Jürg Fleischer*, Michael Cysouw, Augustin Speyer and
Richard Wiese

Variation and its determinants: A corpus-based study of German schwa in the letters of Goethe

Abstract: This paper studies some factors governing the presence or absence of word-final schwa in German. To obtain data as homogeneous as possible we focus on three adverbs outside morphological paradigms, namely, *heut(e)* 'today', *gern(e)* 'willingly', and *bald(e)* 'soon', in one particular text type, the letters written by one and the same person, the writer Johann Wolfgang von Goethe (1749–1832). Apart from lexical differences between the items studied and change over time, various phonological factors are shown to be important, most prominently the accent pattern of the following word (schwa tends to be present if the first syllable of the following word is accentuated), foot structure, and the initial segment of the following word. Statistical analyses, both for the individual factors and their (potential) interactions, reveal significant patterns at work behind the variation. For *gern(e)* the most important factors are purely phonological while for *heut(e)* the type of the following boundary and the position in the sentence is crucial.

Keywords: German schwa, prosodic structure, sound change, logistic regression, Goethe

1 Introduction

The present paper addresses the question how seemingly free morphophonological variation in a language can be treated. As a case study of such variation,

---

*Corresponding author: Jürg Fleischer, Institut für Germanistische Sprachwissenschaft, Philipps-Universität Marburg, Marburg, Germany, E-mail: jfleischer@uni-marburg.de

Michael Cysouw, Institut für Germanistische Sprachwissenschaft, Philipps-Universität Marburg, Marburg, Germany, E-mail: cysouw@uni-marburg.de

Augustin Speyer, FR 4.1 Germanistik, Universität des Saarlandes, Saarbrücken, Germany, E-mail: a.speyer@mx.uni-saarland.de

Richard Wiese, Institut für Germanistische Sprachwissenschaft, Philipps-Universität Marburg, Marburg, Germany, E-mail: wiese@uni-marburg.de

the vowel schwa in word-final position is used, as represented in a corpus of written German of the 18th and 19th century, namely the letters written by Johann Wolfgang von Goethe (1749–1832). Within this corpus to be described below in more detail, we concentrate on the schwa-zero alternation found in three adverbs, namely *heut(e)* 'today', *bald(e)* 'soon', and *gern(e)* 'willingly', and here particularly on *gern(e)*, as it displays the largest amount of variation.

Word-final schwa in present-day German appears in a number of different contexts, where the contexts are defined by word class and morphological paradigmatic dimensions. A number of relevant examples are presented in (1).[1]

(1)   Word-final schwa in inflection
   a.   Nouns:[2]
        Pferd – Pferde 'horse(s)', *Kind – Kinde* 'child' (nom. sg. – dat. sg. [non-obligatory, dated])
   b.   Adjectives:
        gut – gute 'good' (nom./acc. sg. fem., nom./acc. pl. strong; nom./acc. sg. fem./neut. weak)
   c.   Verbs:
        stem *lob:* – *lobe/lobte* 'praise' (1. ps. sg. pres. / preterite)
        stem *geh:* – *gehe/ginge* 'go' (3. ps. sg. pres. / preterite subj.)

In addition, uninflected words may also occasionally display final schwa, as demonstrated in (2).

(2)   Final schwa in uninflected words
   a.   preposition: *ohne* 'without', *infolge* 'in consequence'
   b.   adverb: *heute* 'today', *gerne* 'willingly'

---

1 The following abbreviations are used in glossing examples: acc. – accusative; dat. – dative; dim. – diminutive; fem. – feminine; gen. – genitive; imp. – imperative; ind. – indicative; neut. – neuter; nom. – nominative; pl. – plural; ps. – person; ptc – particle; sg. – singular; subj. – subjunctive; 1./3. – first/third (person).

2 Many (primarily feminine) nouns display schwa in all noun forms, including the nominative singular (as in *Katze* 'cat'). There is some doubt whether the final schwa should be regarded as part of the stem (*Katze*) or as an inflectional morpheme (*Katz-e*). Harnisch (2001), e.g., argues for the second analysis. Morphological handbooks of German express some uncertainty on the status of this final schwa, as in this remark: "Fraglich ist, ob das *-e* in Fällen wie *Katze*, *Kerze*, *Linde*, *Pfütze*, *Steppe*, *Wiese* als Flexionsmorphem zu segmentieren ist oder ob die betreffenden Wörter als monomorphemisch anzusehen sind." (Schröder et al. 2012: 198). Note that schwa-zero alternations occur even in such instances on a regular basis; see *Katze – Kätzchen* 'cat', dim.

However, most or even all of these examples of final schwa in German may show variation, in that schwa may be absent, as shown in (3) with the position of absent schwa indicated by an apostrophe. To be sure, the schwa-less forms are, in some cases, restricted to special circumstances, and may appear to belong to a particular register or to be dispreferred. The crucial observation is that a schwa-zero alternation always seems to be possible in principle (in the examples, missing schwa is always marked by the apostrophe – which might have been added in the case of quoted poems).

(3) Missing schwa
   a. Noun:
      Sah ein Knab' ein Röslein stehn
      'Saw a boy a little rose standing'
      (Goethe, *Heideröslein*)
      Aug' um Auge
      'an eye for an eye'
      Die Lehr' aus der Geschicht'
      'the lesson from the story'
   b. Adjective:
      Müd' sind wir noch lange nicht.
      'Tired we will not be for a long time.'
      Er hat es nicht bös' gemeint.
      'He did not mean it.'
   c. Verb:
      Ich hab' ihn gesehen. 'I saw him.'
      Das seh' ich nicht so.
      'I do not see it this way.'
      Ich hört' ein Bächlein rauschen.
      'I heard a brook rustling.'
      (Wilhelm Müller, *Wohin?*)
   d. Preposition:
      Die Ros' ist ohn' warum
      'The rose is without why/reason'
      (Angelus Silesius, *Ohne warum*)
      ohn' Unterlass
      'without intermission'

The present paper is therefore concerned with the status of final schwa in German. Given the large range of schwa-final words, a study of all or even most of these cases seems impossible (for a study of a range of word-final schwa in

a corpus of present-day written German see Wiese and Speyer [2015], for a study of schwa in different versions of Goethe's *Werther* see Fleischer et al. [2012]). Furthermore, morphology might play a role in the distribution of final schwa. With the aim of observing schwa-zero variation without a possible influence of morphological paradigms, we therefore chose as the object of the present study three schwa-final adverbs, namely *heut(e)*, *gern(e)*, and *bald(e)*. These adverbs cannot be used as adjectives and are therefore never inflected.

The study is structured as follows: First, the historical developments leading to schwa in the first place and its (optional) apocope are summarized in Section 2. In Section 3, some structural factors are presented that influence the presence or absence of word-final schwa in the cases under consideration, and their relevance is explored. A more thorough statistical analysis of these factors in interaction with each other is offered in Section 4. In Section 5, the main issues are summarized and discussed.

2　The history of schwa

Historically, schwa can be traced back to Old High German (OHG) full unstressed vowels which are obviously phonemic, as shown in (4) and (5) for final unstressed vowels in verbal and nominal forms and in (6)–(8) for the three adverbs analyzed in the present study (note that OHG <u>, <i>, <a> etc. stand for full vowels in unstressed syllables; most importantly, OHG <e> does not stand for reduced schwa, but full /e/).

(4)　OHG *suochu* 'I search' (1. ps. sg. ind. pres.), *suochi* 'search' (imp. sg.), *suoche* 'may he search' (3. ps. sg. subj. pres.) > MHG *suoche* > NHG *such(e)*

(5)　OHG *taga* (nom./acc. pl.), *tago* (gen. pl.), *tage* (dat. sg.) > MHG *tage* > NHG *Tag(e)* 'day(s)'

(6)　OHG *hiutu* > MHG *hiute* > NHG *heute* 'today'

(7)　OHG *gerno* > MHG *gerne* > NHG *gern(e)* 'willingly'

(8)　OHG *baldo* 'boldly' > MHG *balde* 'boldly; soon' > NHG *bald* 'soon'

The weakening of unstressed syllables (completed in Middle High German [MHG]) causes a centralization of all vowels in unstressed syllables, leading to a neutralization of all distinctions between them. In consequence, unstressed vowels cannot carry phonemic contrasts, as illustrated by the above Middle High German and New High German (NHG) examples. Following this collapse

Table 1: *Tage* 'days', *Frage* 'question', *heute* 'today' in German dialects and older stages of German.

OHG	MHG	Standard German	Central Hessian	Zurich German	gloss
taga	tage	Tage	Daach	Tääg	'day', nom./acc. pl.
frāga	vrâge	Frage	Fraach	Fraag	'question', sg.
hiutu	hiute	heute	heut	hüt	'today'

of phonemic contrasts, in some dialects of German final schwa was deleted by apocope, leading to the total deletion of a syllable. It is difficult to date this process, since it took place at different times in different regions of the German area, but its first traces are already observed in the Middle High German period (usually dated ca. 1050–1350). Also, it is possible that schwa was deleted or maintained depending on morphological forces.

In East Central German, apocope played a relatively minor role as compared to, e.g., Upper German and most West Central German dialects (see Schirmunski 1962: 159). Although East Central German probably did not play so central a role as assumed by older research (see von Polenz [1994] 2013: 137), it is still clear that this area was important for the formation of present-day Standard German. As East Central German, present-day Standard German is relatively rich in schwas if compared to other High German dialects. The dialects most extremely "hostile" towards schwa are Alemannic, such as, e.g., Zurich German, but others, e.g. the Central Hessian dialects, show widespread apocope of schwa in different morphological environments as well (see Table 1). On the other hand, dialects such as certain East Central German varieties are even more "schwa-friendly" than Standard German (see Schirmunski 1962: 160).

All schwas developed from full vowels featuring phonemic contrasts. However, in several studies it has been argued that schwa in present-day German is largely predictable. According to this analysis, schwa is probably not a phoneme, but instead should be regarded as a vowel of epenthesis and/or as a means to achieve the trochee as the preferred foot type of German. This line of argumentation has been developed in several studies of German phonology, including those by Moulton (1962), Wurzel (1970), Wiese (1986, [1996] 2000, 2009), Giegerich (1985, 1987), and Hall (1989). Although there are minimal pairs featuring the presence and absence of schwa (as in NHG *Tag* 'day' [nom./acc. sg.] vs. *Tage* 'days' [nom./acc. pl.]), this can also be explained by referring to the trochee (strong syllable followed by weak syllable) as the pattern required for plural forms of German nouns. The prosodic approach requiring a word-

final trochee is also able to capture other patterns than the inflectional cases referred to above and below: for example, there is a number of minimal pairs in which a feminine noun requires a final weak syllable (realized by schwa) with a corresponding non-feminine noun ending in a strong syllable. The meaning of the two nouns in such a pair is sometimes identical, as in *Zeh* ('toe', masc.) – *Zehe* ('toe', fem.), and sometimes differs, as in *Schrank* ('closet', masc.) – *Schranke* ('barrier', fem.). Again, synchronic and diachronic variation is wide-spread with respect to final schwa. But, as noted by Eisenberg (1998: 297), the trochee plays a pervasive role throughout the inflectional morphology of Standard German.

If this analysis is basically correct, then there must have been a historical period from which on the distribution of schwa was governed not by the principles of phonemic contrast, but by factors governing a predictable distribution, either by principles of allophonic complementary or free distribution, or by a range of such factors including prosodic preferences leading to a display of variation. Note that many phonemic contrasts were obliterated by the process of vowel weakening, so it is reasonable to assume that schwa came to be interpreted as non-phonemic.

This paper starts from the assumption that the latter picture is correct, and that the factors governing the distribution of schwa are largely ones derived from prosodic forces. This is particularly true for word-final schwa, where it is not required by syllabification as in other cases such as *Segel* 'sail' or *Segen* 'blessing' in which schwa appears between two final consonants. (Compare these nouns to other derivations such as *SegØler* 'sailor' or *segØnen* 'to bless'.) In the following, we will therefore present a corpus-based study of word-final schwas.

A word about the morphological status of schwa seems in order. The absence or presence of word-final schwa marks forms for e.g. number or case in present-day Standard German. Obviously, phonological developments are not the only governing forces for the distribution of schwa, but morphological considerations play a role as well. For instance, while schwa is usually present in the nom./acc. pl. of the noun *Tag* 'day', it is usually missing in the dat. sg. (although it might still be used even there, where it has, however, a very dated connotation). Also, in the written language schwa was reintroduced sometimes after its original deletion, due to processes of regional leveling and standardization. There is a considerable amount of variation with respect to the presence or absence of schwa in present-day Standard German, as illustrated by the examples in (9):

(9)　*Tag*(*e*) 'day' (dat. sg.), *such*(*e*) 'search' (imp. sg.), *öd*(*e*) 'dull', *gern*(*e*) 'willingly'

In the present paper we try to identify factors governing the distribution of word-final schwa, based on the study of a particular corpus. Since morphological factors may play a role, as just argued, we try to exclude them by focusing on three adverbs, namely *heut(e)* 'today', *gern(e)* 'willingly', *bald(e)* 'soon'. As adverbs do not have inflection forms, it is reasonable to assume that morphological factors play no role in this instance, allowing thus to identify phonological and prosodic factors. Consider the high-frequency adverb *heute* 'today': it is (regularly, see below) schwa-final, and there is no adjective of the same form (instead, the adjective is formed by means of the adjectival suffix *-ig*, see *heutig* 'today's').

3 Linguistic factors influencing the presence of word-final schwa in letters by Goethe

As stated above, this study is about the distribution of schwa in *heut(e)* 'today', *gern(e)* 'willingly', and *bald(e)* 'soon'. All of these six forms exist. However, in present-day German, these adverbs do not behave identically with respect to schwa: while schwa-final *heute* is the preferred form, the matter is less clear for *gern(e)*, which shows considerable variation, and schwa-less *bald* is highly preferred over *balde*. For older stages of German and non-standard dialects, the distribution may be different. Presupposing that for these three adverbs both schwa-final and schwa-less forms are possible, and that there is no difference in meaning between the variants, the simplest claim would be that there is free variation between these forms. However, the free variation-hypothesis seems like a last resort: it should be maintained only after different linguistic factors possibly governing the variation have been checked and excluded.

As a simple example, we note the difference in behavior between the three lexemes noted above: the presence of schwa is in part lexically conditioned; for more results on this aspect see Section 3.1, demonstrating the different behavior of three lexemes. Thus, a more thorough study of variation is called for. The central aim of the present paper is to find the best linguistic predictors for the (non-)occurrence of final schwa in the three adverbs mentioned, as used by an individual author (Goethe) and therefore at a particular period in time.

Such a study of variation should be based upon a large corpus of data. For the corpus study, the corpus chosen consists of all published and electronically available letters of the German author Johann Wolfgang von Goethe (1749–1832). This corpus, based on the Weimar edition of Goethe's letters (50 volumes, published 1887–1912) consists of ca. 13,500 letters written personally by Goethe.

They are available in a digitized form in a commercially available CD-ROM. We chose Goethe's letters as our corpus for the following reasons:

1. A period around the beginning of the 19th century allows for a preliminary evaluation of changes within the last 200 years.
2. The corpus is sufficiently large (over 2.7 million running words) to allow for quantitative analyses of the three relevant adverbs.
3. The corpus is available in a digital form to allow for computerized search and analysis.
4. Letters constitute a textual register which is reasonably homogeneous and which constitutes a less formal register than other types of written prose.
5. The letters constituting the corpus were written over a time span of 65 years (from 1764 to 1832), allowing for the observation of potential changes within the life-span of the author.
6. The writings of Goethe as an author have been considered as prominent examples of the German literary language; Goethe (and other writers of his time) is considered by many as an important figure for the formation of Standard German.

It must be stressed that our findings relate first and foremost to the corpus just described, and not to "German" in general. However, we would anticipate that some of the factors found to be decisive in the letters of Goethe would also turn out to be important in other registers or variants of written Standard German.

The main disadvantage of the corpus may be that it is drawn from written language for which the status of phonological factors appears to be unclear *a priori*. This is true for virtually all historical studies of linguistic change, so it is no problem specific to the corpus chosen here. However, as will be shown below, the fact that we are confronted with a written language corpus does not preclude the existence of large-scale variation, and also does not exclude an influence of phonological factors.

There are a number of possible factors influencing the presence or absence of final schwa in the adverbs under consideration, and there is no reason to assume that these factors operate in a categorial fashion; rather, they may influence the presence or absence of final schwa statistically. In the remainder of this section, we discuss these hypothesized factors individually and briefly illustrate their role. In a second step (Section 4), we try to combine the factors and determine whether we can find interactions, and if so, between which factors. We repeat that the following study relates to the three adverbs *heut(e)*, *bald(e)*, and *gern(e)*. Thus, all potential factors must be associable with the occurrence of these forms in a corpus of written texts.

3.1 Lexical differences and changes over time

Given the fact that in present-day Standard German the preferred forms are *heute* but *bald*, with a more balanced occurrence of both *gern* and *gerne*,[3] the expectation for the Goethe letter corpus is that the three adverbs do not behave identically as well. This is indeed the case, as shown in Table 2, which presents the frequencies (absolute numbers and percentages) for the six forms in question over the whole time span. It is obvious that all possible forms occur, but to markedly different extents.

However, with the letter corpus spanning a period of ca. 65 years, we may expect changes in the use of word-final schwa over time. In Figure 1, we therefore plot the percentages of schwa-less forms over the whole time span on a year-by-year basis. All three adverbs are found with and without schwa, but to different degrees and with different kinds of trends (if any) over the time period studied.

Table 2 demonstrates that some schwa-zero variation is to be found for all three forms. However, it also demonstrates that significant variation over the whole time span is to be found mostly with *gern(e),* the adverb that allows for variation within the standard language even today. *Bald(e)* shows variation only in a very limited period in the 1780s.[4] *Heut(e)* starts off by showing considerable variation, but by the beginning of the 1780s the writer seems to have settled for the schwa-containing form almost exclusively.[5]
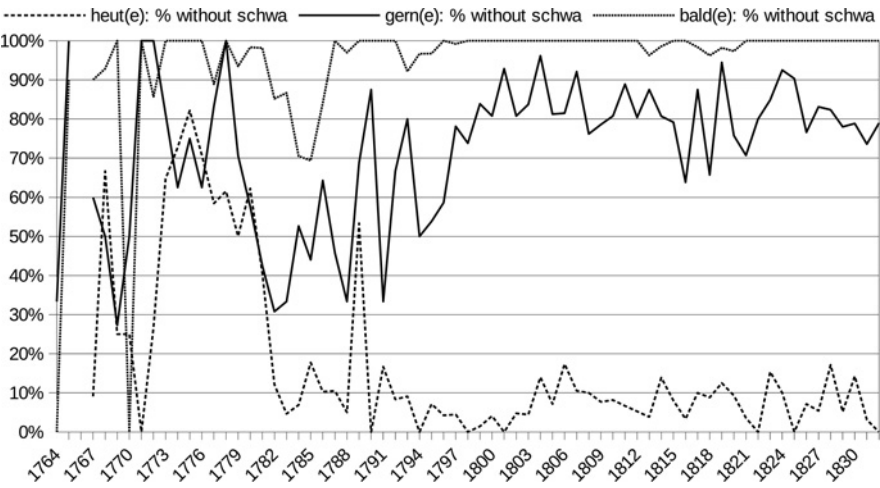
Table 2: Overall frequencies of forms for the three adverbs (row percentages in brackets).

adverb	with schwa	without schwa
heut(e)	1965 (80 %)	480 (20 %)
gern(e)	502 (26 %)	1424 (74 %)
bald(e)	97 (3 %)	2934 (97 %)

3 To substantiate the latter claim: the *Deutsches Referenzkorpus* of present-day written German (www.ids-mannheim.de/DeReKo, DeReKo, subcorpus: W-Öffentlich) contains 15,001 entries for *heut*, and 5,801,893 (= 99.74 %) entries for *heute*; 982,384 entries for *bald*, and 590 (= 0.06 %) entries for *balde*; but 619,237 entries for *gern*, and 893,292 (= 59.06 %) entries for *gerne* (as of May 3rd, 2017).

4 In this period, Goethe composed *Wanderers Nachtlied*, the poem which shows the best-known example of the schwa-containing form *balde*: *Warte nur, balde / ruhest du auch.* 'Be patient, ere long / You too will rest.'

5 The extreme variability in the early years is probably an artifact of the dataset. The number of letters per year is much lower in the early years than in the later years. This is also reflected in the number of tokens of *heute*, *gerne*, and *bald*. A low number of cases leads to strongly differing percentages, as displayed in Figure 1.

3.2 Sandhi phenomena

The segmental neighborhood of potential word-final schwas can be one reason favoring the presence of the vowel schwa, which prevents the avoidance of consonantal clusters. Epenthetic vowels have often been demonstrated cross-linguistically to fulfill the function of avoiding dispreferred syllable onsets or consonantal clusters. On the other hand, absence of schwa can avoid a vowel hiatus if the following word begins with a vowel. Therefore, a potential cause for the schwa/zero-alternation is the nature of the consonant(s) or vowels following the adverbs. The factor underlying this class of phenomena is the class of the following segments; we report the numbers here using a three-fold distinction between vowels ([−consonantal]; [10a]), sonorants, i.e. nasals and liquids, ([+sonorant, +consonantal]; [10b]), and obstruents ([−sonorant]; [10c]). The rationale behind this distinction is that syllables with vocalic onsets are generally dispreferred, and that segments in a sequence should be maximally different from each other. In this sense, *gerne nennen* 'willingly call', (10b) is to be preferred over the alternative *gern nennen*.[6]

(10) a. *Eine   abermalige   Gelegenheit* [...] *Sie* [...] *zu begrüßen   ergreife*
      a   repeated   opportunity   you   to welcome grasp.1sg
      sehr gern   und bitte zugleich   um   Verzeihung
      very willingly and ask   simultaneously around pardon
      folgender Nachfrage
      [following question].GEN
      'I very much enjoy taking the opportunity to welcome you again, and at the same time beg your pardon for asking the following question.'
      (Goethe, *Briefe*, WA-IV, Vol. 46, p. 79 = p. 21572)

    b. *König Louis, wie ich ihn noch immer gerne   nennen mag,*
       king L.   as I   him still always willingly call   may
       'King Louis, as I still like to call him.'
       (Goethe, *Briefe*, WA-IV, Vol. 37, p. 144 = p. 17736)

---

6 The examples taken from Goethe's letters are cited as WA-IV (standing for "Weimarer Ausgabe, Abteilung IV: Briefe"), followed by the number of the volume and the page, referring to the print edition; after "=" we indicate the page in the digital edition with which we worked.

c. *ersuche um die Gefälligkeit, welche Sie mir gewiß gerne*
   ask   for the favor   which you me surely willingly
   zugestehen.
   grant
   'I ask for the favor that you surely will be happy to grant me.'
   (Goethe, *Briefe*, WA-IV, Vol. 27, p. 207 = p. 13688)

Tables 4 and 5 show that this expectation is borne out for both *gern(e)* 'willingly' and *heut(e)* 'today', the effect being stronger for *gern(e)* than for *heut(e)*. These tables (and all the following tables) show the absolute number of occurrences. The numbers that are higher as statistically expected are shown in boldface. Additionally, the standardized residuals (as shown in brackets in the tables) indicate the direction and magnitude in which the observed frequencies differ from statistical expectation (i.e. from no interaction between schwa and following segment). As a rule of thumb, standardized residuals larger than 2 or smaller than –2 are "interesting". Only "interesting" frequencies are shown in boldface in the tables.

There is a tendency for schwa to be avoided when a vowel as the onset of the next word is to follow. This is plausible, as the juxtaposition of two vowels would lead to hiatus. In contrast, if a consonant follows the adverbs, the absence of schwa would lead to a consonant cluster difficult to pronounce in

Table 4: Class of segment following *gern(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Following segment	with schwa	without schwa
vowel	90 (−6.7)	**480 (+6.7)**
sonorant	**90 (+3.6)**	164 (−3.6)
obstruent	**318 (+3.7)**	765 (−3.7)

(χ^2 = 48.85; p = 2.4e−11)

Table 5: Class of segment following *heut(e)*, 1764–1784. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Following segment	with schwa	without schwa
vowel	136 (−3.1)	**128 (+3.1)**
sonorant	83 (−0.2)	59 (+0.2)
obstruent	**289 (+3.0)**	163 (−3.0)

(χ^2 = 10.69; p = 0.0048)

some instances, e.g. /tkn/ in *heut knausere ich* 'today I skimp', /tpfl/ in *heut pflücke ich* 'today I pluck', /tʃv/ in *heut schwatze ich* 'today I chatter' etc., and the insertion of schwa prevents such a cluster. And finally, for *heute* (Table 5), a decrease in sonority over the word-initial consonants to follow leads to an increase in the schwa-containing preceding adverb; the percentage of schwa-less forms is highest if a vowel is to follow, and decreases in accordance with the degree of sonority of the following consonants, and is thus lowest if an obstruent is to follow. Note that syllabification across words (let alone phrases) is not considered to be part of the standard pronunciation in German. Therefore, the small, but significant, differences between groups are not necessarily expected, but it is remarkable that differences such as the ones documented here exist at all.

3.3 Stress clash

Another factor relevant for the occurrence of schwa is the creation of preferred prosodic structures in terms of a stress alternation. Schwa always constitutes the nucleus of an unstressed syllable in German. If occurring between two stressed syllables, a syllable containing schwa will therefore avoid a stress clash; if occurring adjacent to another unstressed syllable, it will create a stress lapse, a sequence of more than one unstressed syllable. Both stress clashes and stress lapses are well-known dispreferred prosodic structures (e.g. Selkirk 1984; Hayes 1995), and the preference for alternations of strong – weak (syllabic trochee) has been demonstrated in many studies of stress in German (Féry 1998; Domahs et al. 2008). A prediction derived from these considerations is that a preferred position of schwa would be before a word starting with a stressed syllable (11a). Conversely, before an unstressed syllable as in articles, prepositions, particles etc., schwa should be dispreferred (11b).

(11) a. *dem   ich   das   doppelte   Glück   gerne   gönnen   wollte.*
      whom   I   the   double   luck   willingly   grant   would
      'whom I am happy to grant the double luck.'
      (Goethe, *Briefe*, WA-IV, Vol. 37, p. 149 = p. 17744)

   b. *so   möchte   man   da   droben   gern   was   Besseres*
      so   might   one   there   above   willingly   something   better
      gewahr werden;
      take-notice
      'thus, one would rather like to see better things up there.'
      (Goethe, *Briefe*, WA-IV, Vol. 40, p. 132 = p. 18980)

Table 6: Stress on syllable following *gern(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Following syllable	with schwa	without schwa
unstressed	192 (−11.2)	**939 (+11.2)**
stressed	**299 (+11.2)**	444 (−11.2)

(χ^2 = 124.33; p < 2.2e−16)

Table 7: Schwa under conditions of stress clash for *heut(e)*. Standardized residuals in brackets.

Following syllable	with schwa	without schwa
unstressed	229 (−0.2)	159 (+0.2)
stressed	281 (+0.2)	191 (−0.2)

(χ^2 = 0.007; p = 0.93)

In Tables 6 and 7, the frequencies of *gern(e)* and *heut(e)* are reported in relation to stress of the first syllable of the following word. The frequency differences are highly significant in Table 6: a following stressed syllable is combined with a preceding schwa syllable in *gern(e)*. The distribution of *heute*, on the other hand, is mostly random. That is, we can conclude that the schwa in *gern(e)* is used to avoid a stress clash, but not in *heut(e)*.

3.4 Word order

Potentially, the position of the adverbial phrase within the sentence is also relevant for its prosodic shape. For the present corpus, we therefore classified each token of the adverbs with respect to its position in the basic clause structures assumed for German as described in terms of topological fields. Using the traditional field-model of German clauses (see Drach [1937] 1963; for a modern version, e.g., Grewendorf et al. 1987), we distinguish between position of the word in the prefield (12a), the position at the left edge of the middle field (12b), the right edge of the middle field (12c), and the position not adjacent to any edge of the middle field (12d). For example, the adverbs may demonstrate a behavior in the initial position in a sentence ("prefield") which is different from its behavior in other positions.

(12) a. [*Gern*]_{prefield} *möchte ich unserem verewigten Iffland auch auf*
        willingly   might   I   [our   eternalized I.].DAT also on
        meine Weise   ein Denkmalstiften (sic!)
        my   fashion a   memorial=fund
        'I would enjoy to fund a memorial for our eternalized Iffland.'
        (Goethe, *Briefe*, WA-IV, Vol. 25, p. 77 = p. 12506)

   b. *Kein guter Acteur mag* [*gern   als bloßer Statist*]_{middle field}
      no   good actor likes willingly as sheer extra
      erscheinen
      appear
      'No good actor likes to appear as a mere extra.'
      (Goethe, *Briefe*, WA-IV, Vol. 21, p. 435 = p. 10710)

   c. *von der   [wir uns doch gerne*]_{middle field} *regieren lassen*
      by   which we us yet willingly   govern let
      'by which we are happy to be governed.'
      (Goethe, *Briefe*, WA-IV, Vol. 10, S. 185 = p. 5131)

   d. *Denn wer ließe   [sich   nicht von so   einer holden*
      for who let.SUBJ himself not by such a   lovely
      Pythonisse gern   in jeden Irrthum]_{middle field} *führen.*
      poetess   willingly in every error   guide
      'for who would not enjoy being led astray into every error by such a
      lovely poetess.'
      (Goethe, *Briefe*, WA-IV, Vol. 21, p. 130 = p. 10244)

Tables 8 and 9 show the frequencies depending on the position of *gern(e)* and
heut(e) in the sentence. Both distributions are strongly significant, but in rather
different ways (as can be discerned from the standardized residuals between
brackets in the tables). In Table 8, *gerne* (with schwa) has a preference to ap-
pear at the end of the middle field, while *gern* (without schwa) prefers the

Table 8: Position in the clause for *gern(e)*. Standardized residuals in brackets, boldface for
frequencies higher than statistical expectation.

Position	with schwa	without schwa
Prefield	45 (−0.4)	136 (+0.4)
Beginning of middle field	29 (−2.9)	**142 (+2.9)**
Middle of middle field	183 (−3.0)	**626 (+3.0)**
End of middle field	**242 (+5.0)**	506 (−5.0)

(χ^2 = 27.77; p = 4.1e−6)

Table 9: Position in the clause for *heut(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Position	with schwa	without schwa
Prefield	111 (−7.5)	**162 (+7.5)**
Beginning of middle field	**118 (+2.9)**	53 (−2.9)
Middle of middle field	**143 (+2.0)**	77 (−2.0)
End of middle field	**138 (+3.5)**	60 (−3.5)

($\chi^2 = 57.74$; $p = 1.8e{-}12$)

beginning and the middle of the middle field. No preference is attested in the prefield. In contrast, Table 9 demonstrates that *heut* (without schwa) prefers the prefield, while *heute* (with schwa) has a preference to occur anywhere in the middle field. The distinction between the beginning and the middle of the middle field does not seem to be important for the question at hand.

3.5 Prosodic categories and boundaries

Perhaps more plausibly, word-final schwa could also depend on the positioning of the respective adverbs with respect to the left and/or right boundaries of specific prosodic categories. In Prosodic Phonology, these categories are usually arranged in a hierarchy (see, e.g., Nespor and Vogel 1986). The highest category in this hierarchy is usually taken to be the Utterance (in the following examples indicated by subscript "[...]$_U$"), dominating one or more Intonational Phrases, indicated by subscript "[...]$_{IP}$", which in turn dominate Phonological Phrases, indicated by subscript "[...]φ".

Here we decided on a four-fold distinction: "no boundary" (13a) is assigned if the following word forms a Phonological Phrase with *gern(e)*, "phrase boundary" (13b) if there is a Phonological Phrase boundary following *gern(e)*, "prefield boundary" (13c) if *gern(e)* stands at the right edge of the prefield, a position which can be associated with an Intonational Phrase boundary, and "utterance boundary" (13d) if the adverb is at the end of a clause or sentence.

(13) a. *und   ich   trage,   was   ich   weiß   und   vermag,* [*gern*
       and   I   contribute what   I   know and   can   willingly
       und   willig]φ *bey,*
       and   voluntarily   PTC
       'and what I know and can I contribute willingly and voluntarily'
       (Goethe, *Briefe*, WA-IV, Vol. 25, p. 96 = p. 12536)

   b. *Möge denn auch dieses Blatt den Weg antreten   den ich*
       may   then   also   this   leaf   the   path   undertake   that   I
       [*so gerne*]φ   [*selbst*]φ   *zurücklegte.*
       so   willingly   self   cover.SUBJ
       'May then this leaf start the path that I would love to cover myself.'
       (Goethe, *Briefe*, WA-IV, Vol. 43, p. 150 = p. 20297)

   c. [*Gern*]IP   [*hätte ich mich über die Verdienste* [...] *geäußert,*]IP
       Willingly   had   I   me   over   the   merits   uttered
       'I would have liked to say something about the merits.'
       (Goethe, *Briefe*, WA-IV, Vol. 28, p. 134 = p. 14116)

   d. [*Daß der Mensch aller geistigen Organe   bedürfe,* [...]
       that   the   man   [all   spiritual   organs].GEN   need
       gestehen wir gern]U
       admit   we   willingly
       'We admit freely that man is in need of all spiritual organs.'
       (Goethe, *Briefe*, WA-IV, Vol. 24, p. 226 = p. 12256)

The following partial analysis of prosodic constituents – Table 10 for *gern(e)* and Table 11 for *heut(e)* – demonstrates that *gern(e)* is found with schwa at the end of the two stronger boundaries, and without schwa at the end of the two weaker boundaries. *Heut(e)* is dispreferred in its schwa-less version if found utterance-finally, while utterance-medial and utterance-initial positions only involve a small difference between the two forms. As with the segmental context, we find that the interactions for both *gern(e)* and *heut(e)* are highly significant, though with different preferences (as indicated by boldface in Tables 10 and 11). The effects are only small for *gern(e)*, with a following phrase boundary slightly preferring schwa, while no following boundary slightly prefers no schwa. In contrast, the effect by *heut(e)* in Table 11 is much stronger, with *heute* strongly preferring the complete end of the sentence (i.e., a following utterance boundary), while *heut* prefers a following prefield boundary.

Table 10: Prosodic boundary following *gern(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Following boundary	with schwa	without schwa
No boundary	1 (−2.8)	**28 (+2.8)**
Prefield boundary	44 (+1.0)	105 (−1.0)
Phrase boundary	**424 (+2.1)**	1140 (−2.1)
Utterance boundary	30 (−2.5)	137 (+2.5)

(χ^2 = 15.17; p = 0.0017)

Table 11: Prosodic boundary following *heut(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Following boundary	with schwa	without schwa
No boundary	154 (−3.1)	**142 (+3.1)**
Prefield boundary	2 (−11.5)	**86 (+11.5)**
Phrase boundary	**205 (+2.3)**	114 (−2.3)
Utterance boundary	**149 (+9.8)**	10 (−9.8)

(χ^2 = 206.11; p < 2.2e−16)

3.6 Foot structure: the effects of *un*-prefixation

While the adverbs chosen for analysis do not undergo inflection and do not occur as attributive adjectives by themselves, the adverb *gern(e)* does undergo morphological derivation. It may be prefixed with accented *un-* and thus appear as part of *úngern(e)* 'unwillingly' (14). In order to demonstrate that linguistic contexts such as the presence or absence of *un-* (which introduces another syllable and might change the foot structure) may influence the variable under consideration, a brief look at this adverb in the four possible forms may be helpful.

(14) *Da   wir   sie   ungern   verlieren*,
      as   we   them unwillingly   lose
      'as we hate to lose them'
      (Goethe, *Briefe*, WA-IV, Vol. 15, p. 204 = p. 7574)

In Table 12, the absolute frequencies of schwa dependent on prefixation are presented. Schwa is found significantly more often with non-prefixed *gerne* than with prefixed *ungerne*, even given the fact that unprefixed *gerne* is far more frequent than the prefixed counterpart. Most intriguingly, the highest frequency of all possibilities is for unprefixed *gern*, but this high number is still

Table 12: Prefix *un-* with *gern(e)*. Standardized residuals in brackets, boldface for frequencies higher than statistical expectation.

Prefixation	with schwa	without schwa
ungern(e)	13 (−5.7)	**170 (−5.6)**
gern(e)	**499 (+5.7)**	1410 (−5.7)

(χ^2 = 31.71; p = 1.8e−8)

lower than the statistical expectation from the independent row and column frequencies.

3.7 An intermediate summary: the effect of the single factors

Summarizing over Tables 4 to 12, we note that all factors show a significant distribution, though in different ways for *heut(e)* and *gern(e)*. First, the class of the following segment matters: If the following word begins in a vowel, the realization of schwa is dispreferred, as we have expected. Realization with schwa would lead to hiatus. Further, a following stressed syllable is combined with a preceding schwa syllable in *gern(e)* thus avoiding a stress clash. However, this effect does not hold for *heut(e)*.

   Turning to prosodic boundaries, schwa seems to be avoided if no boundary follows (see the example in [15]); indeed, there is only one example with no boundary following (given in [16]) in which *gerne* is realized with schwa. If a phrase boundary follows, the frequency of schwa is higher, indicating that it is used to mark a right-edge phrase boundary. Other boundaries are only significant for *heut(e)* but not for *gern(e)*.

(15) *Du siehst aus meinen vorigen   Briefen daß ich gern   und*
      you see   out my   previous letters that I   willingly and
      willig   wiederkehre
      voluntarily return
      'you see from my previous letters that I like very much to return'
      (Goethe, *Briefe*, WA-IV, Vol. 8, p. 144 = p. 18257)

(16) *Ich bin überzeugt daß ausser den gewöhnlichen Dienst*
      I   am convinced that apart the usual   service
      Verrichtungen   er der erste seyn wird, der den magischen
      accomplishments he the first be   will who the magic
      Schleyer, welcher die Renth   Amts   Geschäfte   noch
      veil   which   the finance administration businesses still
      immer zudeckt, gerne   und freywillig   wegzieht.
      always covers   willingly and voluntarily removes
      'I am convinced that he will be the first one who will remove very willingly the magic veil which still covers the tasks of finance administration, notwithstanding the accomplishment of the usual official tasks.'
      (Goethe, *Briefe*, WA-IV, Vol. 9, p. 88 = p. 18689)

Position in the clause consistently shows a gradual distribution: The further to the end of the middle field the word *gern(e)* stands, the more prone it is to be realized with word-final schwa. The beginning of the middle field patterns rather with the prefield in showing relatively low frequencies of realization with schwa. The effect is slightly different for *heut(e)*, as the major difference here is between the prefield and the middle field as a whole. The direction of the distribution is the same as with *gern(e)* in that the prefield disprefers schwa, while schwa becomes more frequent towards the end of the middle field. In summary, the frequency of schwa in these adverbs increases from the left to the right in the sentence. Turning finally to the presence or absence of a prefix, there is an effect in that prefixed forms tend to be realized without schwa.

However, it must also have become obvious now that the preceding analyses are preliminary and unsatisfying in at least one aspect: presenting evidence on the role of individual factors does not provide a picture of the relative weight of these factors and, more importantly, of possible interactions between these factors. Furthermore, it has become clear that none of the factors mentioned operate in a categorial fashion. That is, none of the factors leads to a situation in which final schwa is categorically present or absent. We have to try to combine the factors one by one and look whether the distributions are random or not. If they are not, it needs to be determined whether the distribution patterns follow the patterns of single factors involved. By proceeding in this manner, we can estimate the weights and feed the results into a more formal analysis of the occurrence of word-final schwa in Goethe's letters as a specific and coherent corpus.

4 Combining the factors

In order to investigate the interactions between the factors and the relative importance of the factors, we performed various logistic regression analyses with the presence of schwa as the dependent variable to be explained. For good measure, we also tried various mixed models with the lexical factor *heut(e)* vs. *gern(e)* as a random variable. However, these analyses did not reveal any additional insights, so they will not be discussed here.[7] All data and analyses are available as an online appendix.[8]

---

7 All computations were executed with the statistical package R (R Core Team 2017), with additional packages "readxl" (Wickham 2016) and "lme4" (Bates et al. 2015).
8 See https://www.degruyter.com/view/j/zfsw.2018.37.issue-1/issue-files/zfsw.2018.37.issue-1.xml or http://doi.org/10.5281/zenodo.1156897.

All factors discussed in Section 3 are included in the regression analyses. Based on the results from Section 3, we decided to reduce various factors. First, we combined sonorants and obstruents into a single class. They showed the same tendency for *gern(e)*, and sonorants did not show any tendency for *heut(e)* (cf. Table 4 and 5). Further, the beginning and the middle of the middle field were merged into one class, as they consistently showed the same preference (cf. Table 8 and 9).

The first analysis we performed is a logistic regression including the following five factors and their two-way interactions as independent variables.

- lexeme (*heut(e)* vs. *gern(e)*)
- segment (following segment: vowel vs. non-vowel)
- stress (following segment: stressed vs. unstressed)
- boundary (following boundary: no boundary, phrase boundary, prefield boundary, utterance boundary)
- position (position in the sentence: prefield, beginning of middle field, end of middle field)

An attempt was made to reduce this large model (with five one-way factors and ten two-way interactions) by removing factors until no improvement in AIC (Akaike Information Criterion) was present. Only one factor was removed and the analysis of variance (ANOVA) of the remaining factors is shown in Table 13. The strongest significances and the highest deviance reduction were found for

Table 13: ANOVA of logistic regression.

Factor	Deviance	Probability
lexeme	271.888	< 2.2e−16 ****
segment	53.482	2.610e−13 ****
stress	81.194	< 2.2e−16 ****
boundary	117.788	< 2.2e−16 ****
position	9.898	0.0070898 **
lexeme:stress	31.130	2.413e−08 ****
lexeme:boundary	155.700	< 2.2e−16 ****
lexeme:position	17.421	0.0001648 ***
segment:stress	3.760	0.0525041
segment:boundary	4.536	0.2090918
segment:position	5.665	0.0588797
stress:boundary	13.754	0.0032596 **
stress:position	8.683	0.0130191 *
boundary:position	25.806	0.0002420 ***

**** *p* < 0.0001, *** *p* < 0.001, ** *p* < 0.01, * *p* < 0.05

Table 14: ANOVA of logistic regression for *gern(e)*.

Factor	Deviance	Probability
segment	48.406	3.464e−12 ****
stress	116.591	< 2.2e−16 ****
boundary	4.879	0.1809
position	21.114	2.601e−05 ****

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

the individual factors and the interactions between the factor *lexeme* and the other factors. For that reason we will further investigate the interactions separately for the two lexemes *heut(e)* and *gern(e)*. Mixed models with the factor *lexeme* as a random factor can be found in the online documentation of the analyses.

Restricting the analysis to the adverb *gern(e)*, we only include the individual factors, because the two-way interactions were only very strongly significant for interactions involving the distinction between the two lexemes. The ANOVA in Table 14 shows a clear relative importance between the different factors for the explanation of the presence of schwa in *gern(e)*:

(18) Order of importance for the explanation of schwa in *gern(e)*:
stress of following syllable >>> type of following segment >>> position in sentence

The individual characteristics for the explanation of the schwa in *gern(e)* are shown in the summary in Table 15. Most factors are not significant, which can

Table 15: Summary of logistic regression for *gern(e)*.

Factor	Estimate	Std. Error	z value	Pr (>|z|)
(Intercept)	−1.5626	1.0347	−1.510	0.131
segment (vowel)	−0.7292	0.1377	−5.294	1.20e−07 ****
stress (not stressed)	−1.1086	0.1138	−9.739	< 2e−16 ****
boundary (phrase boundary)	1.1460	1.0272	1.116	0.265
boundary (prefield boundary)	1.9892	1.2553	1.585	0.113
boundary (utterance boundary)	0.6578	1.0481	0.628	0.530
position (end middle field)	0.5138	0.1199	4.287	1.81e−05 ****
position (prefield)	−0.8623	0.7021	−1.228	0.219

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table 16: ANOVA of logistic regression for *heut(e)*.

Factor	Deviance	Probability
segment	−9.272	0.002327 *
stress	0.225	0.634924
boundary	249.195	< 2.2e−16 ****
position	18.499	0.614e−05 ****

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

(also) be understood from the high standard errors for these cases. The significant factors are the following:

- A following vowel leads to fewer schwa vowels (negative estimate), with an odds ratio of $e^{-0.7292} \sim 0.50$. So the odds of a schwa with *gern(e)* are about 1 to 2 when a vowel follows.
- A following unstressed syllable leads to fewer schwas (negative estimate), with an odds ratio of $e^{-1.1086} \sim 0.33$. So the odds of a schwa with *gern(e)* are about 1 to 3 when a stressed syllable follows.
- When *gern(e)* occurs at the end of the middle field, schwa is more frequent (positive estimate), with an odds ratio of $e^{0.5138} \sim 1.67$. So the odds of schwa with *gern(e)* goes up almost 70 % at the end of the middle field.

The same analysis for *heut(e)* results in a rather different prediction for the presence of schwa. The ANOVA in Table 16 now indicates the following relative order of importance of the different factors:

(19) Order of importance for the explanation of schwa in *heut(e)*:
    type of following boundary >>> position in sentence >>> type of following segment

The crucial difference between *gern(e)* and *heut(e)* appears to be that *gern(e)* reacts strongly to the local context in the form of the next segment/syllable, while *heut(e)* reacts more strongly to the global context, viz. syntactic boundaries and position in the sentence.

The individual characteristics for the explanation of the schwa in *heut(e)* are summarized in Table 17. Most factors are not significant, which can (also) be understood from the high standard errors for these cases. The significant factors are the following:

- The intercept is significant with a positive estimate, which indicates that the presence of schwa is overall higher for *heut(e)*. This indicates that the schwa in this word already is on the path to lexicalization, also in the

Table 17: Summary of logistic regression for *heut(e)*.

Factor	Estimate	Std. Error	z value	Pr (> |z|)
(Intercept)	0.8250	0.2027	4.070	4.71e−05 ****
segment (vowel)	−0.4474	0.1784	−2.508	0.0122 *
stress (not stressed)	0.1667	0.2043	0.816	0.4144
boundary (phrase boundary)	−0.1617	0.2385	−0.678	0.4979
boundary (prefield boundary)	−3.5979	0.7477	−4.812	1.50e−06 ****
boundary (utterance boundary)	2.8912	0.3938	7.342	2.11e−13 ****
position (end middlefield)	−0.5884	0.2348	−2.506	0.0122 *
position (prefield)	−1.0195	0.2447	−4.167	3.09e−05 ****

**** $p < 0.0001$, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

current period under investigation, in which *heut(e)* still shows strong variability.

–   Both a following prefield boundary and a following utterance boundary affect the presence of schwa, though in opposite directions. A following prefield boundary leads to fewer schwas (negative estimate), with an odds ratio of $e^{-3.5979} \sim 0.03$. In contrast, a following utterance boundary leads to more schwas (positive estimate), with an odds ratio of $e^{2.8912} \sim 18$.

–   When *heut(e)* occurs in the prefield, the presence of the schwa is lower (negative estimate), with an odds ratio of $e^{-1.0195} \sim 0.35$. So the odds of schwa with *heut(e)* is about 1 to 3 in the prefield.

–   Finally, a following vowel leads to less schwa (negative estimate, but only marginally significant), with an odds ratio of $e^{-0.4474} \sim 0.64$. So the odds of a schwa with *gern(e)* is about 2 to 3 when a vowel follows.

The models for *gern(e)* in Table 15 and for *heut(e)* in Table 17 show significant effects, but they (of course) do not completely explain all occurrences of schwa in our data. As a measure of how strong the predictive power of these models is, it is instructive to correlate the predicted probabilities of schwa with its empirical presence in the data. The square of the correlation coefficient can be interpreted as the explained variance, i.e. how much of the attested variation is explained by the factors in the current models. The explained variance for *gern(e)* is rather low ($R^2 = 0.095$), while it is reasonable for *heut(e)* ($R^2 = 0.26$). A maximum of one would mean that all variation is explained by the model, which is of course not to be expected in case of linguistic variation.

5 Conclusions

We have shown that the distribution of schwa is non-random in a corpus of written German of the late 18th and early 19th century, more specifically the letters written by Johann Wolfgang von Goethe. We chose the adverbials *heut(e)* and *gern(e)* in order to be able to study schwa-zero alternations at the right word edge, and to avoid interaction with morphological factors. Numerous factors were demonstrated to influence the positioning of schwa, most prominently a following stressed syllable (in which case the insertion of schwa is preferred, as it remedies the stress clash), a prosodically well-formed branching foot achieved by the presence or absence of schwa (which is the case in *gerne* and *ungern*, but not in *ungerne*), a vowel to follow the word with optional schwa (in which case schwa is avoided), the positioning of the word at the edge of a prosodic boundary (in which case schwa is avoided), and the position in the sentence of the word with optional final schwa.

All of these factors influence the (non-)appearance of schwa, but we can also see a clear ranking, with different ones for *gern(e)* and *heut(e)*. For *gern(e)*, the biggest influence is exerted by the factor "following stressed syllable", followed by the factor "following segment". Both of these factors relate to the local phonological context of the schwa. In contrast, for *heut(e)* the biggest influence is exerted by factors relating to the syntactic structure, with the "kind of following boundary" outranking the "position in the sentence".

In general, for *gern(e)* the most important factors are the ones operating on a "small-scale" level, most importantly the stress of the following syllable and the type of the following segment, i.e., purely phonological factors. Even today, this adverb cannot be claimed to have lexicalized one or the other of its forms, as in present-day Standard German both *gern* and *gerne* occur in significant quantities (see note 3). It remains to be investigated whether the same factors found to be significant in Goethe's letters are still at work in present-day Standard German. For *heut(e)*, on the other hand, lexicalization is already on its way even in the observed period still showing a significant amount of variation. The most important factors are the ones that operate on a "larger scale", most importantly the type of the following boundary and the position in the sentence. As most instances of schwa-less *heut* occur in the prefield, one can hypothesize that the information-structural properties associated with this position are ultimately responsible for the distribution to be observed. In that perspective, one could argue that schwa-less *heut* is probably stylistically marked already even in Goethe's early letters, and that its tendency to appear most often in the prefield is an epiphenomenon of the fact that this position features more forms closer to spoken varieties.

References

Sources

[Goethe, *Briefe*]: *Johann Wolfgang von Goethe: Leben und Werk*. Digitale Bibliothek
    Sonderband 30. CD-ROM. Berlin: Directmedia Publishing, 2006.

Digital tools

Bates, Douglas, Martin Maechler, Ben Bolker & Steve Walker. 2015. Fitting Linear Mixed-
    Effects Models Using lme4. *Journal of Statistical Software* 67(1). 1–48.
R Core Team. 2017. *R: A language and environment for statistical computing*. Vienna:
    R Foundation for Statistical Computing. https://www.R-project.org/ (01.09.2017).
Wickham, Hadley. 2016. readxl: Read Excel Files. *R package version* 0.1.1.
    https://CRAN.R-project.org/package=readxl (01.09.2017).

Research literature

Domahs, Ulrike, Richard Wiese, Ina Bornkessel-Schlesewsky & Matthias Schlesewsky. 2008.
    The processing of German word stress: Evidence for the prosodic hierarchy. *Phonology*
    25(1). 1–36.
Drach, Erich. 1963 [1937]. *Grundgedanken der deutschen Satzlehre*. Frankfurt a. M.:
    Diesterweg.
Eisenberg, Peter. 1998. *Grundriss der deutschen Grammatik. Band 1: Das Wort*. Stuttgart &
    Weimar: Metzler.

Féry, Caroline. 1998. German word stress in Optimality Theory. *Journal of Comparative Germanic Linguistics* 2(2). 101–142.

Fleischer, Jürg, Katrin Kuhmichel & Augustin Speyer. 2012. Sprachveränderung bei Goethe: das auslautende Schwa in den Werther-Fassungen von 1774 und 1787. *Zeitschrift für germanistische Linguistik* 40(3). 305–351.

Giegerich, Heinz. 1985. *Metrical structure and phonological structure: German and English*. Cambridge: Cambridge University Press.

Giegerich, Heinz. 1987. Zur Schwa-Epenthese im Standarddeutschen. *Linguistische Berichte* 11. 449–69.

Grewendorf, Günther, Fritz Hamm & Wolfgang Sternefeld. 1987. *Sprachliches Wissen*. Frankfurt a. M.: Suhrkamp.

Hall, Tracy Alan. 1989. German syllabification, the velar nasal, and the representation of schwa. *Linguistics* 27(5). 807–842.

Harnisch, Rüdiger. 2001. *Grundform- und Stamm-Prinzip in der Substantivmorphologie des Deutschen: synchronische und diachronische Untersuchung eines typologischen Parameters*. Heidelberg: Winter.

Hayes, Bruce. 1995. *Metrical Stress Theory: Principles and case studies*. Chicago, IL: University of Chicago Press.

Moulton, William G. 1962. *The sounds of English and German*. Chicago, IL: University of Chicago Press.

Nespor, Marina & Irene Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris.

von Polenz, Peter. 2013 [1994]. *Deutsche Sprachgeschichte vom Spätmittelalter bis zur Gegenwart. Band II: 17. und 18. Jahrhundert*, 2. Auflage bearbeitet von Claudine Moulin unter Mitarbeit von Dominic Harion. Berlin & Boston: de Gruyter.

Schirmunski, Viktor M. 1962. *Deutsche Mundartkunde. Vergleichende Laut- und Formenlehre der deutschen Mundarten*. Aus dem Russischen übersetzt und wissenschaftlich bearbeitet von Wolfgang Fleischer. Berlin: Akademie Verlag.

Schröder, Marianne, Irmhild Barz & Wolfgang Fleischer. 2012. *Wortbildung der deutschen Gegenwartssprache*. Berlin & Boston: de Gruyter.

Selkirk, Elisabeth. 1984. *Phonology and syntax: The relation between sound and structure*. Cambridge, MA: MIT Press.

Wiese, Richard. 1986. Schwa and the structure of words in German. *Linguistics* 24. 697–724.

Wiese, Richard. 2000 [1996]. *The phonology of German*. Oxford: Oxford University Press.

Wiese, Richard. 2009. The grammar and typology of plural noun inflection in varieties of German. *Journal of Comparative Germanic Linguistics* 12(2). 137–173.

Wiese, Richard & Augustin Speyer. 2015. Prosodic parallelism explaining morphophonological variation in German. *Linguistics* 53(3). 525–559.

Wurzel, Wolfgang U. 1970. *Studien zur deutschen Lautstruktur*. Berlin: Akademie Verlag.