Potential verbs in German: the emergence of a productivity gap

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This paper explores the theoretical consequences of two parallel changes in the historical development of German.[1] As the result of a change in the phonological wellformedness conditions for verbs all dactylic feet were systematically reduced to trochaic feet by schwa deletion (e.g. MHG ât[ə]m[ə]n > NHG atm[ə]n 'to breathe'). Simultaneously words ending in a schwa syllable closed by non-liquid consonants were excluded from the domain of the highly productive morphological rule of verbalization.

I argue that the emergence of the morphological gap does not reflect a change in the subcategorization requirements of the verbal suffix, but rather is a direct consequence of the autonomous change in the prosodic wellformedness conditions for verbs. On this view the set of potential verbs are those phonologically wellformed nonce verbs which can be related to a base in a phonologically transparent manner. Assuming that the (surface oriented) phonological relatability-conditions remain constant, a gap in the domain of verbalization with precisely the phonological characteristics stated above is predicted to accompany the changes in prosodic structure which marked the transition from MHG to NHG. The theoretical significance of the data thus concern the morphology-phonology interface and in particular the notion of the input.

The paper is structured as follows. In section 1 I describe the prosodic wellformedness conditions for verbs in NHG informally. In section 2 I describe the prosodic wellformedness conditions in MHG in terms of constraints showing how a reranking of those constraints would yield the current patterns. The description is based on Vennemann's wellformedness conditions for syllable structure (cf. Vennemann 1982, 1988), which are formalized within Optimality Theory (cf. Prince and Smolensky 1993). In section 3 I describe the conditions for verb formation in German. In section 4 I discuss the question of why a gap in the domain of verbalization results from historical changes in the prosodic wellformedness conditions of verbs.

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1. Wellformed verbs in NHG[2]

German infinitives are subject to two general conditions on phonological wellformedness. They always end in the alveolar nasal [n], and with the exception of the two high-frequency verbs <u>tun</u> 'to do' and <u>sein</u> 'to be',[3] they always end in exactly one schwa syllable.[4] Historically, this prosodic restriction is the result of a series of changes including 'schwa epenthesis', 'schwa deletion' and 'metathesis'.[5]

(1)   Middle High German: New High
                                             German:

      holn ~ hol[ə]n   hol[ə]n   'to fetch'
      ât[ə]m[ə]n   atm[ə]n   'to breathe'
      hag[ə]l[ə]n ~ hag[ə]ln ~ hagl[ə]n   hag[ə]ln   'to hail'

The historical changes illustrated in (1) not only 'conspired' to bring about a uniform prosodic shape, that is, the occurrence of exactly one final schwa syllable in Modern High German. In addition, there is no longer any variation in the position of the schwa. That is, for any given sequence of postvocalic consonants there is generally only one possible site for the schwa, regardless of the stress contour of the

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[2]For a criticism of relevant descriptions in Lexical Phonology (cf. Giegerich 1987, Wiese 1986, 1988, Hall 1992), see Raffelsiefen 1995.

[3]The verb <u>tun</u> is often pronounced with a final schwa syllable in colloquial speech (i.e. <u>tu[ə]n</u>).

[4]Phonetically, the sequence schwa plus sonorant is often realized as a syllabic sonorant or as a vocalic r respectively, as shown in (ib):

(i)a.   red[ə]n   b.   red[n̩]   reden 'to talk'
     wick[ə]ln   wick[l̩]n   wickeln 'to wind'
     stolp[ə]rn   stolp[ɐ]n   stolpern 'to stumble'
     geb[ə]n   geb[m̩]   geben 'to give'
     reg[ə]n   reg[ŋ̍]   regen 'to move'

The place of articulation of a syllabic nasal is always identical to that of the preceding consonant. The description presented here is based on the perhaps overarticulated variants in (ia). The variants in the b column, as well as other register-dependent variants, can be derived from the representations in column a.

[5]Orthographically the schwa is always represented by the grapheme <e>.

verb or its internal morphological structure.[6] For example, the position of the schwa in the verb <u>hageln</u> in (1) is mirrored by every other verb in which the last full vowel is followed by the consonants g, l, and n. Examples are given in (2):

(2) **XVgln: XVg[ə]ln**

nág[ə]**ln** 'to nail'   fräg[ə]**ln** 'to ask cunningly'
schúrig[ə]**ln** 'to bully'   schmúgg[ə]**ln** 'to smuggle'
móg[ə]**ln** 'to cheat'   máßrèg[ə]**ln** 'to reprimand'

Regarding the question of what determines the site of the schwa we find that almost all patterns follow from two principles none of which is specific to verbs. The first of these principles concerns the wellformedness conditions on sonority relations within the syllable stated in (3):

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[6]Investigating the verbs listed in Muthmann's reverse dictionary we find a total of 323 distinct sequences of consonants following the last full vowel (affricates are considered bisegmental). For all but one of those sequences the position of the schwa is fixed. In the table in (i) the verbs are classified according to the sounds which follow the schwa; consonants preceding the schwa are represented by C_0:

(i)	Position of schwa:	Number of patterns:	Example patterns:	Example verbs:	gloss:
a.	XVC_0[ə]n	156	**XVrl[ə]n**	quirl[ə]n	'to whisk'
b.	XVC_0[ə]rn	88	**XVnt[ə]rn**	kent[ə]rn	'to capsize'
c.	XVC_0[ə]ln	74	**XVpst[ə]ln**	herbst[ə]ln	'to *autumn*'
d.	XVC_0[ə]rln	6	**XVs[ə]rln**	buss[ə]rln	'to kiss'

The verbs illustrated in (id) are not only rare, but are also considered dialectal by many. Nonetheless, whether or not hearers accept such verbs as part of the standard language they will clearly reject any alternative positions for the schwa. The examples in (id) thus support the claim that for any given sequence of postvocalic consonants there is only one possible site for the schwa. The only exception to this generalization concerns verbs in which the last full vowel is followed by the consonants r and n. For such verbs the schwa usually precedes the final n (cf._fahr_[ə]n 'to drive', _probier_[ə]n 'to try') but in the two verbs näh[ə]_rn_ 'to approach' and _wieh_[ə]_rn_ 'to neigh' the schwa precedes the r. These two verbs (along with _tun_ and _sein_, cf. p. 2) are the only counterexamples to the wellformedness conditions formulated here.

(3)   SON
        A sonorant in the syllable onset may only be followed by
        segments of higher sonority; a sonorant in the syllable
        coda may only be preceded by segments of higher sonority.

        According to (3) for every sonorant in the syllable shell
(i.e. head and coda) the sonority level must increase toward
the nucleus. The constraint in (3) is consistent with both
Vennemann's 'Head Law' and 'Coda Law', which say that syllable
heads and codas are the more preferred the more sharply the
sonority increases towards the nucleus (1988:13ff). The
sonority hierarchy with reference to which the constraint in
(3) is evaluated is given in (4):

(4)   increasing sonority   decreasing sonority
        <--->

Vowel	r i̯ u̯ y̑	l	m n ŋ	Obstruent

        The ranking among r, l, and the nasals in (4), is
consistent with the 'discontinuous gradings' of sonority
proposed by Sievers on auditory grounds (1901:198f).[7]
According to the table in (4) sonorants must precede
obstruents in coda position and the only permissible sonorant
clusters are rN, lN, rl, and rlN. Any other combinations would
constitute 'sonority violations' and are obligatorily 'broken
up' by the schwa as shown in (5):

(5)a.   Schem[ə]l]$_N$ 'stool'   b.   *Scheml
        wied[ə]r]$_{ADV}$ 'again'   *wiedr
        At[ə]m]$_N$ 'breath'   *Atm
        Ab[ə]nd]$_N$ 'evening'   *Abnd
        alb[ə]rn]$_A$ 'silly'   *albrn
        Am[ə]n]$_{INTERJ}$ 'amen'   *Amn
        hund[ə]rt]$_{NUM}$ 'hundred'   *hundrt
        MacDon[ə]ld]$_{NAME}$ *Macdonld

        Since the schwa forms an additional syllabic nucleus all
words in (5a) satisfy the condition in (3). Without the schwa

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        [7]There seems to be general agreement among phonologists working on
German that r is more sonorous than l which in turn is more sonorous
than the nasals. The overall structures of the hierarchies proposed,
however, differ considerably (cf. Vennemann (1982:284), Strauss
(1982:97), Hall (1992:64)).

these words would violate (3) as a result of including the boldfaced clusters in coda position as is shown in (5b).

Consider next the ranking of glides in the sonority hierarchy given in (4). This classification is based on the distribution of schwa following diphthongs:

(6)a. faul 'lazy'   b. Mau[ə]r 'wall'
       Geheul 'howling'   teu[ə]r 'expensive'
       Pfeil 'arrow'   Fei[ə]r 'celebration'

On the assumptions that a) German diphthongs consist of a vowel in nucleus position followed by a glide, that is, a high vowel in coda position (i.e. [au], [ai], and [ɔy])[8], and b) that (3) holds, the data in (6a) indicate that glides are more sonorous than l. The fact that a diphthong is never followed directly by r in coda position indicates that glides are equally (or less) sonorous than r.[9] The sonority table in (4) is accordingly consistent with the data considered so far.

The generalization in (3) along with the table in (4) also rule out the occurrence of adjacent identical sonorants, which in fact are broken up by a schwa as well (cf. Pfarr[ə]r 'priest' and Lein[ə]n 'linen', etc.). Coda clusters involving obstruents as second members are not regularly broken up by a schwa regardless of the sonority relation within the cluster. This is the reason for restricting SON to sonorants as formulated in (3).

With reference to the sonority constraint in () one can state the generalizations determining the site of the schwa in NHG verbs concisely. First, when the consonants following the last full vowel include a single cluster in which sonority fails to decrease, that cluster is 'broken up'. Examples are given in (7):

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[8]Sievers claims that only high vowels can appear in coda position which is probably related to the fact that sonority in vowels decreases with hight (1901:204). On the assumption that sonority relations are universally constant but that, in individual languages, speechsounds may range over adjacent slots of the sonority hierarchy it would follow that only the least sonorous vowels can also appear in the slot for (the most sonorous) consonants.

[9]For evidence that glides (i.e. high vowels) and the r occupy the same slot in the sonority hierarchy for Icelandic see Vennemann (1988:51f).

(7) Consonantal Sonority   Example:
     Pattern   Violation:

     XVgln   *gl   ha**g**[ə]**l**n 'to hail'
     XVgrn   *gr   zö**g**[ə]**r**n 'to hesitate'
     XVrntn   *tn   ern**t**[ə]**n** 'to harvest'
     XVnzln   *zl   hän**s**[ə]**l**n 'to tease'
     XVsrln   *sr   bus**s**[ə]**r**ln 'to kiss'
     XVurn   *ur   da**u**[ə]**r**n 'to last'
     XVymdn   *dn   verleum**d**[ə]**n** 'to slander'
     XVrpstln   *tl   herbs**t**[ə]**l**n 'to turn fall'
     XVlpsn   *sn   rülp**s**[ə]**n** 'to burp'
     XVnstrln   *tr   fens**t**[ə]**r**ln 'to visit a lover by
                                            climbing through his or
                                            her bedroom window'

Infinitives such as ha**gl**[ə]**n**, zö**gr**[ə]**n**, etc. are thus
impossible in German, although they do not violate sonority.

In all NHG verbs involving two potential sonority
violations the two violations always overlap in that they
share a sonorant (i.e. the boldfaced sonorant in (8)). In such
cases the schwa always breaks up the rightmost sonority
violation:

(8)   Consonantal   Sonority   Example:
        Pattern   Violations:

        XVtmn   *tm, *mn   at**m**[ə]**n** 'to breathe'
        XVgnn   *gn, *nn   reg**n**[ə]**n** 'to rain'
        XVknn   *kn, *nn   trock**n**[ə]**n** 'to dry'
        XVšlrn   *šl, *lr   tisch**l**[ə]**r**n 'to do woodwork'
        XVkslrn   *sl, *lr   drechs**l**[ə]**r**n 'to work the lathe'
        XVmpnrn   *pn, *nr   klemp**n**[ə]**r**n 'to do plumbing'
        XVrtnrn   *tn, *nr   gärt**n**[ə]**r**n 'to garden'

Third, in the absence of potential sonority violations the
schwa immediately precedes the final n̲ as is shown in (9):

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(9)   Consonantal   Sonority   Example:
         Pattern   Violation

         XVn   –   sä[ə]n 'to sow'
         XVln   –   hol[ə]n 'to get'
         XVrn   –   hör[ə]n 'to hear'
         XVi̯n   –   schnei[ə]n 'to snow'
         XVu̯n   –   hau[ə]n 'to slap'
         XVrln   –   quirl[ə]n 'to whisk'
         XVu̯ln   –   faul[ə]n 'to rot'
         XVy̯ln   –   heul[ə]n 'to cry'

The conditions determining the site of the schwa in German verbs are summarized in (10):

(10)a. Given one potential sonority violations, the schwa breaks it up. Exceptions: none.

b.   Given two 'overlapping' sonority violations, the schwa breaks up the rightmost one. Exceptions: none.

c.   In the absence of sonority violation, the schwa appears before the last segment. Exceptions: _tun_, _sein_, _nähern_, _wiehern_.

The generalisations in (10) raise the question of why there are no examples with nonoverlapping sonority violations. This question concerns the notion of the input and will be addressed in section 4.

Note that the generalizations in (10) make no reference to the internal morphological structure of verbs. In particular, the site of the schwa in the verbs in (11) is not influenced by the phonological structure of their respective (etymological) base:

(11)   Base:
     regn[ə]n 'to rain'   < Reg[ə]n 'rain'
     atm[ə]n 'to breathe'   < At[ə]m 'breath'
     zent[ə]rn 'to center'   < Zentrum 'center'
     knäul[ə]n 'to squeeze sth. into a ball'   < Knäu[ə]l 'ball'

Consider also the morphological rule of "_l_-Infixation" in verbs illustrated in (12). Generally the _l_ directly precedes the final _n_ as shown in (12a). However, if the segment preceding the final _n_ in the base is more sonorous than _l_ we find the pattern in (12b):

(12)   (etymological) base:
a.   äug[ə]ln 'to glance secretly' < äug[ə]n 'to look searchingly'
      streich[ə]ln 'to caress'   < streich[ə]n 'to stroke'
      kusch[ə]ln 'to snuggle up'   < kusch[ə]n 'to knuckle under'
      dräng[ə]ln 'to jostle'   < dräng[ə]n 'to push; to press'

b.   kraul[ə]n 'to fondle'   < (†)krau[ə]n 'to scratch'
      graul[ə]n 'to be scared'   < grau[ə]n 'to be terrified'
      wurl[ə]n 'to swarm'   < †wurr[ə]n 'to roar'
      †wirl[ə]n 'to surge   < wirr[ə]n 'to surge confusedly'
      confusedly'

In the examples in (12a) the position of the schwa is
determined by rule (10a); in the examples in (12b) it is
determined by rule (10c).

2. From MHG to NHG: a constraint-based analysis.

2.1. Basic assumptions

MHG schwas are largely the result of a process of vowel
reduction in unstressed syllables which characterizes the
transition from OHG to MHG:[10]

(13) OHG   MHG   gloss:
      géban   geb[ə]n   'to give'
      hábe:n   hab[ə]n   'to have'
      hólo:n   hol[ə]n, holn   'to call'
      mángolo:n   mang[ə]l[ə]n, mangl[ə]n, mang[ə]ln   'to lack'
      á:tamo:n   a:t[ə]m[ə]n   'to breathe'

In MHG we find variation for some verbs (e.g.
mang[ə]l[ə]n, mangl[ə]n, mang[ə]ln), but not for others (e.g.
a:t[ə]m[ə]n). The same type of variation extends also to new
verbs in MHG (hag[ə]l[ə]n ~ hagl[ə]n ~ hag[ə]ln, but
wa:p[ə]n[ə]n ~ *wa:pn[ə]n) which shows that the distribution
of schwa, including the variation, was rule-governed. The
description of the relevant rules to be presented below is

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[10]The change in (13) indicates a reranking of constraints to the
effect that *SCHWA is dominated by some constraint on foot structure
which will not be discussed here.

based on the assumption that there is a general constraint against schwa as shown in (14):[11]

(14)   *SCHWA

The constraint in (14) implies that schwas are unstable unless their presence is needed in order to satisfy some equally high or higher ranking constraint. For example, the assumption that SON as stated in (3) dominates *SCHWA explains the stability of the schwa in geb[ə]n 'to give' as is shown in (15):

(15)			SON	*SCHWA
		gebn	*!	
	→	geb[ə]n		*

For now it will be assumed that inputs consist of morphological structures which include abstract stems. For example, the candidates in (15) are generated by some context-free epenthesis rule based on the input geb+n, where n is the infinitival suffix. The constraint-based evaluation of the candidates amounts to a phonological interpretation of the input in accordance with the standard view of the morphology-phonology interface in Generative Grammar.

The description in (15) refers exclusively to phonological constraints which concern the wellformedness of syllable structure. The constraint SON prohibits certain sequences of sounds in the syllable coda and onset, whereas *SCHWA refers to the structure of nuclei. As will be shown, the entire range of schwa patterns in MHG verbs can be described exhaustively in terms of an interaction of constraints all of which refer to syllable structure. In order to ensure that the constraints are independently motivated they are consistent with Vennemann's (1988) 'Preference Laws for Syllable Structure'.

2.2. The list of constraints

Apart from SON which constrains the wellformed sequence of speech sounds in the syllable, there are also preferences for noncomplex heads and codas. These constraints are consistent with Vennemann's Head Law and Coda Law, respectively:

(16)a. HEAD
        A syllable head must be neither empty nor complex.

b.   CODA
        A syllable coda must not be complex.

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[11]This constraint is also proposed by Mester and Ito (1994).

Evidence for restricting syllable codas with respect to complexity rather than requiring empty codas will be presented in the next section.

Apart from constraining the complexity of syllable heads and codas there is also a constraint against complex rhymes. That constraint refers not to speech sounds but rather to moras and is stated in (17) (Cf. Vennemann's "Weight Law" 1988:30ff[12]):

(17) WEIGHT
     The maximal weight of a syllable is three moras.

Consider next the wellformedness condition for syllable structure referred to as 'Shell Law' in Vennemann (1988:11). This law says that identical speech sounds flanking the nucleus are disfavored, especially if they are not the only ones within their margin. The Shell Law is expressed in the following constraint:

(18) SHELL
     *CC_iVC_j, where C_i and C_j are equally sonorous.

Finally there is a constraint which does not refer to intrasyllabic structure but rather to the wellformedness of syllable contacts. According to the "Syllable Contact Law" proposed by Vennemann (1982, 1988) the syllable contact A.B is the more preferred, the more sonorous the offset A and the less sonorous the onset B. The 'Contact Law' is adopted here in the following formulation:

(19)   CONTACT
     In a syllable contact A.B, A must be more sonorous than B.

The possible domains for syllabic wellformedness are hereby exhausted. As will be shown in the next section all constraints listed above play a role in MHG verb prosody.

2.3 Wellformed verbs in MHG

As was noted before MHG differs from NHG in that certain verbs show free variation in the position of the schwa. Variants such as those in (20) are often attested to even within a single document (cf. Moser & Stopp (1970:84ff):

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[12]The 'Weight Law' says that "in stress accent languages an accented syllable is the more preferred, the closer its syllable weight is to two moras". Limiting the constraint 'WEIGHT' to two moras would only yield the correct results if the last consonant in a word was ignored.

(20)　hageln ~ haglen ~ hagelen　　-- 'to hail'
　　　handeln ~ handlen ~ handelen　'to handle'
　　　wundern ~ wundren ~ wunderen　'to wonder'
　　　toppeln ~ toplen ~ topelen　　'to play at dice'
　　　kîfeln ~ kiflen ~ kifelen　　'to chew'　·
　　　mangeln ~ manglen ~ mangelen　'to lack'
　　　sateln ~ satlen ~ satelen　　'to saddle'
　　　roteln ~ rötlen ~ röttelen　　'to play the rotte[13]'
　　　rütteln ~ rütlen ~ rütelen　　'to shake'

The cooccurrence of the variants in (20) is accounted for by the constraint ranking in (21).:

(21)			SON	*SCHWA	CONTACT	HEAD	CODA
		hagln	*!				
	→	ha.g[ə].l[ə]n		**			
	?→	hag.l[ə]n		*	*		
	?→	ha.gl[ə]n		*		*	
	→	ha.g[ə]ln		*			*

The "!" marks a fatal constraint violation. Unorderedness among constraints is represented by the dotted lines. Unorderedness among *SCHWA, CONTACT, HEAD, and CODA results in a tie among four candidates thereby expressing the variation observed in (20). Tshe question of whether the written form <haglen> represents hag.l[ə]n, ha.gl[ə]n, or maybe both variants, cannot easily be decided. We will return to this question below.

Characteristic for the verbs in (20) is the presence of a potential contact violation (i.e. <g,l>) followed by a less sonorous final segment (i.e. <l,n>). Verbs in which two consonants potentially forming a wellformed contact (i.e. <r,k>) are followed by a more sonorous final segment (i.e. <k,n>) yield a single optimal candidate as the example merken 'to watch' in (22) illustrates:

(22)			SON	*SCHWA	CONTACT	HEAD	CODA
a.		merkn	*!				
		me.r[ə]kn	*!				
		me.rk[ə]n	*!				
	→	mer.k[ə]n		*			
		me.r[ə].k[ə]n		**!			

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[13]A "rotte" is a musical instrument.

Given a decrease in sonority (i.e. <r,k>) followed by an increase (i.e. <k,n>) we find that for every candidate which violates *SCHWA twice, there will always be a candidate which violates *SCHWA only once without incurring additional violations. Variants with two final schwa syllables such as mereken are accordingly always eliminated. Additional examples are given in (23):

(23)
werfen	*werefn, *werefen	'to throw'
trinken	*trinekn, *trineken	'to drink'
helfen	*helefn, *helefen	'to help'
warnen	*warenn, *warenen	'to warn'
firmen	*firemn, *firemen	'to make firm'
knarschen	*knareschn, *knareschen	'to grind one's teeth'
smirken	*smirekn, *smireken	'to be rancid'
slurken	*slurekn, *slureken	'to swallow'

The absence of ordering between the last four constraints in (22) does not clear the way to a random variety of forms but accounts just for the kind of variation which is attested to.[14]

Consider next the variants in (24):

(24)
kebsen ~ kebesen	*kebesn	'to commmit adultery'
richsen ~ richesen	*richesn	'to govern'
houpten ~ houbeten	*houbetn	'to decapitate'
markten ~ marketen	*marekten, *marketn	'to trade'
vögten ~ vögeten	*vögetn	'to protect'
lechzen ~ lechezen	*lechezn	'to dry out'
rofzen ~ roffezen	*roffezn	'to belch'
guckzen ~ guckezen	*guckezn	'to stare'

In order to account for the occurrence of the dactylic variants in (24) the sonority hierarchy in (4), in particular the ranking among obstruents, must be specified further. According to the table in (25) fricatives and affricates are more sonorous than stops, which is consistent with Sievers' description (cf. Sievers 1901:205).

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[14]The dactylic forms in (i) are not accounted for by the tableau in (22). All counter-examples involve nasals followed by nonhomorganic obstruents.

(i)
vremeden ~ vremden	'to alienate'
(er)lemeden ~ lemden	'to make lame'
baneken ~ banken	'to romp about'
ruomesen	'to brag'
trumeten	'to trumpet'

The existence of such variants indicates perhaps that a constraint ruling out clusters of nasals and nonhomorganic obstruents ranks as high as *SCHWA in MHG.

(25)

Vowel	r	l	Nasal	Fric./Affr	Stop

Reference to the higher sonority of fricatives vis-a-vis stops is crucial in order to explain the occurrence of dactylic variants in (24), but not in (26):

(26) zaspen   *zasepen, *zasepn   'to drag one's feet'
      haften   *hafeten, *hafetn   'to stick'
      vristen   *vriseten, *vrisetn 'to delay'
      vrêsken   *vrêseken, *vrêsekn 'to find out'
      lispen   *lisepen, *lisepn   'to lisp'
      veiJten   *veiJeten, *veiJetn 'to fatten'

All potential syllable contacts in the verbs in (26) are wellformed which is not true for the verbs in (24). As a result, a trochaic candidate is invariably superior to dactylic candidates in (26), but not in (24) as is shown by the next tableau:

(27)			SON	*SCHWA	CONTACT	HEAD	CODA
a.		kebsn	*!				
		ke.b[ə]sn	*!				
	→	keb.s[ə]n		*	*		
	→	ke.bs[ə]n		*		*	
	→	ke.b[ə].s[ə]n		**			
		zaspn	*!				
		za.s[ə]pn	*!				
	→	zas.p[ə]n		*			
		za.sp[ə]n		*		*!	
		za.s[ə].p[ə]n		**!			

Consider next the variation, versus lack thereof, in verbs which do not potentially violate SON.

(28)a. varn ~ var[ə]n   'to go'   b. hôr[ə]n *hôrn   'to hear'
        holn ~ hol[ə]n   'to call'   vall[ə]n *valln 'to fall'
        wern ~ wer[ə]n   'to last'   teil[ə]n *teiln 'to share'
        steln ~ stel[ə]n 'to steal'   vüer[ə]n *vüern 'to lead'

Verbs with a short vowel followed by a single (e.g. nongeminate) liquid typically show free variation between mono- and bisyllabic forms as is illustrated in (28a). By contrast, verbs with a long vowel or a geminate liquid are never monosyllabic. This observation indicates that WEIGHT ranks at least as high as *SCHWA:

(29)			SON	WEIGHT	*SCHWA	CONTACT	HEAD	CODA
	→	varn			..			*
	→	va.r[ə]n			*			
		va.ern			*			*
		hôrn		*				*
	→	hô.r[ə]n			*			
		hô.[ə]rn			*			*

The fact that <u>varn</u> alternates with <u>varen</u> supports the claim that *SCHWA and CODA are unordered (cf. the analysis of the variants in (21)).

The ranking in (29) predicts that in every verb which potentially violates WEIGHT but not SON the schwa precedes the wordfinal <u>n</u>. The lack of variation in the following verbs is thereby accounted for:

(30) bërlen   *bërln, *bëreln, *bërelen   'to decorate'
      murlen   *murln, *mureln, *murelen   'to murmur'
      turlen   *turln, *tureln, *turelen   'to be dizzy'

The starred variants in (30) are ruled out because each of them involves more violations than the actual form:

(31)			SON	WEIGHT	*SCHWA	CONTACT	HEAD	CODA
		bërln		*				**!
		bë[ə]rln		*	*			**!
		bë.r[ə]ln			*			*!
	→	bër.l[ə]n			*			
		bë.r[ə].l[ə]n			**!			

The fact that <u>bër.l[ə]n</u>, rather than <u>bë.r[ə]ln</u>, is the actual form is the main motivation for defining CODA with respect to complexity rather than requiring syllable codas to be empty.

If neither WEIGHT nor SON are violated, monosyllabic variants are always possible. In fact, the constraint ranking in (31) predicts that there is one case in which the optimal candidate must be monosyllabic, that is, all verbs where the wordfinal <u>n</u> is the only postvocalic consonant:

(32)			SON	WEIGHT	*SCHWA	CONTACT	HEAD	CODA
	→	gân						
		gâ[ə]n			*!			

Other relevant examples are MHG <u>stân</u> but *<u>stâ[ə]n</u> 'to stand', <u>sîn</u> but *<u>sî[ə]n</u> 'to be'.

Apart from the case illustrated in (32) where verbs are obligatorily monosyllabic there are also cases where verbs are obligatorily dactylic. Consider the examples in (33):

(33)a. tugenden   *tugneden, *tugnden, *tugendn   'to lend virtue to
        abenden   *abneden, *abnden, *abendn   'evening comes'
        jugenden   *jugneden, *jugnden, *jugendn   'to be youthful'
        zëhenden   *zëhneden, *zëhnden, *zëhendn   'to give a tenth'
        rêterschen   *rêtreschen, *rêtrschen,   'to puzzle'
                     *rêterschn
        ritterschen *rittreschen, *rittrschen,   'to militarize'
                     *ritterschn
   b.   hilderlen   *hildrelen, *hildrlen,   'to nag'
                     *hilderln
        vingerlen   *vingrelen, *vingrlen,   ?
                     *vingerln
        lecherlen   *lechrelen, *lechrlen,   'to smile'
                     *lecherln

The examples in (33) differ in that those in (33a) require two schwas in order to avoid any violations of SON whereas those in (33b) require one schwa for that purpose. The nonvarying dactylic forms in both cases are accounted for by the tableau in (34):

(34)			SON	WEIGHT	*SCHWA	CONTACT	HEAD	CODA
		tugndn	**!					
-		tugn.d[ə]n	*!					
		tug.nd[ə]n	*!					
		tug.n[ə].d[ə]n			**	*!		
		tu.gn[ə].d[ə]n			**		*!	
	→	tu.g[ə]n.d[ə]n			**			
		hildrln	*!					
		hildr.l[ə]n	*!					
		hild.rl[ə]n	*!					
		hil.d[ə]rln		*	*			**!
		hil.dr[ə]ln			*		*	*!
	→	hil.d[ə]r.l[ə]n			**			

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Consider finally the verbs in (35):

(35)
rëgenen	?rëgnen	*rëgenn	'to rain'
âtemen	?âtmen	*âtemn	'to breathe'
morgenen	?morgnen	*morgenn	't procrastinate'
krademen	?kradmen	*krademn	'to make a noise'
wolkenen	?wolknen	*wolkenn	'to be full of clouds'
ëbenen	?ëbnen	*ëbenn	'to level'
truckenen	?trucknen	*truckenn	'to dry'

The verbs in (35) differ from those in (20) in that the dactylic variants appear to be preferred in MHG although trochaic variants for some verbs are also attested to. Preference for dactylic forms is not expressed in the tableau in (36):

(36)			SON	WEIGHT	*SCHWA	CONTACT	HEAD	CODA
		rëgnn	**					
		rë.g[ə]nn	*					
	→	rëg.n[ə]n			*	*		
	→	rë.gn[ə]n			*		*	
	→	rë.g[ə].n[ə]n			**			

How do the verbs in (35) differ from those admitting both trochaic and dactylic variants considered earlier? In particular, on what basis could the trochaic candidates in (36) be ruled out?

Consider first the trochaic candidate rë.gn[ə]n. Unlike trochaic variants of the verbs in (20) and (24) that candidate can be eliminated by ranking SHELL al least as high as *SCHWA. However, in order to eliminate the other trochaic candidate, e.g. rëg.n[ə]n, CONTACT must rank higher than *SCHWA. Such a ranking would imply that variants such as haglen are admitted with the syllabification ha.glen only. The question of whether or not such a conclusion is desirable calls for further phonological investigations.[15] The tableau in (37) rules out the trochaic variants of the verbs in (35) whereas the tableau in (36) allows for them. Both descriptions account for the wellformedness of dactylic variants.

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[15]Conceivably reference to processes of vowel lengthening in open syllable could help decide the issue.

(37)			SON	CONTACT	WEIGHT	SHELL	*SCHWA	HEAD	CODA
		rẽgnn	**!						
		rë.g[ə]nn	*!						
		rëg.n[ə]n		*!					
		rë.gn[ə]n				*	*	*	
	→	rë.g[ə].n[ə]n					**		

It can be concluded then that although there is some uncertainty regarding the ranking among CONTACT and *SCHWA, the interaction between various syllable structure constraints and *SCHWA accurately describes the prosodic form of MHG verbs. In particular there is no need to refer to the internal morphological structure of verbs. Most importantly, the constraint-based description allows for a straightforward account of the seemingly complex changes of prosodic form characterizing the transition to NHG discussed in the next section.

2.4. The transition to NHG

As was noted above the changes from MHG to NHG in the prosodic form of infinitives "conspired" to yield trochaic forms only where for each verb the schwa is in a fixed position. Consider first the fact that among the three or four variants of the verb hagelen in MHG, only ha.geln is left in NHG. This observation suggests the following reranking of constraints:

(38)			SON	*SCHWA	CONTACT	HEAD	CODA
		hagln	*!				
		ha.g[ə].l[ə]n		**!			
		hag.l[ə]n		*	*!		
		ha.gl[ə]n		*		*!	
	→	ha.g[ə]ln		*			*

The illformedness of hagelen in NHG indicates that *SCHWA ranks higher than CONTACT, HEAD, and CODA.[16] The preference of hageln over *haglen shows that CODA ranks lower than CONTACT and HEAD. The analysis in (38) does not indicate a specific

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[16]Except for CONTACT all constraints in (38) are identical to the corresponding constraints in MHG. Evidence for restricting CONTACT to sonorants in NHG comes from verbs in which a stop-fricative cluster is followed by a liquid-nasal cluster (cf. [vɛksəln] wechseln 'to change'). The reader may convince herself that the ungrammatical form *[vɛkslən] would emerge as optimal candidate if CONTACT would also apply to obstruent clusters.

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order among CONTACT and HEAD. The existence of the variants
in (39) indicates that these constraints are either unordered
or that the order differs for different speakers:

(39)   re.[g]nen ~ re[k].nen   'to rain'
        or.[d]nen ~ or[t].nen   'to order'
        e.[b]nen ~ e[p].nen   'to level'

The voicing alternation in (39) follows from the fact
that only voiceless obstruents occur in syllable codas in
German. A lack of order between CONTACT and HEAD would result
in a tie among the two variants in (39), thereby accounting
for the acceptability of both forms in standard German. What
is no longer acceptable is the dactylic variant which is
explained by the constraint ranking:

(40)			SON	*SCHWA	CONTACT	HEAD	CODA
		regnn	*!				
		re.g[ə]nn	*!				
	→	reg.n[ə]n		*	*		
	→	re.gn[ə]n		*		*	
		re.g[ə].n[ə]n		**!			

The ranking of the phonological constraints in (40)
accounts for the generalisations in (10a,b).[17] There is no
evidence that either WEIGHT nor SHELL play any roll in the
prosodic form of NHG verbs.[18,19]
The fact that verbs are trochaic in NHG even if they do not
potentially violate SON (e.g. sä[ə]n, hol[ə]n, etc.) indicates
that *SCHWA is dominated by a constraint which requires verbs
to end in a schwa syllable. That constraint presumably has the

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[17]The same ranking also accounts for the distribution of the schwa
in uninflected words (cf. the examples in (5)).

[18]The observation that WEIGHT no longer plays a role in NHG is in
accordance with the general loss of quantity-sensitivity in German. The
MHG length contrasts in consonants (i.e MHG ta[n:]e 'pine' vs. va[n]e
'flag') and arguably also in vowels (i.e. MHG m[a:]ge 'relative' vs.
m[a]ge 'stomach') have disappeared in NHG. The phonological analysis of
phonetic length contrasts in NHG vowels is a matter of debate (cf.
Ramers 1988).

[19]While there is no direct evidence for SHELL, its existence
requires perhaps a ranking among CONTACT and HEAD in order to account
for the variant re.gn[ə]n. This is because re.gn[ə]n would eventually
lose to the candidate reg.n[ə]n when evaluated with respect to SHELL,
regardless of how low that constraint ranks. The order CONTACT >> HEAD
yields the form re.gn[ə]n, whereas the order HEAD >> CONTACT yields
reg.n[ə]n. Both variants and consequently both orders exist.

function to adjust the prosodic shape of such verbs to the shape of the majority of verbs where the trochaic form is determined by a potential SON violation (e.g. geb[ə]n, ruf[ə]n, etc.).[20] Because the constraint in question is irrelevant for the morphological issues under investigation, it will be ignored here.

To sum up, the variation in the prosodic patterns found in MHG verbs indicate a lack of order among various phonological constraints. The specific order among those constraints in MHG has resulted in trochaic forms only, where liquids systematically precede the final n in all verbs which involve a potential SON violation. The changes are summarized in (41):

(41)   MHG: SON >> *SCHWA, CONTACT, HEAD, CODA, SHELL
           NHG: SON >> *SCHWA >> CONTACT, HEAD >> CODA >> SHELL

The next section discusses the morphological changes which accompanied the phonological changes in (41).

3. Potential verbs

In German there is a highly productive morphological rule for forming new verbs. Apparently any uninflected word, regardless of its category or morphological complexity, can be verbalized by n-suffixation. Examples of verbs based on words ending in a schwa syllable are given in (42):

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[20]Such a constraint dominates *SCHWA in all words with a sonorant suffix in NHG which shows that the prosodic form of those words is no longer determined by strictly phonological wellformedness conditions alone. The claim that the historical schwa insertion in words such as sä[ə]n 'to sow' is morphologically conditioned is also supported by considerations concerning word frequency. Words with a high frequency are first to undergo phonological rules but are last to undergo morphologically motivated change (cf. Philipps 1984). As was noted before, the only exception to the historical schwa insertion rule are the verbs sein 'to be' and tun 'to do', both of which are very frequent.

(42) Category of   derived verb
     base:

     adjective   sicher 'safe'   sichern
                     dunkel 'dark   verdunkeln[21]

     comparative   milder 'milder'   mildern
                     neuer 'newer'   erneuern
                     weiter 'wider'   erweitern
                     schlechter 'worse'   verschlechtern
                     leichter 'easier'   erleichtern

     noun   Zwiebel 'onion'   zwiebeln
                     ferkel 'piglet'   ferkeln

     plural noun   Eier 'eggs' (sg.:Ei)   eiern
                     Löcher 'holes' (sg.:Loch)   löchern
                     Geister 'ghosts' (sg.:Geist)   geistern
                     Hämmer 'hammers' (sg.:Hammer)   hämmern

Evidence for the high degree of productivity of
verbalization comes from the observation that native hearers of
German are typically unsure of whether or not nonce verbs such
as the italicized formations in (43) "exist":

(43)   *amseln* -> Amsel 'blackbird'   *faltern* -> Falter 'moth'
        nesseln -> Nessel 'nettle'   *kadern* -> Kader 'cadre'
        sesseln -> Sessel 'armchair'   *ebern* -> Eber 'boar'
        rüsseln -> Rüssel 'trunk'   *messern* -> Messer 'knife'
        disteln -> Distel 'thistle'   *katern* -> Kater 'tomcat'
        wachteln -> Wachtel 'quail'   *kaisern* -> Kaiser 'emperor'
        gürteln -> Gürtel 'belt'   *pfarrern* -> Pfarrer
                                          'priest'
        schnabeln -> Schnabel 'beak'   *bibern* -> Biber 'beaver'

Actual words such as <u>Amsel</u> or <u>Falter</u> imply apparently that
<u>amseln</u> and <u>faltern</u> are potential verbs. The productivity of the
rule also extends to loanwords. Again, most of the italicized
verbs in (44) are not listed in dictionaries and yet they are
acceptable:

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[21]Verbalizations of adjectives or comparatives tend to include a
prefix as well.

(44)	Butler	*butlern*	Level	*leveln*
	Label	*labeln*	Model	*modeln*
	Panel	*paneln*	Navel	*naveln*
	Container	*containern*	Oldtimer	*oldtimern*
	Cracker	*crackern*	Teenager	*teenagern*
	Poster	*postern*	Hamburger	*hamburgern*
	Gangster	*gangstern*	Power ·	*powern*
	Insider	*insidern*	Cover	*covern*
	Computer	*computern*	Joker	*jokern*
	Laser	*lasern*	Trawler	*trawlern*
	Charter	*chartern*	Compiler	*compilern*

In view of the high degree of productivity of verbalization in German it is striking that one class of words is excluded from the domain of the rule. The productivity gap concerns words which include a postvocalic schwa followed by a non-liquid consonant. The claim that such words do not give rise to potential verbs is illustrated in (45) with nouns ending in a nasal. The reader may convince herself that the italicized nonce formations listed in (45a,b) are the only possible derivations which satisfy the phonological wellformedness-conditions for verbs. That is, their final segment is n̲, they end in exactly one schwa-syllable where the position of the schwa always conforms to the rules in (10). Yet, they are clearly unacceptable verbalizations of the nouns in the lefthand column. Note that the nonce verbs in (45) cannot be ruled out on semantic grounds because for all corresponding nouns in English verbalisations are attested.

(45)	Besen 'broom'	a.	*besen	b.	*besnen
	Daumen 'thumb'		*daumen		*daumnen
	Bogen 'bow; arch'		*bogen		*bognen
	Riemen 'strap'		*riemen		*riemnen
	Drachen 'kite'		*drachen		*drachnen
	Kragen 'collar'		*kragen		*kragnen
	Volumen 'volume'		*volumen		*volumnen
	Kissen 'pillow'		*kissen		*kissnen
	Schmarren 'trash'		*schmarren		*schmarrnen
	Magen 'stomach'		*magen		*magnen
	Hafen 'harbor'		*hafen		*hafnen
	Boden 'ground'		*boden		*bodnen
	Rachen 'throat'		*rachen		*rachnen
	Balken 'beam'		*balken		*balknen
	Garten 'garden'		*garten	·	*gartnen
	Fladen 'fritter'		*fladen		*fladnen
	Knochen 'bone'		*knochen·		*knochnen
	Kuchen 'cake'		*kuchen		*kuchnen
	Busen 'bosom'		*busen		*busnen

How do the the unacceptable verbalizations in (45) differ from those considered so far? As for the nonce formations in

(45a) an obvious difference concerns the fact that they are formally identical to their base (cf. (46a)) whereas the formations in (43) and (44) include a segment which is not present in their base (cf (46b):

(46)a. [bézən] = [bézən] 'Besen]$_N$'   b. [ámzəln] ≠ [ámzəl] 'Amsel]$_N$'

The nonce formations in (45b), on the other hand, differ from the examples in (43) and (44) in that they lack phonological transparency with respect to their base. Phonological transparency is given in (47b) because the base is phonologically identical to a part of the derived verb, but not in (47a):

(47)a. [**béznə**n] - [**bézən**] 'Degen]$_N$'   b. [**ámzəl**n] - [**ámzəl**] 'Amsel]$_N$'

The unacceptability of the verbalizations in (45a) and (45b) is accordingly due to distinct causes which is reflected in a difference in hearer judgments. The verbalizations in (45b) are consistently judged to be considerably worse than those in (45a), an observation, to which we will return below.[22]

Any verbalizations which involve neither of the two problems (e.g. phonological identity or lack of phonological transparency) would necessarily be phonologically illformed as is shown in (48). The formations in (48a) are unpronounceable in German because they include a geminate; those in (48b) are illformed because they end in more than one schwa syllable:

(48)a. *[bézənn]   b. *[bézənən]

The illformedness of the verbalizations in (47) concerns accordingly their form in *relation* to the form of their base; the illformedness of the verbalizations in (48), on the other hand, concerns the form of the verb itself. The conditions delimiting the set of potential verbs can informally be stated as in (49):

(49)   A word with the phonological (surface) form [X] can be verbalized iff either [Xn] or [Xən] satisfy the phonological wellformedness conditions for verbs.

The generalization in (49) leads us to expect that all words ending in a schwa syllable closed by a consonant less sonorous than $\underline{l}$ cannot give rise to potential verbs in NHG. If verbs were formed from such words by adding the sequence [ən] the resultant formation would end in two final schwa syllables and hence be illformed (cf (48b)). Adding just $\underline{n}$ to a word

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[22]Neef (1994:178) points out that the verbalizations in (45a) are more acceptable with a prefix, which is consistent with the claim that their unacceptability is due to phonological homonphony.

ending in any consonant other than liquids would necessarily yield a sonority violation (cf. (48a). Avoiding the sonority violation by schwa epenthesis while at the same time preserving trochaic foot structure accommodates phonological wellformedness but has the consequence that the relation to the base no longer satisfies phonological transparency (cf. (47a). The dilemma described here affects all words ending in a schwa syllable closed by any consonant other than liquids which accounts for the observation that such words do not give rise to potential verbs.

The productivity dilemma encountered by words ending in a schwa syllable closed by a non-liquid can be further illustrated with the relatively few nouns listed in standard dictionaries in which a schwa is followed by a wordfinal obstruent. For such words there is only one possibility of forming a phonologically wellformed verb, which, however, is always entirely unacceptable as a derived form (the capital letters indicate the provenience of the nouns, 'Y': Yiddish, 'R': Rhenish, 'E': English):

(50) Nippes 'knick-knack'   *nipsen
      Kirmes 'kermis'   *kirmsen
      Pommes 'French fries'   *pomsen
      Kokolores 'rubbish; fuss'   *kokolorsen
      Tinnef (Y) 'trash'   *tinfen
      Schabbes (Y) 'sabbath'   *schabsen
      Dokes (Y) 'bottom'   *doksen
      Dalles (Y) 'poverty, money troubles'   *dalsen
      Schammes (Y) 'shammes'   *schamsen
      Zores (Y) 'anger'   *zorsen
      Schmackes (R) 'zest, verve'   *schmacksen
      Kappes (R) 'cabbage; rubbish'   *kapsen
      Köbes (R) 'waiter (in a Cologne pub)'   *köbsen
      Ticket (E)   *tickten
      Racket (E)   *rackten
      Krocket (E)   *krockten
      Kricket (E)   *krickten
      Velvet (E)   *velvten

The starred verbalizations in (50) lack phonological transparency with respect to their base, a condition which could only be rectified at the expense of phonological illformedness (i.e. *nipp[ə]sn, *nipp[ə]s[ə]n). The dilemma illustrated in (45) and (50) is argued here to be at the root of the productivity gap which delimits the set of potential verbs. To be sure, there are actual verbs which are etymologically related to words ending in a schwa syllable closed by a nonliquid. First, Duden (1989) includes twenty-six pairs of etymologically related words, which seem to illustrate

precisely the pattern of the starred nonce verbs in (45a) and the respective nouns to their left.[23]

(51) Graben]$_N$ 'ditch'   graben]$_V$ 'to dig'
      Husten]$_N$ 'cough'   husten]$_V$ 'to cough'
      Schnupfen]$_N$ 'cold'   schnupfen]$_V$ 'to take snuff'
      Rechen]$_N$ 'rake'   rechen]$_V$ 'to rake'
      Tropfen]$_N$ 'drop'   tropfen]$_V$ 'to drip'
      Schaden]$_N$ 'damage'   schaden]$_V$ 'to damage'
      Streifen]$_N$ 'strip'   streifen]$_V$ 'to brush (against)'
      Glauben]$_N$ 'belief'   glauben]$_V$ 'to believe'
      Zapfen]$_N$ 'plug; cone'   zapfen]$_V$ 'to tap (beer)'
      Nutzen]$_N$ 'use, benefit'   nutzen]$_V$ 'to be of use to'
      Fetzen]$_N$ 'shred'   fetzen]$_V$ 'to rip'
      Flicken]$_N$ 'patch'   flicken]$_V$ 'to patch'
      Funken]$_N$ 'spark'   funken]$_V$ 'to spark'
      Haken]$_N$ 'hook'   haken]$_V$ 'to hook'
      Schrecken]$_N$ 'fright, horror'   schrecken]$_V$ 'to scare'
      Flecken]$_N$ 'stain'   (be)flecken]$_V$ 'to stain'
      Brocken]$_N$ 'lump, chunk'   brocken]$_V$ 'to break (bread)'
      Rücken]$_N$ 'back'   rücken]$_V$ 'to move'
      Ballen]$_N$ 'bale'   ballen]$_V$ 'to clench (a fist)'
      Stopfen]$_N$ 'stopper; cork'   stopfen]$_V$ 'to stuff; to darn'
      Gefallen]$_N$ 'favor'   gefallen]$_V$ 'to please'
      Schatten]$_N$ 'shadow'   (be)schatten]$_V$ 'to shadow, to tail
      Rahmen]$_N$ 'frame'   rahmen]$_V$ 'to frame'
      Klumpen]$_N$ 'lump'   klumpen]$_V$ 'to go lumpy'
      Knoten]$_N$ 'knot'   knoten]$_V$ 'to knot'
      Fohlen]$_N$ 'foal'   fohlen]$_V$ 'to foal'

If phonological identity were the reason for why the formations in (45a) are unacceptable then what accounts for the existence of the verbs in (51)? There is evidence that none of the verbs in (51) were derived from the nouns in the lefthand column in their present phonological form. In particular, the final n in those nouns is innovative as the corresponding MHG words show:[24]

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[23]The nouns listed in (51) do not include gerunds, which are always neuter (cf. das Graben 'the digging' vs. der Graben 'the ditch').

[24]I do not claim that the verbs in (52) were necessarily derived from the nouns to their left in MHG. In fact, in many cases both forms already existed in Old High German where some of the nouns were possibly derived from the corresponding verbs. At least the strong verbs (graben, braten, laden, gevallen) are clearly not historically derived from nouns. The table in (52) merely shows that there exists a stage at which the nouns did not meet the description characterizing the gap (e.g. words wnding in a schwa syllable closed by a nonliquid) and most of the verbs are already attested.

(52) graben]$_V$ ~ grabe]$_N$ haken]$_V$ ~ hâke]$_N$
        huosten]$_V$ ~ huoste]$_N$ schrecken]$_V$ ~ schrecke]$_N$
        snupfen]$_V$ ~ snupfe]$_N$ vlecken]$_V$ ~ fleck(e)]$_N$
        rechen]$_V$ ~ reche]$_N$ brokken]$_V$ ~ brocke]$_N$
        tropfen]$_V$ ~ tropfe]$_N$ rücken]$_V$ ~ rück(e)]$_N$
        schaden]$_V$ ~ schade]$_N$ ballen]$_V$ ~ balle]$_N$
        streifen]$_V$ ~ strife]$_N$ stopfen]$_V$ ~ stopf]$_N$
        gelouben]$_V$ ~ g(e)laube]$_N$ gevallen]$_V$ ~ geval]$_N$
        zapfen]$_V$ ~ zapfe]$_N$ (be)schatewen]$_V$ ~ schate(we)]$_N$
        nutzen]$_V$ ~ nutze]$_N$ (?ramen]$_V$) ~ rame]$_N$
        vetzen]$_V$ ~ vetze]$_N$ (?klumpen]$_V$) ~ klumpe]$_N$
        vlicken]$_V$ ~ flick]$_N$ (?knoten]$_V$) ~ knote]$_N$
        vunken]$_V$ ~ vunke]$_N$ (?volen]$_V$) ~ vol(e)]$_N$

The process by which nouns like _grabe_ developed a final -_n_ is illustrated in (53). The final nasals in the oblique forms, which at one point were inflectional suffixes, were reanalysed as being part of the stem and consequently appeared in the nominative as well:[25]

(53) Stage I: Sg. Nom. grabe   Stage II: Graben
            Gen. graben   Grabens
            Dat. graben   Graben
            Acc. graben   Graben

The data in (51) are consistent with the claim that verbalization has only been possible before the historical suffix -_n_ was reanalysed as part of the stem. In accordance with the generalization in (49) _graben_ is a potential verb and hence may come into existence as long as there exists a word _grabe_ functioning as the base. As soon as the noun _grabe_ develops a final -_n_, _graben_ ceases to be a potential verb, though it certainly may be and in fact is an actual verb.

The data in (52) clearly do not prove that verbalization was only possible prior to the reanalysis of the nasal suffix. More conclusive evidence in this matter would require access to the entire set of nominative forms as well as the entire set of verbs at every stage of the language. What can be shown is that

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[25]The claim that the _n_ appeared in the nominative forms because the oblique forms were reanalysed as simplexes presupposes that its morphological function failed to be recognized by learners. That failure would be expected if learners encountered the oblique forms far more frequently than the nominative forms. Such an asymmetry seems plausible in view of the fact that the leveling in (i) only affects inanimate nouns. According to Behagel (1928) inanimate nouns function generally as objects and consequently have oblique case marking whereas animate nouns are more likely to function as subjects and consequently appear in the nominative form. The direction of leveling is then due to frequency effects.

most verbs in (51) are already attested in MHG[26] and that for each verb which appears to be based on a homophonous noun synchronically, that noun goes back to a form with no stemfinal -n.[27] This observation is explained on the hypothesis that the generalization concerning potential verbs in (49) held true of earlier stages in the language as well. At the same time this hypothesis explains why the coinages in (45a) are not acceptable to native hearers of German.

In addition to the pairs in (51), Duden (1989) includes a total of sixteen pairs of etymologically related words, which show a phonological alternation similar to that between the starred nonce verbs in (45b) and the respective nouns to their left ("E": 'elevated', "A" 'archaic'):.

(54) Atem 'breath'   atmen 'to breathe'
      Wappen 'coat of arms'   wappnen 'to prepare to face sth.
      Waffen 'weapons'   bewaffnen 'to arm'
      Orden 'decoration, medal'   ordnen 'to order, to arrange'
      Zeichen 'sign'   zeichnen 'to draw'
      Regen 'rain'   regnen 'to rain'
      Segen 'blessing; bliss'   segnen 'to make the sign of the cross
      eben 'level; flat'   ebnen 'to smooth; to level off'
      trocken 'dry'   trocknen 'to dry'
      eigen 'own'   eignen 'to be suited'
      offen 'open'   öffnen 'to open'
      gegen *prep.* 'against'   begegnen 'to encounter'
      vollkommen 'perfect'   vervollkommnen 'to make perfect'
      Willkommen 'welcome'   (E) bewillkommnen 'to welcome'
      Boden 'ground'   (A) verbodmen 'to pawn the cargo of
                                            a ship'
      Faden 'thread'   (A) auffädmen 'to string (beads)'

Except for _vervollkommnen_ und _bewillkommnen_ all verbs in (45) are already attested in MHG where they ended in two schwa syllables:

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[26]The four paranthesized verbs in (52) are not listed in Lexers, but I assume that they were coined before leveling took place.

[27]The only counter-example to this generalization is the verb _röntgen_ 'to X-ray' which however is based not on a common noun but on a name.

(55) âtem 'breath'   âtemen 'breathe'
      wâpen/wâfen 'weapon'   wâpenen/wâfenen 'to arm'
      orden 'rule; order; law'   ordenen 'to order'
      zeichen 'sign, example'   zeichenen 'to put a sign on sth.'
      rëgen 'rain'   rëgenen 'to rain, to let rain'
      sëgen 'sign of the cross;   sëgenen 'to make the sign of the
            blessing '   cross; to bless'
      ëben 'level, flat, equal'   ëbenen 'to level; to unite'
      trucken 'dry'   truckenen 'to dry'
      eigen 'own'   eigenen 'to acquire sth.'
      offen 'open, exlained'   offenen 'to open, to explain'
      gegen 'towards'   gegenen 'to come towards'
      bodem 'ground, floor'   bodemen[28] 'to make a wooden floor'
      vadem 'thread'   vedemen 'to thread'

The data in (55) are significant in that they show that the
verbs in (45) came into existence before the reranking in (41)
took place. That is, those verbs were coined before the
prosodic restriction to a single final schwa syllable
characteristic of NHG took effect. The verbs in (54) are
therefore consistent with the generalization in (49), according
to which a word can be verbalized only if suffixation of n or
ən yields a form which satisfies the respective phonological
wellformedness condition for verbs.

The existence of the noun-verb pairs in (51) and (54)
consequently does not challenge the claim that words ending in
a schwa syllable closed by a nonliquid are outside the domain
of verbalization in NHG. Rather, the existence of those pairs
challenges the view that the question of what the potential
words of a language are can be decided on the basis of the
synchronically existing 'alternations'. The assumption that a
hearer will automatically pick up a rule for deriving new forms
if there are enough recurrent pairs of words showing some
phonological and semantic resemblance is inconsistent with the
observation that the nonce forms in (45) are not acceptable.
Rather, the acceptability of new verbs seems to be subject to
prosodic wellformedness conditions for verbs interacting with
phonological conditions on base relations.

4. Defining the set of potential words.

According to the generalization in (49) the potential
formation of verbs depends on the wellformedness of the surface
phonological structure of the derived verb. That generalization
is therefore not consitent with the standard view on the
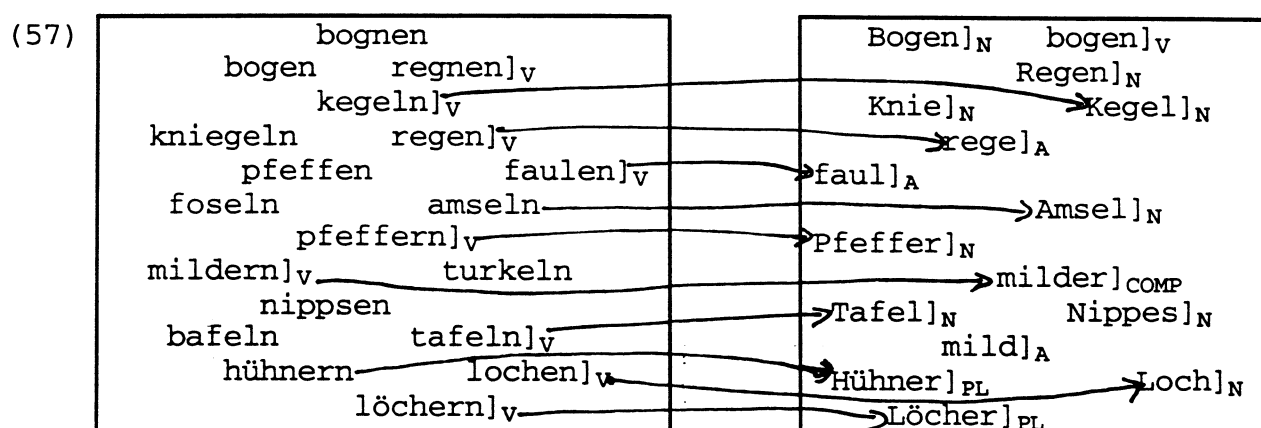morphology-phonology interface in Generative Grammar, according

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[28]This verb is not listed in Lexer's but in J. and W. Grimm's
"Deutsches Wörterbuch" from 1854.

to which the phonology interprets morphological structure.
Instead the generalization in (49) suggests that potential
verbs are defined in terms of relations between two sets, the
set "P$_V$" which consists of all nonce words satisfying the
wellformedness conditions for verbs and the set of actual
words. The set P$_V$ includes all candidates evaluated as optimal
on the basis of the constraint rankings given in (43), or (45)
respectively. Potential verbs can then be defined as follows:

(56)   The set of potential verbs consists of all strings
        [X(ə)n] included in P$_V$, for which there exists an actual
        word [X].

For speakers who find the verbalisations in (45a)
marginally acceptable [X] can be substituted by [X((ə)n)] in
(56). The unacceptability of the verbalisations in (45b) shows
that the rule in (56) must refer to surface forms. The rule is
illustrated with the figure in (57):

(57)

| bognen |
| bogen   regnen]$_V$ |
| kegeln]$_V$ |
| kniegeln   regen]$_V$ |
| pfeffen   faulen]$_V$ |
| foseln   amseln |
| pfeffern]$_V$ |
| mildern]$_V$ turkeln |
| nippsen |
| bafeln   tafeln]$_V$ |
| hühnern   lochen]$_V$ |
| löchern]$_V$ |

| Bogen]$_N$ bogen]$_V$ |
| Regen]$_N$ |
| Knie]$_N$ Kegel]$_N$ |
| regel]$_A$ |
| faul]$_A$ |
| Amsel]$_N$ |
| Pfeffer]$_N$ |
| milder]$_{COMP}$ |
| Tafel]$_N$ Nippes]$_N$ |
| mild]$_A$ |
| Hühner]$_{PL}$ Loch]$_N$ |
| Löcher]$_{PL}$ |

The leftmost set in (57) illustrates P$_V$ in NHG. P$_V$ thus
includes almost all existing verbs[29] as well as an infinit
number of nonce verbs. The rightmost set includes existing
words of various categories (e.g. noun, plurals, adjectives,
comparatives, etc.). The wellformedness conditions for verbs in
conjunction with the rule in (56) rule out the possibility that
items in the left set can be related to words ending in a
schwa-syllable closed by nonliquids thus explaining the
productivity gap.
    It is important to note that given the same input (e.g. any
arbitrary string), the optimal candidates would differ in MHG
and in NHG because of the difference in conastraint ranking.
Under the assumption that the rule in (56) has not changed over
time we would consequently expect that the productivity gap in
question did not exist in MHG. The examples in (58) illustrate

[29]The existing verbs not included in P$_V$ are the four verbs tun,
sein, nähern, and wiehern mentioned earlier.

the claim that words, which fall outside the domain of
verbalization in NHG, satisfy the conditions on potential verbs
in MHG:

(58)

regenen]$_V$			regen]$_N$
kebesen]$_V$			kebes]$_N$
vögeten]$_V$			vöget]$_N$
abenden]$_V$			abent]$_N$
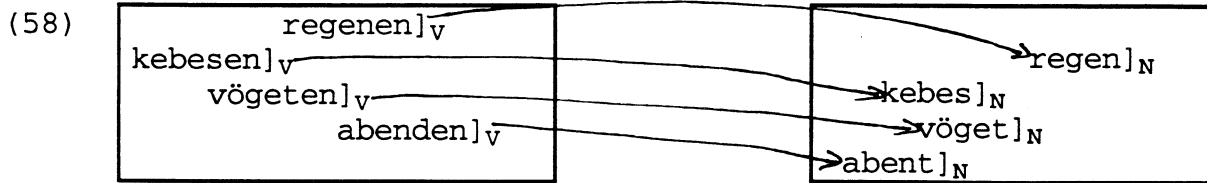
In fact, the data indicate that words ending in closed
schwa syllables could be verbalized regardless of the sonority
of the final consonants. The MHG verbs in (59) relate to bases
ending in the sequence schwa plus nasal.

(59) morgen]$_{Adv}$ 'tomorrow'   morgenen]$_V$ 'to procrastinate'
      siben]$_{Num}$ 'seven'   sibenen]$_{Adv}$ 'to interrogate sb. in th‹
                                              presence of seven witnesse‹
      zëhen]$_{Num}$ 'ten'   (ver)zëhenen]$_V$ 'to pay one tenth of a
                                              income'
      brâdem]$_N$ 'steam'   brâdemen]$_V$ 'to steam'
      kradem]$_N$ 'noise'   krademen]$_V$ 'to make a noise'
      gadem]$_N$ 'one room house'   (be)gedemen]$_V$ 'to bring into a *gadem*'
      krisem]$_N$ 'sacred unction'   krisemen]$_V$ 'to anoint with *krisem*'
      ludem]$_N$ 'screaming'   ludemen]$_V$ 'to scream'
      swadem]$_N$ 'steam'   swademen]$_V$ 'to steam'
      mitten]$_{Adv}$ 'in the middle'   mittenen]$_V$ 'to sit down in the middle
      kristen]$_A$ 'Christian'   kristenen]$_V$ 'to Christianize
      û en]$_{Adv}$ 'out, outside.'   û enen]$_V$ 'to divest oneself of sth.'
      wolken]$_N$ 'cloud'   wolkenen]$_V$ 'to be full of clouds'
      brëhen]$_N$ 'gleam, shine'   brëhenen]$_V$ to gleam, to shine'
      keten]$_N$ 'chain'   ketenen]$_V$ 'to put in chains'
      vesten]$_N$ 'fortress'   vestenen]$_V$ 'to build a fortress'
      dëgen]$_N$ 'warrior, hero'   dëgenen]$_V$ 'to turn sb. into a hero'
      tougen]$_N$ 'secret'   tougenen]$_V$ 'to keep secret'
      trahen]$_N$ 'tear'   trahenen]$_V$ 'to cry'
      lâchen]$_N$ 'medicine'   lâchenen]$_V$ 'to spread medicine on sb.
      lêhen]$_N$ 'feoff'   lêhenen]$_V$ 'to enfeoff sb.'
      bësem]$_N$ 'broom; rod'   bësemen]$_V$ 'to sweep; to whip sb. with
                                              a rod'
      ougen]$_{N, Pl}$ 'eyes'   ougenen]$_V$ 'to show'
      meiden]$_N$ 'stallion'   meidenen]$_V$ 'to castrate'
      besamen]$_{Adv}$ 'together'   besamenen]$_V$ 'to gather warriors'
      lougen]$_N$ 'denial'   lougenen]$_V$ 'to deny; to revoke'
      widem]$_N$ 'the groom's   widemen]$_V$ 'to give a dowry'
      dowry'
      solden]$_V$ 'to pay a   soldenen]$_V$ 'to pay a soldier'
      soldier'
      biben]$_V$ 'to tremble'   bibenen]$_V$ 'to tremble'
      bürden]$_V$ 'to give sb. a   bürdenen]$_V$ 'to give sb. a load to car
            load to carry'

bederben]$_V$ 'to be useful' bederbenen]$_V$ 'to be useful'
rechen]$_V$ 'to count'   rechenen]$_V$ 'to count'

As a result of adjusting to the prosodic wellformedness
conditions for verbs in NHG (i.e. <u>morgenen</u> > <u>morgnen</u>), the
morphological status of the verbs in (59) changed. In
particular, they lost their status of being potential verbs
with the result that this group can only lose members but not
gain new ones. In the examples listed in (59) either the base,
the derived verb, or both have become obsolete in NHG. The only
verbs of this type that are left in NHG are those listed in
(54).

The examples in (60a,b) illustrate coinages based on words
ending in the sequence schwa plus obstruent or schwa plus non-
liquid cluster:

(60)a. kebes]$_N$ 'concubine'   kebesen]$_V$ 'to commit adultery'
        houbet$_N$ 'head'   houbeten]$_V$ 'to decapitate'
        vöget]$_N$ ' '   vögeten]$_V$ 'to protect'
        kachez]$_N$ 'roaring laughter' kachezen]$_V$ 'to laugh loudly'
        market]$_N$ 'market'   marketen]$_V$ 'to trade'

b.   âbent]$_N$ 'evening'   âbenden]$_V$ 'evening comes'
        jugent]$_N$ 'youth'   jugenden]$_V$ 'to be youthful'
        tugent]$_N$ 'usefulness, virtue' tugenden]$_V$ 'to show *tugent*, to
                                                      lend sb. *tugent*'
        zehent]$_{ORD}$ 'tenth'   zehenden]$_V$ 'to pay a tenth'

The data in (60b) raise the question of why all verbs have
disappeared in NHG. Note that the absence of dactylic verbs in
NHG is not explained. The verb based on the noun <u>Abend</u>
'evening', for example, would clearly have two schwas according
to the constraint ranking for NHG:

(61)			SON	*SCHWA	CONTACT	HEAD	CODA
a.		abndn	*!				
		abn.d[ə]n	*!				
		ab.nd[ə]n	*!				
		ab.n[ə].d[ə]n		**	*!		
		a.bn[ə].d[ə]n		**		*!	
	→	a.b[ə]n.d[ə]n		**			

Is the fact that <u>abenden</u> became obsolete in NHG accidental
or was it "pushed out" by a so far unexpressed phonological
requirement for maximally binary feet? Since only a handful
verbs of that type existed in MHG (e.g. verbs with two

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potential nonoverlapping sonority violations), the question will be left open.[30]

The data indicate then that the conditions for deriving new verbs in German have remained constant (cf.(56)). This assumption is supported by the fact that the rule shows much the same properties since MHG. Characteristic are not only the high degree of productivity but also the lack of sensitivity to the syntactic category and morphological complexity of the base.[31]

What has changed, are the phonological wellformedness condition for verbs. Given that the condition as stated in (56) is correct, words ending in a syllable closed by a nonliquid are expected to disappear from the domain of potentrial verb bases as soon as the reranking in (41) takes place. This dependence of potential verbalisations on the phonological surface form of the derived forms challenges the view of phonology as a rule system which merely interprets morphologically derived strings. Such a view could only be maintained if the productivity gap was encoded in terms of a prosodic subcategortization frame of the suffix -n. That analysis would fail, however, to explain why this prosodic requirement emerged at the same time when the phonological wellformedness conditions for verbs changed. Given the condition in (56) the productivity gap affecting verbalization in NHG is considered an epiphenomenon, rather than a property of the suffix n̲.

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[30]One also needs to investigate the question of whether there are any independent clear examples of words becoming systematically obsolete because of phonological illformedness.

[31]In MHG. we even find verbs in the domain of verbalization (cf. the data in (cf. the last four examples in (59)). The fact that verbs cannot be verbalized in NHG is presumably due to their phonological form: verbs end in a sequence schwa plus nasal.

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