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Reduction of unstressed vowels in Proto-Frisian and the Germanic 'Auslautgesetze'

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The quantitative reduction and loss of Proto-Germanic vowels during the transition from some form of Common North West Germanic to the attested 'Old' languages, such as Old English and Old Frisian, is a complicated process, interfering with morphological restructuring processes. Various reconstructions have been presented, the most extensive one by Boutkan (1995). Scrutiny of the Runic Frisian data, from the period ca. 500–800, shows that especially the apocope of PWGmc *-*a* and of *-*u* < PGmc *-*ō* should be positioned much later in the relative chronology than envisaged by Boutkan. The order that can be derived from the Runic Frisian data reflects a gradual loss of one mora, running in a cline from the least salient to the most salient vowel, which provides a phonetic rationale for the development. This gradual mora reduction can be dated to the period between ca. 500 and 700. This absolute dating can have implications for phonological processes in which root vowels interact with the quality or quantity of the vowel in the following syllable.

1. Introduction

The Germanic 'Auslautgesetze', the reconstruction of the development of unstressed syllables from Proto-Germanic to the 'Old' stages of the Germanic languages, is one of the most complicated issues in the study of Germanic language history. The reasons for it are manifold. In the first place, the unstressed vowels are in most instances morphological endings and as such their later appearance is not only the result of regular – and sometimes irregular – phonological changes, but also of analogical reshuffling and levelling. The amount of evidence is limited: some endings are rare and appear in only a few morphological categories, and the amount of attested evidence is limited because the major source

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is the runic inscriptions, which provide only very few morphological contexts, i.e. mostly (pro)nominal nom.sg. forms and very few verb forms.

It is therefore not surprising that the reconstruction of the 'Auslautgesetze' is a cumbersome enterprise. The most comprehensive study so far is Boutkan's (1995) *The Germanic 'Auslautgesetze'*, which – unfortunately – could not profit from Syrett's (1994) study on *The unaccented vowels of Proto-Norse*. A synthesis of various insights and earlier studies is presented in Nielsen (2000:77–103, 2010:110–112). My analysis of the Runic Frisian corpus was an attempt to add information from that corpus to the discussion (Versloot 2016a). I observed two major deviations from Boutkan's (1995:435) chronology of sound changes in that study: the graphemic realisation of PGmc *-*az*/-*an* (the nom.acc.sg.masc. *a*-stems) and of PGmc *-*ō* after heavy syllables, both as RF -**u**. Boutkan's chronology suggests that the *-*a* would be lost before the final consonants *-*z* and *-*n* and that both would be lost already at the time of the attestations of Runic Frisian, largely contemporaneous with Early Old English.

The relatively long preservation of a reflex of PGmc *-*az* and *-*an* in the Runic Frisian corpus has for a long time been considered with some scepticism, but the recent Continental Germanic finds of **kaba** 'comb' (Frienstedt 3rd c.) and **lapela** 'spoon' (Ichtratzheim 6th c.) have cast new light on the Frisian data (Schmidt, Nedoma & Düwel 2010; Fischer et al. 2014). The order of the loss of *-*z* before *-*a* was earlier sketched by e.g. Nielsen (2000:93), Hogg (2011:63), Stiles (2013:15), Euler (2013:68) and Nedoma (2014). Nielsen (2000:92, 100) also noted the preservation of -**u** < PGmc *-*ō* in **medu** 'meed, reward' on the Undley bracteate (ca. 450–500), but he did not contrast its preservation with the fate of PGmc short *-*u* after heavy syllables.[1]

Section 2.1. contains an overview of the Runic Frisian inscriptions and their interpretations relevant for the line of argumentation in this paper. The Runic Frisian system of unstressed vowels is summarized in § 2.2, while the evidence from the Runic Frisian corpus for the instances of PGmc *-*a*C and *-*ō* are discussed in more detail in § 2.3. The main argument is made in § 3, demonstrating a strong correlation between the order of reduction found in the Runic Frisian corpus and the phonetic salience of the vowels under consideration. In section § 4, I will compare these outcomes with the schemes presented by Nielsen (2000). The argumentation concerns primarily vowels that were in word final position, at least in West Germanic, where word final *-*z* had disappeared after unstressed sylla-

1. Waxenberger (2013:47; with further references) keeps the interpretation of **medu** as 'mead', OE *medu*, open. The preservation of -*u* after a light syllable stem does not differ in any way from the distributions known from Early Old English.

bles, as in the **kaba** example. Included are vowels from PGmc *-V*n* which were likely nasalised vowels in Proto-West Germanic.

2. The Runic Frisian data

2.1 The Runic Frisian corpus: Relevant forms and interpretations

A corpus of Runic Frisian inscriptions has been discussed on various occasions. Some scholars are fundamentally sceptical about the concept of a Runic Frisian corpus (Page 1996), but most of them agree on the identification of a set of inscriptions that can either by geographical origin or by linguistic features be connected with the history of the Frisian language, such as Quak (1990), Nielsen (1996) and most comprehensively Looijenga (2003:299–328).[2] The inscriptions from Fallward (**ksamella [a]lguskaþi**) and Sievern (**rwrilu**), both near Wremen in Land Wursten (north of Bremerhaven) and Hitzum (**fozo groba**) in West Friesland (Looijenga 2003:239–240; 215; 208) are usually not included in the Runic Frisian corpus: they contain no specific Anglo-Frisian runic characters and are all dated to the 5th century. The Sievern and Hitzum bracteates are often considered to be of Scandinavian origin, but given various other finds of bracteates outside Scandinavia – in total ca. 15% of all bracteates (Looijenga 2003:40) – this is not necessarily the case (Seebold 1996; Quak 2010:153). Fallward and Sievern lie in the so-called Elbe-Weser triangle, the region many of the settlers of Frisia and England in the 5th and 6th century came from (Higham & Ryan 2015:70–125). The texts can therefore be interpreted as reflections of 5th century (North) West Germanic, from which Frisian and English developed. By the same token, if Hitzum is indeed local, it reflects an early stage of the language that eventually developed into Frisian. A categorical division between 'Frisian' and 'non-Frisian' inscriptions is unnecessary and even undesirable for diachronic reconstructions: differences between etymologically related endings on earlier and later inscriptions are rather instrumental for the absolute dating of sound changes in the history of pre-Old Frisian.

I discussed all the endings in detail in Versloot (2016a) and gave interpretations also in Versloot (2014), with extensive references to earlier scholarship. A couple of runic textual items serve as illustrations of sound changes in this article. I will introduce these items in this section in chronological order and point out issues regarding their interpretation.

2. Looijenga contains an extensive catalogue with references to earlier scholarship.

The 5th century Sievern bracteate contains the text **rwrilu**, which is mostly read as **r(unō) wrītu* 'I write the runes' (Looijenga 2003: 215, Findell 2012: 274). The characters for <l> and <t> differ in only one stroke, which makes this a reasonable emendation.

The footstool from Fallward contains the inscription **ksamella** [**a**]**lguskaþi**. (Looijenga 2003: 239, Findell 2012: 486). The first part is interpreted as **skamella* and seems to refer to the footstool, OFris. **skomel*. The reading of the second part supposes a repetitive reading of the final **a** of **ksamella**. The sequence [**a**]**lgu** 'elk' reflects most likely a PGmc **algi-* (Findell 2012: 146). This suggests that the -**u** in this word renders a reduced vowel (Nedoma & Theune-Großkopf 2008: 57–58, Nedoma 2014: 347).

The Hitzum bracteate has long been considered to be of Scandinavian origin, but can – as mentioned before – also be taken as a local product. It is often considered to be a name in the form of a nom.sg.masc. *n*-stem (Seebold 1996; Nedoma 2014: 344). The interpretation of **fozo** as 'non-Frisian' based on the final -**o** instead of **-a* is anachronistic for a 5th century inscription: Old Frisian and Runic Frisian final *-a* developed from a PGmc **-ō* (*-ō*) (Nedoma 2007: 318), as in the nom.pl. ending of the *ō*-stems, OFris. *-a* < **-ōz*; compare also OE *-as*, OFris. *-ar* vs. OS *-os* in the nom.pl. of the *a*-stems. The South-Germanic ending *-o(-)* represents merely the archaic vowel quality.

Various interpretations (nom.sg.fem. *ō*-stem, instrumental sg.; cf. Bammesberger 1998; Schuhmann 2014: 404) have been put forward for the **skanomodu** text on the solidus in the British Museum, from ca. 600. Both this text and the inscription on the Hamwic knucklebone are generally assigned to the Frisian corpus due to the rendering of PGmc **au* as **a**, vs. Old English *ea*, see e.g. Quak (1990) – a more sceptical approach can be found in Waxenberger (2017). A nom.sg. form with PGmc **mōdaz* as the second part is nowadays widely accepted and the one entertained in this study (Nedoma 2014: 348, 350). The **o** in the first part of the name is puzzling, given the wide-spread forms with *i*-mutation: German *schön*, West Frisian *skjin*. It has been hypothesised that the adjective had been shifted to the *a*-stems, so e.g. Nielsen (1984: 15), Nedoma (2007: 307), and the vowel subsequently reduced in quality. We find a similar instance in the Fallward inscription [**a**]**lgu**- for **algi-*. The actual vowel colour in **skanomodu** may be an instance of vowel harmony with the *ō* in the second part of the name (Versloot 2016a: 30).

The text **hada** on the Harlingen gold bracteate from ca. 600 is interpreted as a nom.sg.masc *n*-stem with Runic Frisian *-a* from earlier *-ō* (Nedoma 2007: 318; compare the **fozo**-text on the Hitzum bracteate).

The interpretation of the Schweindorf-bracteate of roughly the same date as the previous text has become a heavily disputed issue. Looijenga (2013) suggested

the reading **welad**, *Wēland*, which gained support from Hans-Frede Nielsen and John Hines (Düwel 2018:534), contrary to the traditional reading **weladu**, which is advocated by Nedoma (2014:351) and Düwel (2018). The word is ascribed to three different declensional classes: either an *a*-stem or a consonantal stem, when interpreted as a present participle in **-and(a)z*, or an *-u* stem from a reconstructed **wēl-handuz* or by analogy (Bammesberger 1998:124). Examples for potential non-*a*-stem forms are Old Norse *Vǫlundr*, gen.sg. *-ar*, Frankish *velandv* (gen.sg.), Old French *Walandus* (examples from Nedoma 2014:351). Bammesberger (1998:124) notices that the present participle is expected to be a consonantal stem and not an *a*-stem. In the case of an *a*-stem, the ending **-u** would nicely tie in with the rest of the evidence for nom.sg.masc. *a*-stems in Runic Frisian. The short form **welad** would attest to the loss of the short *u*-stem ending **-u(z)* after heavy syllables or to the loss of **-z* in case of a consonantal stem, starting from the interpretation as a nom.sg. form.

The text **æniwulufu** on the so-called Folkestone tremissis from the 7th century is interpreted as a compound name, reflecting a PGmc **Auni-wulfaz*, Frankish *Aunulf* (Nedoma 2014:352). The form **kõbu** 'comb' on a comb from the 8th century is one of a series of nom./acc.sg. forms of PGmc **kambaz/-n* (Nedoma 2014:353), including the Oostum instance **kabu** (acc.sg.) and the Frienstedt form **kaba**.

The late 8th century inscription on the Arum sword, **edæ bõda**, was extensively discussed by Nedoma (2007:311–320). There are various interpretations possible. The word **bõda** is an *n*-stem in all of them (either a personal name or the word *boda* 'messenger') and the final **-a** corresponds to the OFris. ending *-a*. **edæ** is interpreted as a female name in the nom.sg., most likely an *n*-stem.

The word 'I' may be attested in two inscriptions, the late 8th century Rasquert form **ek** (the first two characters of the inscription) and potentially in circumposition in the undated Hantum inscription **i:æhæ:k** (Nedoma 2007:322). Looijenga (2003:317) reads **umædit** as the second word of the Rasquert inscription, a reading that is also considered by Nedoma (2007:323). Looijenga interprets the sequence as a past particple of a *jan*-verb **maidjan-* 'to make mad' (cf. Old English *gemǣdan*).

The Oostum comb, from the 8th or 9th century, contains the text **aib kabu deda habuku**. The reading **aib** (ᚠᛁᛒ) instead of **ælb** (ᚠᛚᛒ) is based on personal inspection of the object; see Versloot (2014:48–49) for extensive considerations with further references.[3] The syntactic interpretation of the sequence leaves several possibilities (Düwel & Tempel 1968:367, Nedoma 2014:354–355). I opt for the interpretation: 'Aib made the comb for Habuk', where *Habuku* is the dat.sg. of a

3. Both in **aib** and **habuku**, the stroke on the ᚠ-rune is not connected to the rest of the rune, but it is in **kabu**.

feminine *ō*-stem. It has been justifiably argued that **habuku** fits well as nom.sg. *a*-stem, PGmc **haƀukaz*, which is well attested in all Germanic languages: Mod-WFris. *hauk*, Old Norse *haukr* etc. (Nedoma 2014: 355). The Frisian male's name *Hauke* (e.g. in Th. Storms *Schimmelreiter*), is not an *a*-stem but rather an *n*-stem: OFO (West Frisian charters) I, 486 (1504); II, 290 (1519): *Hauka* (Sipma & Vries 1927–77). The name is found to refer to a female person in Cadovius-Müller (König 1911: 86), who mentions *Hawke* under the female names and not under the male names in his 1679 list of names in the East Frisian Harlingerland. The form *Hauk* is frequent as a female name in Fryslân in the 18th century. Both later forms can regularly be derived from an OFris. *ō*-stem, with regular loss of final Old Frisian *-e* in post-mediaeval West Frisian and its retention in the Harlingerland dialect (Versloot 2008: 133).

The first word **aib** is easily associated with **aebi** on the Schwangau fibula from ca. 600. However, Nedoma (2015: 312) does not find any independent evidence for a protoform ***Aibija* and concludes that a short name form is rather expected to be an *n*-stem: **Aibōn*. The former should give ***aibi* in Runic Frisian, the latter ***aiba*. The 15th and 16th century West Frisian charters (Sipma & Vries 1927–77) see many instances of both the name *Eeba* and *Eebe* and *Eeb*.

The name **jisuhldu** in the undated Westeremden A inscription was extensively discussed by Nedoma (2007: 300–305) and can be interpreted as the oblique case, originally instrumental, of a *jō*-stem, governed by the preposition **meþ** 'with'. The preposition was derived from a PGmc **miþi* or **miþa* (Philippa et al. 2003: s.v. *mede*). The form with *-*i* seems to be the inherited one from Proto-Indo-European, but the vowel quality /e/, in Runic Frisian, but also in other Germanic languages (e.g. Icel. *með*, Dutch *met*), seems to point to a variant with final *-*a*.

The Westeremden B inscription of unknown date was interpreted by Seebold (1990), an interpretation that was largely followed with few modifications by Looijenga (2003: 312–314). Relevant for this article are the words **hämu** 'home', which is a locative, with the originally instrumental ending PGmc *-*ō* and the form **iwi** 'yew' a locative in PGmc *-*ī* (Versloot 2017a: 208–209).

The form **katæ** on the Hamwic knucklebone of unknown date is interpreted as the nom.sg. of a Runic Frisian *ō*-stem, attesting to the shift of the acc.sg. form, PGmc *-*ōn*, to the nom.sg., a shift that is common in Old Saxon and Old High German (Versloot 2016b).

A long, but complicated text is found on the Britsum yew-wood stick, also of unknown date. One of the words that seems pretty clear is **beret**, interpreted as an imperative pl. 'carry!' from a PGmc **birid*.

2.2 The reconstructed Runic Frisian system of unstressed vowels

The analysis of the attestations in the Runic Frisian corpus (Versloot 2016a) shows the following developments from Proto-Germanic:

- Proto-Germanic word final long vowels and diphthongs are retained, most likely as short vowels: **(jisu)hldu** 'Hilde (PN)' (instr.sg.) < PGmc **-h(i)ldjō* 'hero',[4] **iwi** 'yew' (loc.sg.) < PGmc **īwī* 'yew';
- Proto-Germanic *-a-* < **-az* and **-an* show vestiges in Runic Frisian. The vowel is usually interpreted as /ə/ in the literature, but phonetically it may have been a mid or possibly high rounded central vowel, i.e. [ɵ] or [ʉ]:[5] **kōbu**, **kabu** 'comb' < PGmc **kambaz/-an*;
- Other Proto-Germanic word final short vowels than **a* from **-az* and **-an* are dropped after heavy syllables and in unstressed words: **ek**, **ik** 'I' < PGmc **eka(m)*, **meþ** 'with' < PGmc **meþi* or **meþa*. The loss of a final **-i* may also be found in **aib** 'Eebe (PN)', if we want to associate the form with the almost 200 years older South Germanic form **aebi**. In the interpretation of the Schweindorf text as **welad** 'Wieland (PN)' and being a former *u*-stem, the word would attest to the loss of short **-u* after a heavy syllable. The evidence from **aib** and **welad** is, however, uncertain;[6]
- Proto-Germanic short vowels that were still protected after the apocope of final consonants in Proto-Germanic are retained but with a strong tendency to reduction to */ə/, spelled **u**, and possibly colouring through vowel harmony with neighbouring stressed syllables: **jisu̲(hldu)** < PGmc **gīsa-*, **[a]lgu̲(skaþi)** 'elk-damager' < PGmc **algi-*, **skano̲(modu)** 'Schönmut (PN)' < **skauni-* or **skauna-*. The **-u** can also render a svarabhakti-vowel, as in **-wulufu** 'wolf' (Damsma & Versloot 2015);
- The mid-open vowels from PGmc **-ai*, **-ē*, **-ōn#* on the one hand and PGmc **-ana-*, **-ō-* and **-au* had developed into an /æ/ ~ /å/-system, as it was also found in 9th century Old Saxon, and in early Old English (<æ> ~ <a>): **katæ** 'knuckle-bone' < PGmc **kautōn* (acc.sg.) ~ **boda** 'messenger(?)' < PGmc **budōn-*;
- A phonological distinction between protected <e> and <i> could not be established: **beret** 'carries' < PGmc **birid*, **umædit** 'not mad' < PGmc **-maidiþ*.

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4. See Nedoma (2007:304) for the argumentation why **hld** can be read as *hild*. In the case of runic ᛁ and ᛚ, a bind rune **ᛁᛚ** may technically also be possible.

5. So Nedoma (2014:358–359), who states that the vowel was pronounced "[..] geschlossener als 'reines' [ə] [..]".

6. Cf. Ringe & Taylor (2014:44–48, 55–58) for a much more detailed reconstruction of the loss of short **-i* and **-u*. The scarce Runic Frisian evidence can neither confirm nor contest those details, apart from the relative order of the loss of short **-i* and **-u* vs. **-a*.

This leads me to postulate the following system of vowels in Runic Frisian unstressed syllables:

Table 1. Reconstructed Runic Frisian vowels in unstressed syllables

short vowels		examples	
/ i/ ᛁ	/u/ ᚢ	**iwi**	**-hldu**
/ə/ ᚢ, ᛟ, ᛗ		**kobu**, **skano-**, **beret**	
/æ/ ᚠ, ᚨ	/å/ ᚨ	**katæ**	**boda**

This system complies largely with the systems for early Old English and for Old Saxon (Nielsen 2001: 518), both in its synchronic distribution as in its diachronic derivation, with one difference: the additional /ə/. The most archaic form of the Old Frisian system of unstressed vowels, represented in the Riustring manuscripts R_1 and R_2, had a three-vowel system, where /i/ and /æ/ merged into /e/, which subsequently appears as *-i* or *-e* as a result of synchronic rules of vowel harmony and vowel balance (Boutkan 1996: 26–32). The system was somewhat more complicated in protected positions and compounds (Smith 2008).

2.3 PGmc **a*C and **-ō#* in the Runic Frisian material

The existence of a vocalic echo in West Germanic of the nom.acc.sg. endings PGmc **-az* and **-an* in the *a*-stems has long been met with scepticism, e.g. Bammesberger (1998), Schuhmann (2014). (Waxenberger 2017: 110–111). The form *focla* 'bird' < PGmc **fugla-* in the 6th century Lex Salica was the sole indication of such an ending (Boutkan 1995: 171), together with the curious **-u**-spellings in the Runic Frisian corpus. Some scholars recognized the interpretation as a remnant of the *a*-stem ending earlier, so e.g. Düwel & Tempel (1968: 365) or Nielsen (1984: 13). Nielsen (2000: 93) acknowledges the fact that Frisian had a remarkable archaism here. With the uncovery of the **kaba** and **lapela** inscriptions (see § 1), adjoining the 1994 discovery of **ksamella** on the Fallward footstool and the earlier mentioned *focla*, there is a substantial body of evidence for a 5th and 6th c. ending *-a* in West Germanic (Schmidt, Nedoma & Düwel 2010; Euler 2013: 68) of which Runic Frisian **-u**, interpreted as /ə/, seems a late, 8th c. vestige (Nedoma 2014: 358).[7] South Germanic attestations, such as **awimund** (cognate Icel. *Eymundur*), a male

7. An ambiguous position is taken by Ringe & Taylor (2014: 45), who claim on the one hand that "[…] at the time the loss [of *-a*] occurred PWGmc was still a single speech community […]" but also acknowledge that the 8th century "[…] Frisian-speaking area must have been by far the last holdout against this apocope […]".

personal name on a find from Weimar, from the 6th c. from Thüringen (Findell 2012: 476), show that the loss of the final vowel may have started in the south-east, leaving the (West) Franconian and Frisian areas as relic zones. This leads to a substantial adjustment of Boutkan's and others relative and absolute chronology of the 'Auslautgesetze'.

Another modification of Boutkan's account concerns his order PGmc *-*ō* > *-*ū* (stage 1) > *-*u* (stage 8), with a subsequent loss of -*u* after heavy syllables (stage 9). The forms **jisuhldu** (PN) < **Gīsah(i)ld(j)ō*, **hämu** 'home (instr.sg.)' < **haimō*, and possibly also **habuku** 'Hawk (PN)' < **Habukō* if indeed a dat.sg. *ō*-stem, show retention of -*u* < *-*ū* < *-*ō* after heavy syllables. The vowel -*u* < *-*ō* is earlier also found on the 5th century Sievern bracteate with the text **wri[t]u** 'I write' and in various other, South Germanic inscriptions (Findell 2012: 152). The loss of *-*u* after heavy syllables is stage (9) in Boutkan's overview, which posits the -*u*-apocope to a moment before the creation of the four-vowel system in unstressed syllables (his stage 13), which we find in Early Old English, Old Saxon and also Runic Frisian. The Runic Frisian attestations suggest that the loss of this -*u* post-dates the creation of the four-vowel system.

One should keep in mind that the apocope of -*u* < PGmc -*ō* after heavy syllables was not as wholesale as it is generally presented. The -*u* was fairly consistently lost in the nom.acc.pl. of the neuter *a*-stems, but not in the instr.sg. of *a*-stems, nor in the 1.sg.ind. (in Old Frisian, Old English, Old Saxon, Old High German) or the dat./instr.sg of the *ō*-stems (Runic Frisian, Old Saxon, Old High German) (Boutkan 1995: 186, 228, 309, 382). This partial loss fits in with a scenario where -*u* < *-*ū* < PGmc *-*ō* was lost at a relatively late date in the chronology.

A crucial question is what happened to the short *-*u* from PGmc *-*u*(C), as in the *u*-stems. The reading of the Schweindorf solidus from ca. 600 as **welad**, interpreting it as a *u*-stem, implies that the loss of *-*u* < PGmc *-*uz* was of an earlier date than -*u* < *-*ū* < PGmc *-*ō*. This interpretation is one out of the various options and constitutes therefore a fragile piece of evidence, but we will see that it would comply with the phonetic rationale presented in § 3. The number of instances where a non-nasal *-*u* stood in absolute final position are limited.

3. A phonetic rationale for the order of vowel reductions in Frisian and its proto-stages

The observations in § 2 enable the following reconstruction of the chronology. It involves two rounds of vowel quantity reduction, including apocope of short vowels. At first, the reduction of word final -*a* to -*ə* in the *a*-stems can be dated to the 6th century: the full vowel is still preserved in the Fallward footstool from

the middle of the 5th century, whereas the -**u** is for the first time attested in the **skanomodu** text from the late 6th century. Then the Proto-Germanic word final short *-u* and *-i* were lost after heavy syllables. The loss of *-u* may have been first, already before 600 (**welad** from the middle of the 6th century – which is only very weak evidence), whereas short *-i* was lost during and directly after the period of *i*-mutation, which is mostly dated at ca. 600.[8] The outcome of this first round is attested in the Runic Frisian inscriptions, most of which are dated to the 8th c.: they still show the remnant of the ending *-*a* and the preservation of PGmc *-*ō*, both written -**u**. In a second round of vowel reduction, marking the transition to Old Frisian, these two vowels are also lost; the former entirely, the latter only partly, and then only after heavy syllables.

Two more changes are fairly well datable as well. The transition of the PWGmc nom.sg.masc. *n*-stem ending *-*ō* to *-å* must have taken place some time in first half of the 6th century: the Hitzum bracteate, dated to the late 5th century reads **fozo** (likely a masc. PN), whereas the -**a** appears in the Harlingen inscription **hada** 'Hedde (PN)', dated to the late 6th or early 7th century. Another transition that may have been on its way in the 7th or 8th century is the raising of *-*a* (*-*ā*?) < PGmc *-*ē* and *-*ōn#* to *-æ* as in **edæ** (PN). Most of the evidence comes from undated finds, a few from the 8th century. This development has a direct parallel in pre-Old English and Old Saxon (Boutkan 1995: 436, nr (13)).

The arrangement in Table 2 is not a mere incident but complies with the phonetic feature of the vowels' salience. The salience of a vowel is the combination of its amplitude and duration (Versloot 2008: 258–269).[9] Vowels have a so-called inherent phonetic duration, where open vowels tend to be acoustically longer than closed vowels, correlating with the movement of the jaw. The length of West Frisian vowels that most likely correspond to the reconstructed vowels in Runic Frisian in Table 2 is given in Table 3. It can be seen that the short vowels [i], [u] and [ə] are (roughly) equally long, but as [ə] is less articulated, it has a lower salience than the other two. The difference in salience between [i], [u] and the ultimate open vowel [a] is shown in Figure 1. The salience as a product of duration

8. This overlap in time is demonstrated in the only partial application of *i*-mutation by PGmc *-*i* in the Old Frisian root nouns (e.g. nom.acc.pl. *mūs* 'mice', *bōk* 'books' (Versloot & Adamczyk 2018: 35) as well as in the *i*-stems, e.g. nom.acc.sg. *wald* < **waldi* but dat.sg. *welde* < **waldī*.

9. The concept and relevance of 'salience' has been discussed at various places, such as in Goldschneider & DeKeyser (2001). The aforementioned study by Versloot (2008) reveals a sensitivity of diachronic changes to sub-phonemic measurable differences in phonetic length of unstressed vowels.

Table 2. Synopsis of the gradual implementation of apocope from Proto-West Germanic to Old Frisian

- The *-u* ~ *-o* and *-e* ~ *-i* alternations in Riustring Old Frisian are the result of Vowel Harmony and Vowel Balance (Boutkan 1996).[10]
- '*-Ø / -e*' < RF *-u* reflects the morphologically selective application of the second *-u*-apocope, such as *hūs* < WGmc **hūsū* 'houses', against *(h)abbe* < WGmc **habbjū* '(I) have'.
- A more extensive version with examples is given in Appendix 1.

		Apocope I: Runic Frisian		Apocope II: Riustring Old Frisian	
	Proto-WGmc	**light syllable**	**heavy syllable**	**light syllable**	**heavy syllable**
PGmc **-u(C)*	**-u*	*-u*	-Ø	*-u* ~ *-o*	-Ø
PGmc **-i(C)*	**-i*	*-i*	-Ø	*-i* ~ *-e*	-Ø
PGmc **-a(C)*	**-a*	*-ə*		-Ø	
PGmc **-ō*	**-ū*	*-u*		*-u* ~ *-o*	-Ø / *-e*
PGmc **-ei*, **-ī*	**-ī*	*-i*		*-i* ~ *-e*	
PGmc **-ai*	**-ǣ*	*-æ*		*-i* ~ *-e*	
PGmc **-ōn*	**-ɔ̄* > **-ā*	**-a* > *-æ*		*-i* ~ *-e*	
PGmc **-ō(V)n-*	**-ō*	*-å*		*-a*	

and amplitude is biggest for [a], followed by [i]. Finally [u], with its dark timbre, has the lowest salience.[11]

The first step in the reduction, from Proto-West Germanic or Anglo-Frisian to Runic Frisian, entails a general mora reduction: a short vowel (μ) becomes Ø, while a long vowel (μμ) becomes a short vowel (μ).[12] There are two exceptions to this general rule. First, short vowels following a light syllable are not affected.

10. Interfering with the vowel harmony and vowel balance, there are traces in Riustring Old Frisian of a historical contrast between Runic Frisian **-i* and **-ī* (<*ī*/*j*), such as in *stede* 'place': acc.sg. 2x *stede*, 1x *stidi* < **stædi*, against 3x dat.sg. *stidi*, 1x *stede* < **stædī*; *breke* 'breech': nom.dat.sg. *breke* < **bryki*, against 4x nom.dat.acc.sg. *hiri* 'army' < **hærī* < PGmc **harja-*.

11. This perceptional characteristic of low salience may have been the reason to choose the <u> to render /ə/.

12. A similar mora-loss is observed for the transition from Early Runic to Old Norse (Haugen 2004: 62); see also fn. 16. The transition from Old High German to Wallis German follows a similar pattern (Wipf 1910: 48–59): most of the preserved word final vowels in the modern dialect derive from Old High German either long or protected vowels. Possible exceptions are found among /a/ and /o/, the phonetically longest vowels, and a couple of instances with OHG *-u*, which developed from PGmc **-ō* (compare the discussion for Runic Frisian in § 2.3).

Table 3. The length of the reconstructed Runic Frisian vowels in measurements on Modern West Frisian. The shortest long vowel [ɔː] is 190 ms. (De Graaf 1986)

vowel (P(W)Gmc/RF)	duration Mod. Frisian
-ə [ə]	95 ms
-u [u]	95 ms
-i [i]	95 ms
-a [a]	115 ms
-æ [ɛ]	140 ms
-å [ɔ]	125 ms

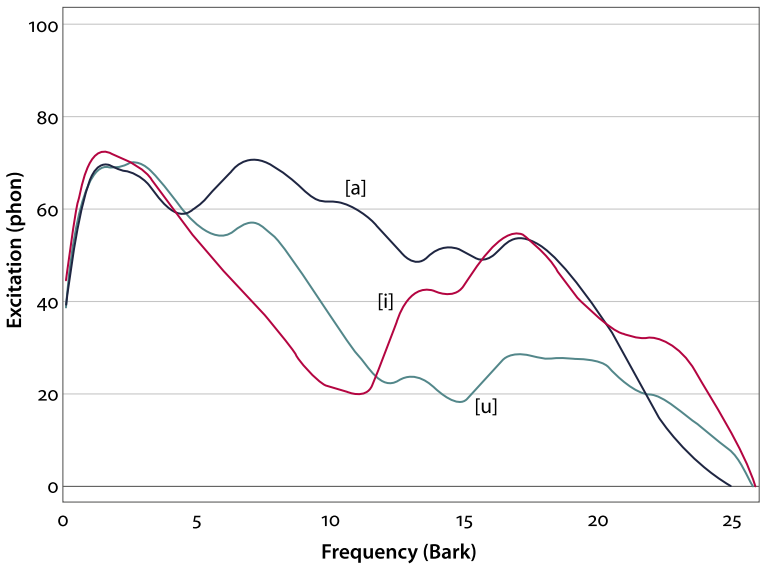

Figure 1. The loudness of [a], [i] and [u] as the cumulative loudness level over the frequency range
Legend:
horizontal: the auditory frequency (Bark); vertical: the auditory loudness level (phon)
blue = [a], black = [i], red = [u]
Thanks to Paul Boersma (UvA) for creating the figure.

This can be explained by recourse to the concept of foot structure: the vowel in the second syllable is part of the same foot as the stress bearing root of the word, which has the structure of a moraic trochee, and can therefore not be affected by apocope (Smith 2008). Old Germanic languages, such as Old Frisian and Old

English, maintain this metrical condition.[13] Second, the short vowel [a], with the highest salience through its duration and larger amplitude, behaves rather like a long vowel: it is not sensitive to foot structure (like the long vowels) and after losing one mora, there is still an acoustic vestige left, namely /ə/.[14]

The second step in the reduction, from Runic Frisian to Riustring Old Frisian, shows a perfect gradual scale of reduction. The by then least salient vowel [ə] is eliminated. The second least salient vowel, [u], is under pressure. Eventually, also RF *-u* < PGmc *-*ō* tended to disappear after heavy syllables in Old Frisian, just as it did in some instances in Old English, Old Saxon and Old High German, e.g. in the nom.acc.pl. of neuter *a*-stem nouns, but there were – as mentioned – many exceptions, where Old Frisian shows *-e*. After light syllables, the foot structure is still a protective environment. The other vowels, including the Runic Frisian short *-i*, are 'strong' enough to avoid apocope, but only short /a/, through its duration and amplitude the most salient, keeps its full quality and is not affected by vowel balance and vowel harmony effects. This reconstruction unifies phonetic universals and the actual historical evidence from Frisian.

4. Implications for the reconstruction of the 'Auslautgesetze'

The fairly long retention of (vestiges of) PGmc *-*a(z/n)* and *-*ō* in Runic Frisian is paralleled in Early Runic ('Urnordisch'). The 7th century Eggja-stone contains a dat./instr.sg. **solu** 'sun' < PGmc **sōlō* (Krause 1971:143). The reductions in North Germanic are dated to the transition period from Early Runic to Old Norse (Haugen 2004:54–64). Old Norse heavy syllable forms such as the *u*-stem acc.sg. *hǫnd* 'hand' < **handu* indicate that also short **u* was retained in Early Runic until a fairly late date. One has to consider nasalisation (acc.sg. **handũ*, cf. nom.sg. **handuz*) as a protective feature here. In West Germanic, the nom.sg. ending *-z* had disappeared at an earlier date, but the acc.sg. may have been nasalised for a long time. Apart from the possible instance in **welad**, I do not know of any instance of a heavy syllable nom.acc. sg. *u*-stem word in West Germanic runic inscriptions that could prove the

13. Later stages of the languages lose this conditioning, leading to large scale schwa-apocope and many monosyllabic words, also with a short syllable. Personally, I am reluctant to accept merely abstract features, such as foot structure, as an explanation for linguistic phenomena and processes. I am therefore inclined to assume a phonetic realisation of level stress on disyllabic light syllable words (Smith & Van Leyden 2007; Kristoffersen 2008).

14. The later continuation of Riustring Old Frisian, the dialect of the East Frisian island of Wangerooge, had an /i, ə, u/ system < OF /i, a, u/, similar to the Runic Frisian products of PGmc short vowels. While /i, u/ were fairly stable, the final /ə/ shows some inclination to be lost in word final position (Versloot 1996:244).

early loss of *-*u* against the longer retention of *-*ū* < PGmc *-*ō* in West Germanic.[15] The number of instances of PWGmc word final *-*u* was very limited anyway.

It was mentioned that various steps are fairly well dateable for Runic Frisian:

- Reduction of word final -*a* to -*ɔ*: first half of the 6th century
- Reduction of word final -*ō* to -*å*: first half of the 6th century
- Apocope of word final -*u*: first half of the 6th century (?)
- Apocope of word final -*i*: around 600
- Raising of PWGmc *-*ā* to -*æ* maybe not before the 7th or even 8th century

Irrespective of the fate of word final *-*u*, the separate development of short and long *-*i/ī* implies that some length contrasts must have existed into the 7th century in Runic Frisian.[16] The Early Old English sources from ca. 700 already show the four-vowel system, without any noticeable length opposition. The loss of vowel length as a distinctive feature in Anglo-Frisian may in fact have been a gradual process: with the loss or reduction of a short vowel, its long counterpart lost its phonologically distinctive length feature, irrespective of its phonetic length. There was an additional interference with phonetic nasalisation in a few instances as well: nasalised vowels tend to be longer than oral ones. The loss of one mora, mentioned in § 3, was therefore not a sudden development, but started around 500, with the reduction of -*a* > -*ɔ*, and was completed around 700, and largely followed the salience cline sketched in § 3.

For the time around 600, we can reconstruct an 'Anglo-Frisian' set of vowels in unstressed syllables as shown in Appendix 1 and 2. This system complies with the 'middle' stage as sketched by Nielsen (2010:111), with :/i, ɛ̄, a, ɔ̄, u/, although Nielsen is not entirely clear about the timing of the quantitative merger of earlier *-*i/u* and *-*ī/ū*. Nielsen separates *-*ɛ̄* < PGmc *-*ai* from *-*a* from PGmc *-*ōn* and protected PGmc *-*a*. A vestige of this in Anglo-Frisian may be found in the Runic Frisian form **[a]le**, if correctly interpreted as a 3. pers.sg.subj. PGmc *-*ailai(þ)* from *-*alan* 'to grow', in the Westeremden B inscription, but the evidence is feeble (Versloot 2016a:21). An open question is in which order PGmc *-*ɛ̄*[1], *-*ai* and

15. It seems that nasalisation also 'counted' as a mora (Haugen 2004:65). This is well illustrated in the acc.sg. and pl. of *u*-stems: PGmc *-*un* ~ *-*unz* > Early Runic *-*ū* ~ *-*unn* > Transition Period *-*u* ~ *-*un* > Old Norse -Ø ~ -*u*. The often-quoted form *flōdu* 'floods' on the Franks Casket (Findell 2014:48) has its final -*u* probably thanks to a similar sequence.

16. In addition to the phenomena described in fn. 10 for Riustring Old Frisian, it can be mentioned that Early Old English shows a different *i*-mutation effect of *-*i* vs. *-*ī/j* (Versloot forthc.). Effects of vowel length contrasts in pre-Old English until a fairly late date are also mentioned by Goering (2016).

*-*ōn* merged.[17] Appendix 1 and 2 do not distinguish them anymore for the Runic Frisian stage. Another open detail is the merger of the PGmc infinitival ending *-*ana-* and an Anglo-Frisian *-*ō* from PGmc *-*ō*C (not *-*ōn*) and *-*au*, which both ended up as *-a* in Old Frisian. Nasalisation may have played a role here as well up to a fairly late date. Such processes are not necessarily 'neat', as is demonstrated by the realisation of word final *-u* in Wallis German: this vowel continues both OHG *-u*, *-ōn* and other short vowels before *-n*, leaving a synchronically variable trace of nasality or [n] (Wipf 1910: 50–51, 56–57).

5. Conclusion

It was demonstrated that the Runic Frisian attestations comply with a theory of unstressed vowel reduction in North Sea Germanic languages, in particular Frisian and English, posing a gradual mora reduction of unstressed vowels, implemented between ca. 500 and 700. The loss of one mora implied the loss of short vowels under specific conditions and the (phonological) shortening of long vowels. This general reduction overlaid the qualitative changes that Proto-Germanic vowels experienced and probably interfered with the nasalisation that may have counted as a mora in the abstract analysis of the vowel system. A second round of reductions, affecting Runic Frisian *-u* after heavy syllables and *-ə*, took place at a fairly late date in Frisian, only during or after the 8th century, which tallies with the datings found in North Germanic. A similar development must have taken place earlier in Old English, given the fact that the Early Old English sources from ca. 700 exhibit a four-vowel system without traces of PGmc *-*az/-an* and with apocope of earlier *-*u* from PGmc *-*ō* after heavy syllables.

The absolute and relative dating of the reduction process is also important for understanding the development of vowels in stressed syllables. Several of these developments depend on the quality and quantity of the vowels in unstressed syllables. The most explicit example is *i*-mutation, but also the monophthongization of PGmc **ai* depends, among others, on the quality of the following vowel in Frisian (Versloot 2017b), just as does the fronting of PGmc **a* in Frisian (Versloot 2016b: 387–388) and English (Hogg 2011: 93, Versloot forthc.).

17. The problematic interpretation of the fate of PGmc *-$\bar{e}^1$ in Runic Frisian is discussed in Nielsen (2000: 163–164).

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Appendix 1. Synopsis of the gradual implementation of apocope from Proto-Germanic to Old Frisian

				Apocope I: Runic Frisian		Apocope II: Riustring Old Frisian		
Proto-Gmc	**example**	**Proto-WGmc**	**A-F**	**light syll.**	**heavy syll.**	**light syll.**	**heavy syll.**	**Old Frisian example**
PGmc *-*a*/-*i*	**eka* 'I',	-Ø	-Ø	-Ø		-Ø		*ik*
PGmc *-*uz*/-*un*	**sunuz*/ *handuz* /-*un*	*-*u*	*-*u*	-*u*	-Ø	-*u* ~ -*o*	-Ø	*sunu – hond*
PGmc *-*iz*/-*in*	**stadiz*/*gastiz* /-*in*	*-*i*	*-*i*	-*i*	-Ø	-*i* ~ -*e*	-Ø	*stidi – jest*
PGmc *-*az*/-*an*	**fiskaz*	*-*a*	*-*a*	-*ə*		-Ø		*fisk*
PGmc *-*ō*	**sugō*/**wurdō* (pl)	*-*ū*	*-*ū*	-*u*		-*u* ~ -*o*	-Ø / -*e*	**sugu~fretho* / *word~habbe*
PGmc *-*ei*, *-*ī*	**leudīz* (pl.)	*-*ī*	*-*ī*	-*i*		-*i* ~ -*e*		*liode*
PGmc *-*ai*	**kumai(t)* (subj.)	*-*ǣ*	*-*ǣ*	-*æ*		-*i* ~ -*e*		*cumi ~ kome*
PGmc *-*ē*	**dedē(þ)*	*-*ā*/*ǣ*(?)	*-*ǣ*	-*æ*		-*i* ~ -*e*		*dede*
PGmc *-*ōn#*	**tungōn*	*-*ɔ̄*^{n}	*-*ā*	-*æ*		-*i* ~ -*e*		*tunge*
PGmc *-*ana*-	**kumana*- (inf.)	*-*an*	*-*an*	-*a*		-*a*		*koma*
PGmc *-*ō(V)C*-/-*au*	**hanōn*- / **haƀōz* (pl.)	*-*ōn*/-*ō*	*-*ō*-	-*å*		-*a*		*hona/hewa*

The -*u* ~ -*o* and -*e* ~ -*i* alternations in Riustring Old Frisian are the result of Vowel Harmony and Vowel Balance (Boutkan 1996).

'-Ø / -*e*' < RF -*u* reflects the morphologically selective application of the second -*u*-apocope, such as *hūs* < PWGmc **hūsū* 'houses', against *[h]abbe* < WGmc **habbjū* '(I) have'.

Appendix 2. The developments from Proto-Germanic to Runic Frisian, illustrated with Runic Frisian evidence

				Runic Frisian			
				light	heavy		
Proto-Gmc	**example**	**Proto-WGmc**	**A-F**	**syll.**	**syll.**	**Examples**	**Dating**
PGmc *-*a/-i*	**eka* 'I', *miþi* 'with'	*-Ø*	*-Ø*	*-Ø*		**ek, meþ**	< 400
PGmc *-*uz/-un*	**–/-handuz* 'hand'	**-u*	**-u*	*-u*	*-Ø*	*sunu* **wela[n]d(?)**	525–575
PGmc *-*iz/-in*	**skaþiz*(?)/*aibiz* 'Ybe'	**-i*	**-i*	*-i*	*-Ø*	**skaþi aib(?)**	ca. 600
PGmc *-*az/-an*	**kambaz* 'comb'	**-a*	**-a*	*-ə*		**[sk]amella > kō[m]bu**	440–575
PGmc *-*ō*	**-hildjō* 'hero'	**-ū*	**-ū*	*-u*		**jisuh[i]ldu**	–
PGmc *-*ei, *-ī*	**īwī* 'yew'	**-ī*	**-ī*	*-i*		**iwi**	–
PGmc *-*ai*	**alai(t)* (subj.) 'thrive'	**-ǣ*	**-ǣ*	*-æ*		**[a]le** (?)	–
PGmc *-*ē*	**dedē(þ)* 'did'	**-ā/ǣ*(?)	**-ǣ*	*-æ*		**deda**	ca. 700?
PGmc *-*ōn#*	**kautōn* 'knuckle'	**-ɔ̄^{n}*	**-ā*	*-æ*		**jibăda/katæ**	?
PGmc *-*ana-*	**–farana-*	**-an*	**-an*	*-a/ ã* (?)		*fara* (OFris.)	–
PGmc *-*ō(V)C-/-au*	**hadōn-* 'Hedde'	**-ōn/-ō*	**-ō-*	*-å*		**fozo > hada**	500–575

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