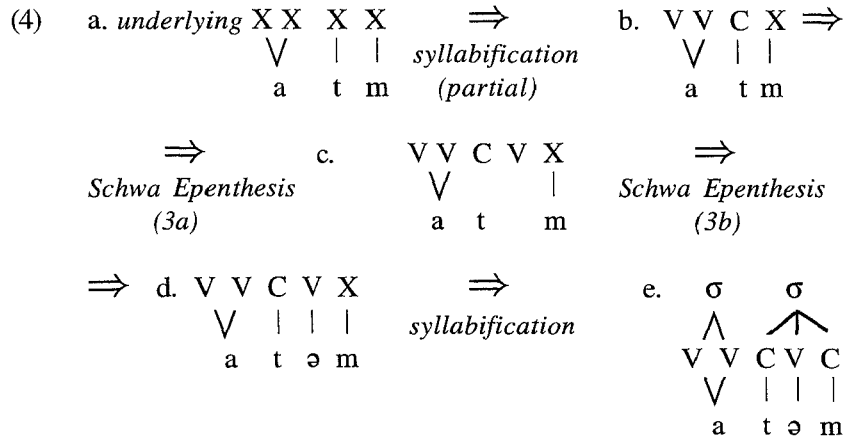
3. Analyses of the alternation under the Lexical Phonology Approach

An example of the treatment of the schwa-zero alternation in MSG under the LPA is the account by Wiese (1986, 1988). Wiese assumes that schwa/zero alternation is the result of epenthesis. Apart from Wiese, many other phonologists, e.g. Rennison (1980), Giegerich (1985, 1987), Hall (1992), Noske (1993) have shown that it is only possible to really understand at least some of the regularities of the German schwa/zero alternation phenomena if they are uniformly considered as a result of epenthesis, and not of deletion. Wiese goes a step further in that he assumes that *all* schwas, including the non-alternating (or stable) ones, are epenthetic, and that they are inserted by a very simple insertion rule, which works at different strata in the lexicon:

(3)   Wiese's (1988: 144) Schwa Epenthesis

a. $\emptyset \rightarrow V /$ __ $X]_{word}$

b.   Link an empty V with schwa

An example of the application of this rule is given in (4):

(4)   a. *underlying* X X   X X $\Longrightarrow$ b. V V C X $\Longrightarrow$
                         V | | *syllabification*   V | |
                         a   t m   *(partial)*   a t m

$\Longrightarrow$ c.   V V C V X $\Longrightarrow$
Schwa Epenthesis   V | *Schwa Epenthesis*
(3a)   a   t   m   *(3b)*

$\Longrightarrow$ d. V V C V X $\Longrightarrow$ e.   σ   σ
                    V | | | *syllabification*   /\   /⌐\
                    a t ə m   V V C V C
                                                                V | | |
                                                                a t ə m

The simplicity of this rule, however, has to be paid for by an extremely detailed specification of its domains of application, given here in table 3 (Wiese 1988: 165):

Table 3. Domain specification for Schwa Epenthesis (3)

level	word structures
1	Verb[...[liquid]]
2	Noun[ ], Adj[...[nasal]], lʀl
3	Verb[...[nasal]], Adj[ ], lʀl

The derivations of *Dunkeln* (noun), *dunklen* (adj.), *zittern (verb)* and *atmen* (verb) are shown in table 4:

Table 4. Sample derivations involving Schwa Epenthesis (3)

$duŋkl_A$	$duŋkl_A$	t^sItR_V	atm_V	stem
level 1 ——	——	$t^sItəR_V$	——	*Schwa Epenthesis (3)*
level 2 $duŋkl_N$	——	——	——	*A → N*
$duŋkəl_N$	——	——	——	*Schwa Epenthesis (3)*
level 3 $duŋkəl_N+n$	$duŋkl_A+n$	$t^sItəR_V+n$	atm_V+n	*inflection*
——	$duŋklən$	——	$atmən$	*Schwa Epenthesis (3)*

An advantage of this analysis compared to that by Kloeke is that there are no longer two rules working in each other's opposite directions, which is counter-intuitive.

However, the fact remains that also in Wiese's analysis, like in the one by Kloeke, complex reference is made to morphological categories, this time in the domain of application of schwa-epenthesis as given in table 4. Note that in this specification reference is also made to certain types of segment, like the facts that Schwa-epenthesis applies on level 1 in liquid-final verbs and on level 3 in nasal-final verbs, that it applies on level 2 in nasal-final adjectives and that reference is made to lrl of both level 2 and level 3. This means that in a presumably morphological type of specification (the levels in the sense of Lexical Phonology) direct reference is made to phonological categories. Hence, the information contained in the specification of the levels is of a disparate nature and no separation has been reached between phonology and morphology. It can thus be said that the complexity in the formulation of phonological processes themselves has been exchanged for a complexity in the formulation of their domain of application.

In the framework of Optimality Theory (OT) the problem is not solved. Instead of morphologically specified level ordering as in the case of Lexical Phonology, OT needs two different constraint rankings for different morphological categories, in order to account for the contrast in the behaviour of schwa. In this way, phonological processes are triggered in different orders for the phonological categories.

Apart from the usual constraints PARSE, FILL and *COMPLEX-ONSET, an alignment constraint is needed, more specifically a constraint that requires that syllable edges and prosodic word edges should coincide. This constraint, given in (5) has been proposed by Mester & Padgett (1993).

(5)   σ-ALIGN (σ, Edge, PrWd, Edge)

Violations of the constraint are expressed in the number of moras which separate a given syllable from a prosodic word edge. The following two constraint rankings could be assumed:

(6)   a.   verbs, nouns:
           PARSE-SEGMENT ≫ FILL ≫ *COMPLEX-ONSET ≫ σ-ALIGN(R)

     b.   adjectives:
           PARSE-SEGMENT ≫ FILL ≫ σ-ALIGN(R) ≫ *COMPLEX-ONSET

The selections of [dʊŋkəln] for nouns and [dʊŋklən] for adjectives are given in (7) and (8) respectively.

(7)

/dʊŋkl+n/	PARSE-SEGMENT	FILL	*COMPLEX-ONSET	σ-ALIGN(R) σ1 σ2
☞ .dʊŋ.kəln.		*		μμμ
.dʊŋ.klən.		*	*!	μμ
.dʊŋ.kələn.		**!		μμμ μμ
.dʊŋk.<ln>	**!			

(8)

/dʊŋkl+n/	PARSE-SEGMENT	FILL	σ-ALIGN(R) σ1 σ2	*COMPLEX-ONSET
.dʊŋ.kəln.		*	μμμ!	
☞ .dʊŋ.klən.		*	μμ	*
.dʊŋ.kə.lən.		**!	μμμ μμ	
.dʊŋk.<ln>	**!			

This solution is not insightful, however, precisely because it needs different constraint rankings for different grammatical categories. In the perspective of OT, it is difference in constraint rankings which make languages differ from each other (as well as differences in the phoneme and lexical inventories). The language-internal coherence in behaviour is then explained by the unitary constraint ranking within the grammar of that language. Positing different constraint rankings for different morphological categories would deprive a constraint grammar of its explanatory power, and we would end up with a statement that essentially says that things are different for different morphological categories, but offer no explanation.

4. Solutions in the Underlying Form Approach: schwa as an underlying category marker

The explicit reference to morphological categories in the formulation of phonological processes (be it in the structural description of a rule or in the specification of its domain of application) can be contested. In the case of German, this has hardly been done. For an alternative for the LPA in the analysis of the German alternations, I cannot but refer to a co-author and myself, as well as to a subsequent analysis which was inspired by this analysis. First, I will give a short outline of the syllabification-based account given in Noske (1993) (and, in an embryonic form, in Hamans & Noske (1988)). Then I will outline two OT-analyses, one by Itô & Mester (1994) and an alternative to that solution that I will present. The common denominator of these three accounts is that they do not necessitate any morphological category specification in their formulation.

4.1. A syllabification-based account

Hamans & Noske (1988) and Noske (1993: chapter 5) contain a syllabification-based account of the German alternations, which is characterized by two main ideas:

(i)   certain schwa's are underlying, e.g. in the adjectival inflection, where it is an adjectival category marker,

(ii)   liquids, but not nasals can be lexically syllabic.

Thus, in our analysis, the adjectival form *dunklen* contains a schwa underlyingly: /duŋkl+ə+n/, whereas the nominal form *Dunkeln* and infinitive *zittern* do not: /duŋkl+n/, /tˢɪtʀ+n/. The idea that there are two different types of schwa in German has already been put forward by Isačenko (1974), who distinguishes between 'stable' and 'mobile' schwas.

For a full understanding of the phenomena involved it should be mentioned that there is postlexically a free alternation between syllabic sonorant consonants in German and a sequence of schwa + sonorant.[1] See the patterns in (9), where L and N stand for liquid and nasal respectively:

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[1] In Standard German an additional process takes place affecting ʀ in this position: it is always vocalized and becomes ɐ. However, in regional varieties of German where r is rhotic, like in Bavarian dialects, the free alternation does exist.

(9)   a.   əL ~ L̩   b. əN ~ N̩

Syllabification in this analysis is the superimposition of a canonical sylla-
ble structure. The linking between the subsyllabic nodes *Onset* (O),
Nucleus (N), *Coda* (Cd) takes place by the well-known autosegmental
association conventions (i.e., mapping, spreading, dumping).

The syllabification of the nominal form *Dunkeln* takes place as fol-
lows:

(10)
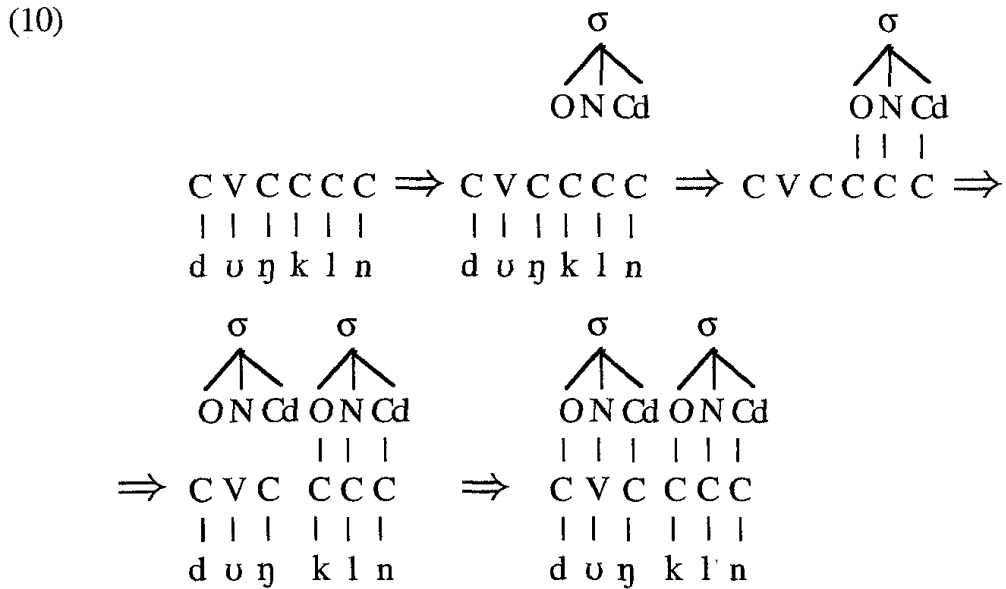
This form then receives phonetic interpretation [duŋkəln] ~ [duŋkl̩n].
The infinitives *handeln* and *zittern* are derived in the same way (but see
note 1). The derivation of the adjectival form *dunklen* is given in (11):

(11)

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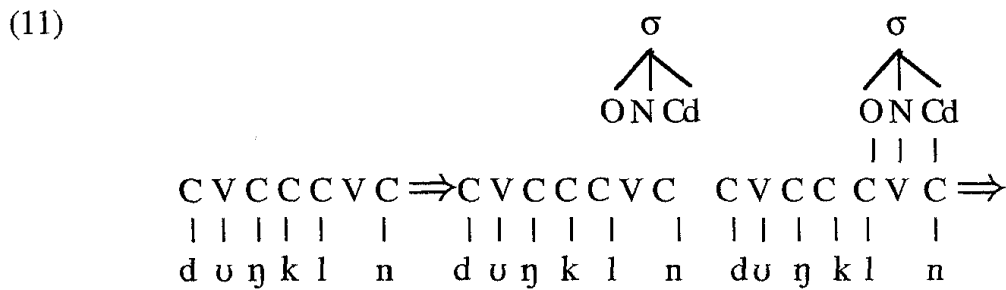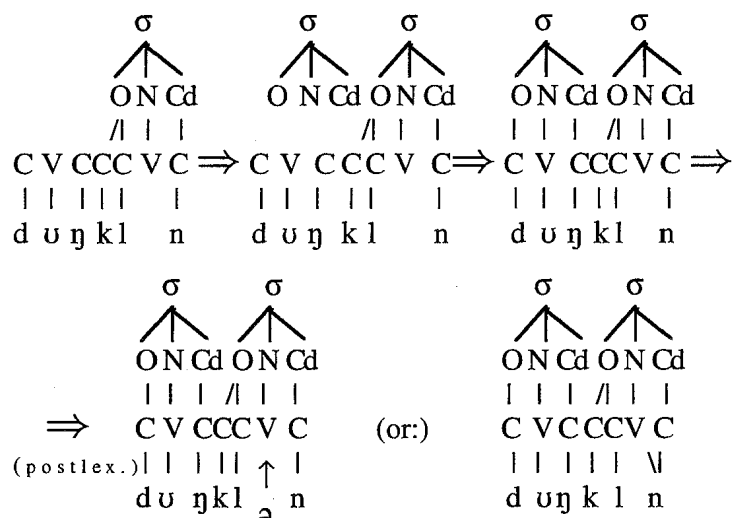
In (11) it can be seen that the underlying schwa in this specific proposal is conceived of as an underlying V-slot, which it later spelled out as schwa on the segmental tier.

4.2. Two analyses in the framework of OT

The analysis outlined above inspired an OT analysis, i.e. Itô & Mester (1994). That analysis aims to show that three kinds of well-formedness, viz. (i) nuclear sonority, (ii) morphology-prosody alignment, (iii) faithful preservation of underlying moraic specification enter into competition to produce the complex picture of schwa-zero alternations in German.

The idea proposed in Noske (1993: 164), that schwa (in fact empty V) is an adjectival category marker, hence (phonologically) underlying, has been translated into the assumption that this adjective marker is an underlying mora (Itô & Mester 1994: 8). The second idea, i.e. that liquids, but not nasals, may be lexically syllabic, has found its translation into the assumption and ordering of three constraints:

(12) a. *NUC/NASAL: A nasal consonant does not head a syllable.
      b. *SCHWA: Schwas are disallowed (i.e. no empty vowels).
      c. *NUC/LIQUID: A liquid does not head a syllable.

The constraints are ranked in the order given above. In my 1993 analysis, an empty nucleus is created by syllabification if there is no

element to be linked to that nucleus. Later in the derivation this empty nucleus is filled by an empty V, which in its turn becomes schwa. The results of both analyses, Itô & Mester's and mine, are the same: schwa-insertion takes place instead of linking the nasal to a nuclear position in the syllable.

Before I give an example, it should (again) be mentioned for the sake of clarity that there is a free postlexical variation between schwa + sonorant and a corresponding syllabic sonorant, except for ʀ, which is always vocalized under these circumstances. Examples are given in table 5 (Noske 1993: 143, Itô & Mester 1994: 1).

Table 5. Postlexical schwa + sonorant ~ syllabic sonorant variation

postlexical realization	example		
[m̩] ~ [əm]	[gʀoːsm̩] ~ [gʀoːsəm]	großem	'big'
[n̩] ~ [ən]	[faːdn̩] ~ [faːdən]	Faden	'thread'
[l̩] ~ [əl]	[gaɪzl̩] ~ [gaɪzəl]	Geisel	'hostage'
[ɐ]	[laɪtɐ]	Leiter	'ladder'

In Itô and Mester's solution the lexical sources are lexically syllabic sonorants, which they denote by uppercase M, N, L, R. An example of the working of Itô and Mester's analysis, is given in (13):

(13) a.   (er) atmet /atm+t/ [atmət] *[atm̩t] '(he) breathes' (V + infl.)

b.

/atm+t/	*NUC/NASAL	*SCHWA	*NUC/LIQUID
.a.tMt.	*!		
☞ .at.mət.		*	

The contrast given above in table 1 between the adjective in attributive position *dunklen* and the nominalized form *Dunkeln* is accounted for by a faithfulness constraint, PARSE-MORA, whose name is self-explanatory. This is illustrated in (14) and (15):

(14) a.   Dunkeln /dʊŋkl+n/ [dʊŋkəln] ~ [dʊŋkl̩n] (N + infl.)

b.

/dʊŋkl+n/	PARSE-MORA	*NUC/NASAL	*SCHWA	*NUC/LIQUID
☞ .dʊŋ.kLn.				
.dʊŋ.klN.		*!		*

(15) a. dunklen /dʊŋkl+μ/n/ [dʊŋklən] ~ [dʊnklŋ̩] (Adj. + infl.)

b.

/dʊŋkl+μ/n	PARSE-MORA	*NUC/NASAL	*SCHWA	*NUC/LIQUID
<μ>.dʊŋ.kLn.	*!			*
☞ .dʊŋ.klN.		*		

It can be seen that in the 'winning' form in (15b), the nasal is linked to the nucleus, in spite of *NUC/NASAL being violated. This is so because, if this were not the case, the higher ranked PARSE-MORA would be violated.[2]

In this OT analysis, no morphological category specifications need to be made in the statement of rules or constraints. Morphological considerations come in only in morphology-phonology alignment constraints (not treated here, but proposed by Itô & Mester 1994: 5-6).[3]

If one does not wish to use underlying mora's for the stable schwa, but simply assumes that schwa is a segment (or an element on the skeletal tier, there is another, more straightforward, analysis is possible which consists of using the constraints PARSE-SEGMENT and FILL replacing PARSE-MORA and *SCHWA respectively. In contrast to *SCHWA, FILL only rules out epenthetic schwas, not underlying ones.

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[2] The analysis by Itô & Mester poses problems with respect to the exact site of realization of the underlying mora they assume. Note that the underlying form in (15b) has the mora (μ) linked to the flexional n. If there was no link, the mora could also be realized as syllabicity of the l. This is so, among other things, because mora is on a different tier. If one links the mora underlyingly to the adjectival ending, like Itô & Mester tacitly do, one obscures the fact that some of these endings are not specific to the adjectival category, like genitive -s.

[3] One reader of a previous version of this paper commented there is no difference in the use of alignment constraints and full reference to morphological categories in the statement of phonological processes. To my mind, this is not the case. Alignment constraints refer only to morphological boundaries, not to the nature of the categories themselves. Moreover, it is at morphological boundaries that concatenation has phonological effects, hence it is only natural that the morphology-phonology interface is expressed in terms of boundaries and not in terms of morphological categories.

(16) a. Dunkeln /duŋkl+n/ [duŋkəln] ~ [dunkl̩n] (N + infl.)

b.

/duŋkl+n/	PARSE-SEGMENT	*NUC/ NASAL	FILL	*NUC/ LIQUID
☞ .duŋ.kLn.				*
.duŋ.kə.lən.			**!	
.duŋ.klən.			*!	
.duŋ.klN.		*!		

(17) a. dunklen /duŋkl+ə+n/ [duŋklən] ~ [dunkl̩n] (Adj. + infl.)

b.

/duŋkl+ə+n/	PARSE-SEGMENT	*NUC/ NASAL	FILL	*NUC/ LIQUID
.duŋ.kL<ə>n.	*!			*
.duŋ.kə.lən.			*!	
☞.duŋ.klən.				
.duŋ.kl<ə>N.	*!	*!		

Whether one wishes to adopt my 1993 analysis, or Itô and Mester's 1994 analysis, or the one outlined in (14) and (15), it is clear that the assumption of an attributively adjectival class marker (underlying mora or schwa) makes it possible to analyze the German schwa/zero alternations without having to refer to morphological categories.

As we will now see, there is strong evidence from the historical development of New High German for such an underlying class marker.

5. The historical development of schwa as a morphological class marker

I now come to the central point of this paper. In Proto-Germanic, the cognates of the High German (and Dutch) schwas were full vowels. In the development towards Common Germanic, there was a stress shift from a putative free stress to an initial stress. In the subsequent development, that towards Old West Germanic, a syncope process took place in the inflectional system, known as Sievers' (1901) syncope law, deleting a short vowel following a heavy root syllable. Examples are *sconisto* > Middle High German (MHG) *schœnste* 'most beautiful, prettiest' and *kannida* > Middle Dutch *kande/kende* 'knew'. Then, a vowel reduction took place, reducing unstressed vowels to schwa.

From this point onwards, Dutch and High German developed dif-

ferently. As can be seen in table 1 above, Dutch (and, more generally, Low German in the broad sense) has mostly maintained schwas in positions where they have disappeared in MSG. This disappearance is the result of additional vowel deletion processes in Early New High German (ENHG). A main source on these processes is Moser & Stopp (1970), henceforth referred to as M&S. Examples taken form this work are given in (18) and (19). These are taken from a number of dialects, from Upper German as well as Middle German varieties of ENHG. Where possible the dates, as given in M&S, are also indicated.

(18) ENHG syncope

    a. gleich < geleich 'equal' (*Bavarian, before 1500, M&S: 6; Swabian, 1346, M&S: 11; Eastern Low Allemanic, M&S: 17; Ripurian, 15th century, M&S: 34*)

    b. Glaube < gelaube 'belief, religion' *(Swabian M&S: 11, around 1350; Low Alemannic, M&S: 15; Eastern Franconian, M&S: 30, 15th century)*

    c. Gnade < genade 'mercy' *(Bavarian, 1350, M&S: 6; Swabian, 1485, M&S: 10; Eastern Middle German, M&S: 35)*

    d. bleiben, bliben < beliben 'to stay' *(Bavarian, 1357, M&S 47; Eastern Franconian, 1384, M&S: 52; Silesian, 15th century, M&S: 56)*

    e. anfang < anefang 'begin' *(Bavarian, 14th century, M&S: 57; Nurembergian, M&S: 59; High Alemannic, M&S: 5)*

Throughout the ENHG period there is much variation in the data. The forms listed in (18) are often also found with a schwa. Despite this variation, however, there is a progressive development towards the MSG situation.

For the ENHG counterparts of the type shown in table 1, where there were originally two consecutive schwa syllables, the variation not only pertains to the question whether schwa is syncopated or not, but also which schwa in the two consecutive syllables is deleted. Consider the forms in (19), where it is shown that MHG -*elen*, -*eren* and -*en*V show up in various forms in ENHG:

(19) considerable variation around 1500:
    a. -elen
        Bavarian (Chelms Records, 2-9-1493 – 8-5-1494): han(n)deln *(57.9%)*; hanndlen, hanndlest *(36.8%)* 'to act'; edeln *(20%)* edlen *(80%)* 'noble' *(M&S: 85)*

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High Alemannic (Luzern, 1600): handlen, *much less often*: handelen, *still rarer*: handeln *(M&S: 88)*

Low Alemannic (Alsatian, e.g. Strasburg Records, 1519): handlen *as well as* handeln *(M&S: 87)*

Eastern Low Alemannic: sy murmlen 'they murmel'; sebelln, prigeln, *but*: Ainsidlen *(M&S: 88)*

b. -eren:

Swabian: ainandren (12.5%) ainandern (87.5 %) 'each other' *(M&S: 1970: 99)*

Low Alemannic (Alsatian): hindren *(44.4%)* hindern *(55.6%)* 'to hinder' *(M&S: 101)*

c. -enV:

Bavarian: hoch gebornen 'high-born' (*MSG:* hochgeborenen), gelaugent *vs.* verlaugnet 'denied' *vs.* 'renounce' *(M&S: 113)*

Low Alemannic (Alsatian): Ordenung ~ Ordnung *(in the same text!)* 'order' *(Rappolstein Records from 1452, M&S: 115)*

High Alemannic: gewaffnet ~ gewaffent *(in the same text!)* 'armed' *(Lucern Records from around 1400, M&S: 117)*

If one compares these ENHG forms with the MSG forms in table 1, one notices that the apparent morphological conditioning of the site where schwa is present had not yet been established.

The question then arises how the reanalysis from underlying to epenthetic schwa took place in German. In this connection it is useful to note that there was another type of schwa-zero alternation in German, i.e. an epenthetic schwa ('Sproßvokal') that occurred in the late Middle High German period:

(20) a. *MHG (Paul 1982: 65-66):*

tewenge *(MSG:* zwinge*)* '(I) force'

South Alemannic: zewussent, zewizschent *(MSG:* zwischen) 'between'

Bavarian (13th cent.): zoren *(MSG:* Zorn*)* 'anger'

Bavarian (13th cent.): arem *(MSG:* Arm, arm*)* 'arm, poor'

Bavarian (13th cent.): sturem *(MSG:* Sturm*)* 'storm'

Middle Bavarian (14th cent.): melichen *(MSG:* melken*)* 'to milk'

Middle Bavarian: galigen *(MSG:* Galgen*)* 'gallow-trees'

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b. *Also later in Early Modern High German (Moser & Stopp 1970):*

Bavarian (1409): Heribst (*MSG:* Herbst) 'autumn' *(cf. Modern Dutch* herfst [hɛr(ə)fst])

Rhine-Franconian: erebeteil (*MSG:* Erbteil) 'legacy'

Bavarian: voligen (*MSG:* folgen) 'to follow' *(cf. certain Dutch dialects:* [vɔləχən])

Bohemian, Eger (present day Cheb (Czech Republic), 1562): Catechißimum 'catechism'

Lower Austria: (1300): zewelf (*MSG:* zwölf) 'twelve' zewen (*MSG:* zwei) 'two'

This process was an innovation and appears to have been able to apply in any consonant cluster. It disappeared later in the ENHG period. It is clear that the two processes must have interfered with each other, at least in language acquisition. It must have been difficult for first language learners to distinguish between schwas that can be optionally deleted (like the cases in (18), (19)) and epenthetic schwas. This difficulty could be the source of the innovation towards the situation in which all schwas alternating with zero must be considered as epenthetic. I come to the following hypothesis:

Explanations for the change from syncope to epenthesis:

i.   A first language learner of Early New High German is confronted with a large number of schwa/zero alternations. On the one hand these are the result of a process, productive at the time, of schwa epenthesis (like the forms in (20) e.g. *zewizschent*). This process can take place in a great variety of consonant clusters.

ii.   Our learner is on the other hand confronted with cases of schwa-deletion (syncope) like in (19), e.g. *handelen > handlen ~ handeln* (Early MHG). This process takes place in a more limited number of environments, i.e. if the underlying form contains two schwas with a single intervening sonorant consonant.

iii.   The learner will now reanalyse the schwas in the forms resulting from the syncope as the result of a more general class of epenthesis. Thus he reanalyses the underlying forms.

iv.   Next, the ə/Ø alternation like in *zewizschent* (where there was free variation), has again vanished, but the schwa remained in endings in forms like *handeln*, because it was necessitated by

syllable structure. As a result, the alternating schwas have become a direct result of syllabification.

This hypothesis explains a part of the regularization of the distribution of schwa, i.e. that with respect to the occurrence of schwa in verbs and nouns, more specifically the fact that infinitival forms like *handlen, *zittren and that nominal forms like *Dunklen have become impossible (cf. tables 1, 2). This is so because the language learner has the language universal syllabification principles at his disposal (provided by UG), which because of directional syllabification (emulated by alignment in OT), allows only one site for the nucleus of the syllable.

There is reason to assume that in acquisition of phonology (as opposed to syntax) it is highly improbable that a language learner can distinguish between morphological word categories. This would be necessary in order to explain the difference between dunklen and im Dunkeln, unless schwa (or, if one adopts Itô & Mester's analysis: a mora) is a phonologically underlying grammatical adjectival formative.

However, this leaves us with a major question, i.e. why, then, do adjectives behave differently from nouns and verbs? At least two reasons present themselves:

(i) Attributive adjectives are always inflected and the inflection always contains a schwa, also if their stem does not contain a schwa, hereby contrasting with nouns which lost many of their case endings in the same period. Therefore, the schwa has been reanalysed, prior to the deletion > epenthesis reanalysis, as being part of the inflection. Consider the inflected adjective in an attributive position not preceded by an inflected determiner. In that case the inflectional consonant can be an obstruent like the masculine/neuter genitive singular or neuter nominative/accusative singular -s like in (21):

(21)   grünes [gʀynəs] 'green'

The form *[gʀyns], although syllabically well-formed, is excluded in MSG (but see below for the development in ENHG). The masculine/ neuter genitive -s is not specific to the adjectival paradigms, but can also be found in (what is left of) the nominal inflection. The conclusion must be that schwa has evolved as an attributive adjectival marker. Hence the underlying form for grünes must be /gʀyn+ə+s/, with a morpheme boundary between ə and s.

(ii) A second reason that may be invoked is recoverability. This is so because, while, as mentioned above, the attributive adjective is *always* inflected, schwa is sometimes the only marker of a grammatical function.

Note that the assumption of schwa as a phonologically underlying attributive adjectival marker explains the remaining part of the regularization, i.e. that the behaviour of adjectives is consistently different from that of nouns and verbs, such that also in adjectives the variation has disappeared and that one no longer finds doublets of the type *edlen ~ edeln* (see (19)) after the ENHG period.

6. The historical proof of the status of schwa as adjectival class marker

Apart from the process of syncope, there is also a process of apocope in ENHG. This process develops at the same period as that of syncope and the two processes have historically been considered as a single process (called VOKALSCHWUND 'vowel loss' in the German literature, see e.g. Paul (1881, 1982: 61-65), Penzl (1969: 88-89, 1975: 105-106). Examples are given in (22):

(22) ENHG apocope
   a. und < unde 'and' *(many dialects, M&S: 236-240)*
   b. on, an < ane 'without' *(many dialects, M&S: 240-245)*
   c. sant, sent, sand, sanct, synt < sante, sente, sancte, sincte 'saint' *(many dialects, M&S: 245-246)*
   d. -ung < -unge nominalizing suffix *(many dialects, M&S: 247-252)*
   e. -nis, -niss, -nus, -nuss nominalizing suffix < -nisse, -nusse *(many dialects, M&S: 254-259)*
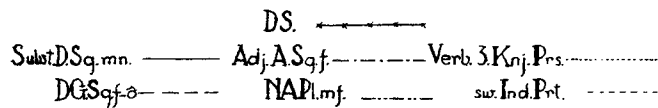
An interesting study of this process was made by Lindgren (1953), who studied the historical development of apocope in virtually all major dialect groups of ENHG. Apocope is taken by Lindgren in its wide meaning, i.e. it also encompasses vowel deletion in final syllables where the schwa is not the final segment like in *grünes > grüns*. The figures below, copied from Lindgren (1953: 182-185), show the development in the apocope of schwa for the following dialect groups and morphological categories:
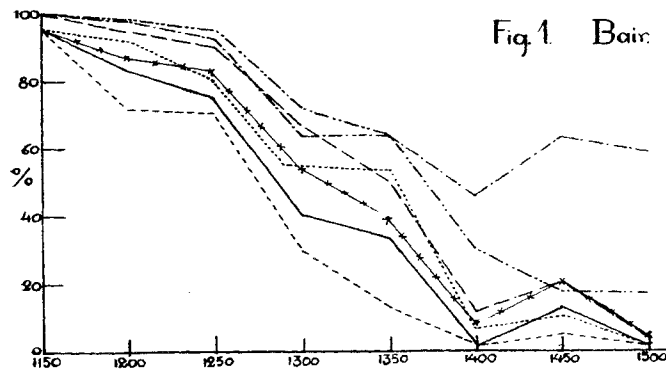
a. dialect-groups: Bavarian (*Bair.*, fig. 1), Upper Franconian (*Ofr.*, fig. 2), Swabian (*Schw.*, fig. 3), Upper Alemanic (*Obal.*, fig. 4), Lower Alemanic (*Ndal.*, fig. 5), Bohemian (*Böhm.*, fig. 6) Rhine-Franconian (*Rhfr.*, fig. 7)).

b. *Subst D.Sg.mn.* = dative singular masculine noun ————

c.   *DGSg.f.ô* =dative/genitive fem. noun (ô-declination) — — — —

d. *Adj.ASg.f.* = accusative singular feminine adjective —·—·—·—·

e.   *N.A.Sg.F* = nominative/acc. plural masc./fem. adj. — ·· — ·· — ··

f. *Verb.3.Knj.Pers* = 3rd person conjunctive sing. verb ···············

g.   *sw. Ind.Prt* = indicative preterit weak verb — — — — —

f. *D.S.* (Durchschnitt) = average –x—x—x—x–

The figures show the percentage of cases of apocope taking place for the respective dialects with on the horizontal axis a time scale from 1150 to 1500 A.D. and on the vertical axis a scale from 0 to 100% representing the percentage of realization of final schwa. Figure 8 (23i) presents an idealized picture of the development (*Zeit* = 'time').
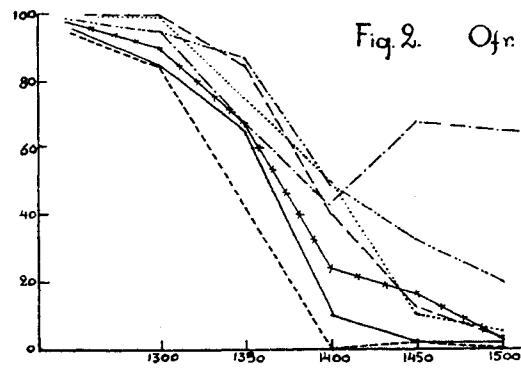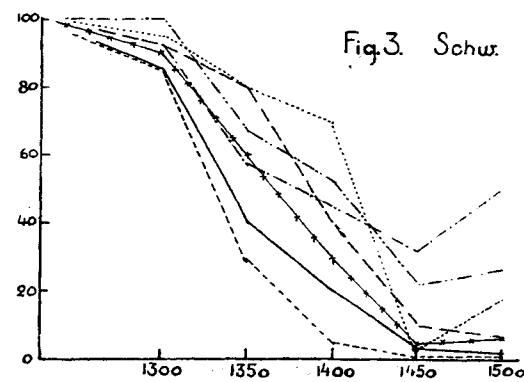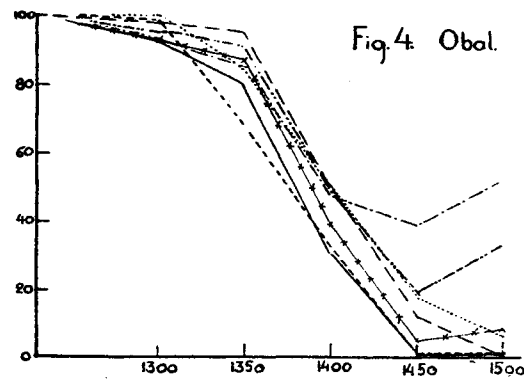
(23)   a.

b.

c.

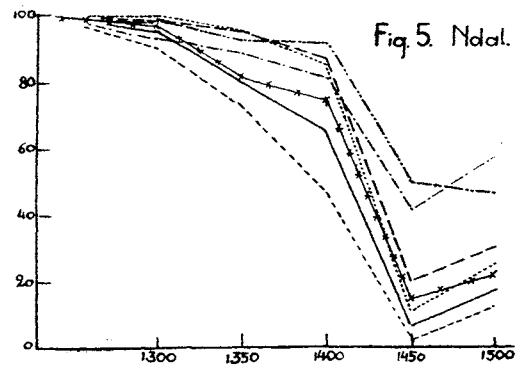Fig. 2. Ofr.

d.

Fig. 3. Schw.

e.

Fig. 4. Obd.

f.

Fig. 5. Ndal.

g.

Fig. 6. Böhm.

h.

Fig. 7. Rh.fr.
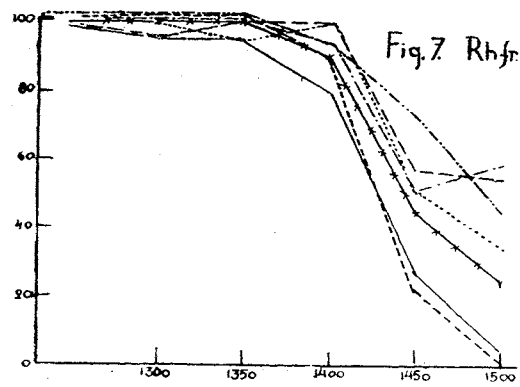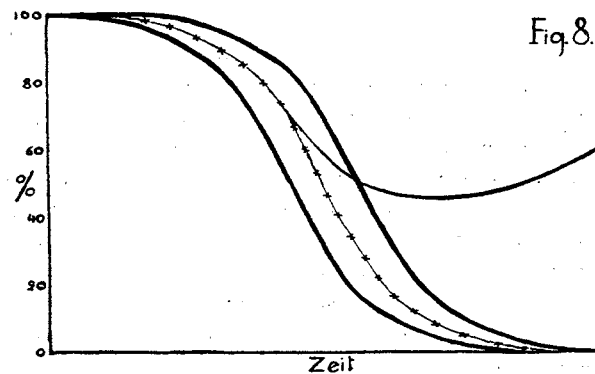
i.

Fig. 8.

Zeit
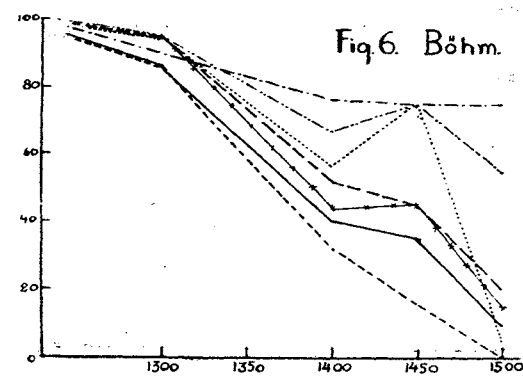
Lindgren describes these diagrams as follows (1953: 181, my translation):

The diagrams show a simple picture: the bundle of lines start in a closed way at 100%, then it starts to disperse and descends in an increasingly steep way until about 50%, then the bundle narrows again and becomes flatter, *except for the adjectives which leave the bundle in the middle and start rising again* (emphasis added).

We can see that schwa became an inherent feature of adjectives in attributive position. This is independent proof of the development of the status of schwa as an adjectival marker. It is independent, because no second originally underlying schwa is involved (as is the case in the doublet *Dunkeln/dunklen*): the schwa also started to appear again and become stable in places where it could easily have been deleted without preventing syllabification to syllabify all other segments as would be the case in e.g., in *gute* > *gut*. This confirms what I said above about (21) *grünes*.

Lindgren then explains why in nouns apocope was rather pervasive in case endings, while by contrast, number and gender endings were much less affected. The reason is

.... that gender and number had important functions (in the usage of the time) which had to be expressed explicitly, but that case had fewer important functions, which consequently could do without an specific form (1953: 214-5, my translation).

With respect to verbal inflection, Lindgren (1953: 217) notes that

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the apocope was much stronger in the indicative mode than in the conjunctive. This he again explains by the fact that the function of the endings were taken over by other elements, in the verbal case by auxiliaries (in spoken language the preterite had completely disappeared. (1953: 218)).

By contrast, adjectives behaved much differently:

> In this respect also the special status of the inflected adjectival forms can be understood. If the form of the phrase should be expressed through the determiner, then the attributes cannot loose their endings. It is true that only four forms are in danger, but they are the important ones: the nom. and acc. sing. fem. must indicate the number and the nom. and acc. plur. must indicate the gender. Hence in this case there is a strong need for an ending and this has caused a strong resistance to apocope (1953: 222, my translation).

Note that this point is the same as the recoverability argument I mentioned in section 5. Lindgren then mentions cases in which the original -*iu* ending was replaced by schwa by analogy. One of the results of Lindgren's study is that some apocopated schwas became reinstated. This may also be explained by analogy:

> The endings of the adjective, important from a functional perspective, were not "newly created" after a full apocopation, but the conservative tendencies in the language intervened in the process already early on and slowed it down, preempting the apocopation of the endings and reinstating them again in places where they had already partially disappeared (1953: 222, my translation).

We thus see that there is a **clear link** between the lack of apocope in adjectives in general and the site of the schwa in the contrast of the type *Dunkeln/dunklen* between verbs and nouns on the one hand and adjectives on the other: the genesis of schwa as an attributive adjective marker.

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7. Discussion and conclusions

7.1. Conclusions regarding German

The specific case study above shows that for a principled account of the schwa/zero alternations in German direct reference to morphological categories in phonological rules and conditions need not be made. The assumption of an adjectival category marker, schwa, makes it possible to understand the alternation in German as a truly phonological process.

The viability of this type of analysis in itself suffices to reject solutions with direct reference to morphological categories: the type of grammar it entails maintains a clear separation between morphology and phonology and is therefore much more elegant than one in which morphology and phonology are intermingled.

However, on top of considerations of elegance, the historical evidence from Lindgren's work clearly demonstrates that schwa developed as an adjectival marker, which to my mind, makes this type of analysis here compelling.

7.2. Discussion and conclusions regarding phonological theory

First, I would like to draw a brief conclusion concerning historical phonology: the disappearance of schwa in the underlying form in German, in conjunction with the emergence of schwa as an underlying adjectival marker, confirms once again that change in underlying forms, i.e. reanalysis, plays a crucial role in the understanding of language change.

We should now discuss a general and recurrent issue for phonological theory. Since the work of Bloomfield, and more specifically since that of Zellig Harris, an agglutinative view of morphology has prevailed over earlier conceptions of morphology in which word paradigms play a crucial role. In the agglutinating model, inflection is marked by affixes that can be put into one-to-one correspondence with morphemes. This view is termed *Item-and-Arrangement* in a pivotal article by Hockett (1954). In many cases, however, the desired result cannot be produced by the mere arrangement of items. One of the possibilities to remedy this is provided by a more dynamic view of morphology, which in its turn came to overshadow the agglutinative view: in this contrasting approach, which Hockett terms *Item-and-Process*, the items themselves undergo processes. It is this view

that has given rise to generative phonology. In generative phonology the principle of Item-and-Arrangement is partially recognized, but the items can have a fairly abstract underlying form and are transformed by processes to their surface form.

If we now look again at the German case, we see that SPE-accounts like the one by Kloeke, Strauss and Wurzel, use transformations abundantly. As already mentioned, the transformations are very complex. From an epistemological view this is only natural: over-usage of newly developed devices and notions is commonplace in the history of science.

Not long after the start of generative linguistics a tendency developed to limit the power and range of transformations. In syntax, this development started with Chomsky (1964), introducing the A-over-A principle, and has evolved up to present-day minimalism.

In the history of generative morphology and phonology the same strive towards transformational power reduction can be seen in the developments as diverse as the abstractness controversy, the debate concerning intrinsic versus extrinsic rule ordering and the development of Lexical Phonology. This latter development created the possibility to exclude direct reference to morphological categories from the formulation of processes. However, one can also overuse this *Lexical Phonology Approach*. We saw this in the analysis by Wiese, who has to use baroque statements in the formulation of phonological levels.

In this paper I have confronted this latter approach with an approach which contains elements of the Item-and-Arrangement model: because it was assumed (and proved historically) that schwa is an adjectival morpheme by itself, the baroqueness could be removed. I have called this approach the *Underlying Form Approach*. Explicitly, this methodological approach says that the assumption of underlying morphemes and markers should be preferred over reference to morphological categories in the formulation of processes. It differs from Item-and-Arrangement in that it does not refute the existence of (general) phonological processes, like in the German case the epenthesis of schwa through syllabification.

In short, underlying forms do matter.

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